ANNEX G

105000469//03/004
September, 2018

NORTH BECK ENERGY LTD

North Beck Energy Centre

Environmental Permit Application: Fire Prevention Plan

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Client	North Beck Energy Ltd
Title	Environmental Permit Application: Annex G: Fire Prevention Plan
Project	North Beck Energy Centre
Project No.	105000469
Classification	105000469/15/03/004
Drawing/Reg./Serial No.	
File name	Annex G Fire Prevention Plan Rev0.docx
File location	
System	Microsoft Word 14.0
External distribution	
Internal distribution	
Contribution	
Responsible BU	

Revisions:

Original

Date of document	11th September 2018
Author/position/signature	Indran Aandi
Date of control	11th September 2018
Checked by/position/signature	Julian Scutter

1

Date of document	
Author/position/signature	
Date of control	
Checked by/position/signature	

2

Date of document	
Author/position/signature	
Date of control	
Checked by/position/signature	

Change at last revision

Preface

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1 INTRODUCTION

1. North Beck Energy Ltd. (NBEL) is proposing to build an Energy-from-Waste (EfW) facility ("Plant"), the North Beck Energy Centre (NBEC), at Immingham, North East Lincolnshire, United Kingdom ("Site"). The Plant will consist of two lines of boilers using conventional moving grate combustion technology and flue gas abatement systems. The capacity of the plant will be approximately 560,000 tonnes per annum of fuel and shall produce 49.5 MW net electrical power output. The Feedstock fuel will be derived from non-hazardous residual waste from municipal / household, commercial and industrial sources. Residual waste is that material which remains after material has been separated for recycling. In the main, it is expected that the plant will burn Refuse Derived Fuel (RDF) – refer to the **Supporting Information Report**, Section 2.1 for a full definition of the fuel that will be used.
2. The purpose of this document is to set out fire prevention measures and procedures to be put in place before the Plant becomes operational. This is a preliminary Fire Prevention Plan (FPP) which will be subject to further review as the project is further developed. . Currently, the Project is at an early development stage in selecting a preferred EPC Contractor for the design and construction of the Plant and also an O&M Contractor. It is expected for the Plant detail design to start during 2019 when local Fire and Rescue Service (FRS) fire-fighting strategy and requirements for the Site will be incorporated. Following the detailed design stage this plan will be reviewed and updated as appropriate, similarly after the O&M Contractor has been appointed.
3. This FPP has been developed with the following objectives:
    - to minimise the likelihood of a fire happening;
    - to enable a fire to be extinguished within 4 hours; and
    - to minimise the spread of fire within the site and to neighbouring sites.
4. This document sets out the measures that will be put in place to reduce the risk of a fire breaking out. It also identifies the possible causes of a fire at the Site and the measures that will be put in place to address those fire risks.
5. This document is developed based on the EA Guidance for a Fire Prevention Plan published in https://www.gov.uk/government/publications/fire-prevention-plans-environmental-permits/fire-prevention-plans-environmental-permits and has generally been structured to follow the guideline.

2 SITE DESCRIPTION

2.1 Site location

6. The site for the NBEC is located approximately 1.45km east of the town of Immingham and is reached from Queens Road (the A1173), which runs immediately to the North of the site (see Figure 2-1). Figure 2-1 also shows the site location and immediate surrounding sensitive receptors.

2.2 Site Activities

7. The following are activities that will be carried out at the site that could create a fire risk:

   a) combustible Feedstock deliveries (potential for hot loads), storage (self-combustion) and feeding of the Feedstock into the furnace (fire spreading). Other combustion residues such as Incinerator Bottom Ash (IBA) and Air Pollution Control (APCr) residues will be low risk since these will be the products from the combustion process and will consist of inert material. These materials have therefore not been considered in this assessment;

   b) storage of powdered activated carbon and risk of self-heating;

   c) hot work such as cutting, grinding and welding during repair and maintenance works;

   d) turbine lubrication oil system; and

   e) fuel oil storage for the boiler auxiliary burners and emergency diesel generator.

2.3 Site Plan

8. The Site has good access via King's Road and Queens Road which will allow for the FRS to respond quickly. The nearest fire station is the Immingham East Fire Station located at Kiln Lane which is only two miles away from the Site and should be able to respond within 5 mins.

9. The Fire Prevention Equipment Layout (Attachment 1) shows the following:

   - layout of buildings;
   - any areas where hazardous materials are stored on site (location of gas cylinders, process areas, chemicals, Feedstock bunker, activated carbon silos and fuel oil tank);
   - main access route for fire engines via a new dedicated road off Queens Road;
   - access points around the site perimeter to assist fire-fighting;
   - hydrants and water supplies;
   - areas of natural and unmade ground;
   - the location of fixed plant or where mobile plant is stored when not in use;
   - drainage runs, pollution control features such as drain closure valves and fire water containment systems;
   - storage areas with preliminary bunker dimensions are shown in Figure 4-1;

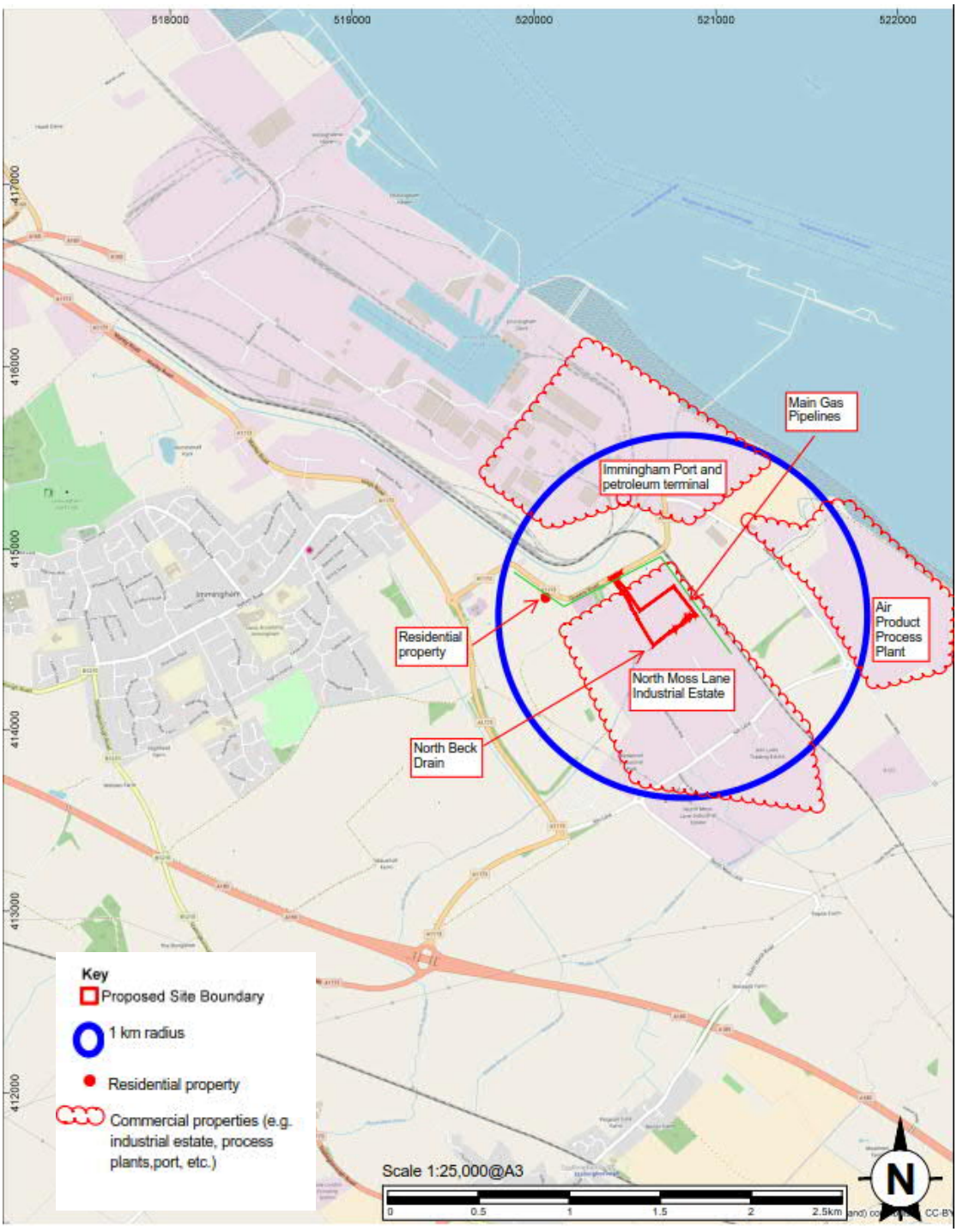
- feedstock quarantine area;
- a compass rose showing north and the prevailing wind direction.

10. The main areas of operation are:
    - A Tipping Hall where incoming fuel is discharged by delivery vehicles into the Feedstock Bunker; and
    - Feedstock Bunker where incoming fuel is stored temporarily before feeding into the combustion plant.
11. The layout is still preliminary and the information identified above must be considered to be indicative and will be subject to further optimisation during detailed design by the EPC Contractor.

2.4 Receptors

12. Figure 2-1 (overleaf) shows sensitive human and ecological receptors within a 1 km radius of the site that could be impacted by a fire and/or fire-fighting which includes the following:
    - a residential property and shops along Queens Road;
    - shops and offices along Queens Road;
    - Warehouses and factories within North Moss Lane Industrial Estate;
    - Immingham port and petroleum terminal towards the North;
    - Air Product process plant towards the East;
    - Main gas pipelines running along the Queens Road and along the eastern boundary of the Site.
    - North Beck Drain along the Southern boundary of the Site.
13. The Site is located in an industrial area surrounded by commercial properties such as warehouses, process plants, factories, shops and office buildings and only one residential property along Queen's Road to the North West. The prevailing wind direction is towards the Southwest (see attachment 2) and within this area, there mainly consists a few storage warehouses and factories with a low population density. Also, there are no ecological receptors at close proximity to the site. Therefore, in the event of a fire at Site, the impact on human and ecological receptors will be minimal.
14. The nearest highly populated area is the Immingham town at the Northwest which is about 1.45 km away from the Site and it is not in the prevailing wind direction. Therefore, in the unlikely event of fire at Site, it should not have significant impact on receptors in Immingham town.
15. Conversely, a fire at neighbouring premises is unlikely to affect the Site or spread to the Site as the facility is well distanced from surrounding neighbours.

Figure 2-1 Sensative Receptors within 1 km radius of the Site



3 COMMON CAUSES OF FIRE AND ITS MANAGEMENT

16. This section identifies the common causes of fire that could potentially arise from the activities on Site and describes measures that will be put in place to reduce the risk of fire.

3.1 Arson

17. Security measures will be installed to prevent unauthorised access to the site to avoid vandalism and arson attacks. The Site will be manned at all times and will include CCTV, a security fence around the site perimeter with motorised security gate and a separate entrance barrier, intruder alarm and a security guard in the weighbridge office outside of normal delivery hours. Plant operators would be able to monitor the Site perimeters through the CCTV from the Central Control Room (CCR) and also from the weighbridge office. NBEC will have a 24 hours manned security presence or at least 24 hour coverage such as drive-by security runs.

18. Material deliveries and collections will generally be limited to weekdays over a 12-hour period (06:00 – 18:00). This will limit site access during off-peak hours and reduce the risk of intrusion by locking up the site entrance gate during out-of-hours operation.

19. An emergency response plan will be developed as part of the Site procedures during the implementation stage which will detail procedures to follow during emergency situations on site, including arson attack or unauthorised personnel on site.

3.2 Plant and equipment

20. Plant Operation and Maintenance (O&M) will be carried out in accordance with work instructions given in the O&M manuals. The O&M manuals will be developed by the EPC Contractor and the O&M Contractor during the plant commissioning stage which will detail the maintenance and inspection programme to be followed as well as routine operating procedures. Maintenance activities will be carried out at set intervals and according to safe procedures in order to avoid the risk of fire accidents.

21. Mobile vehicles will also be maintained as per manufacturers recommendations and will be fitted with portable fire extinguishers. These vehicles will be parked in designated parking areas and kept away from combustible material and hazardous areas.

3.3 Electrical faults including damaged or exposed electrical cables

22. Electrical faults, both in processing equipment and general electrical systems, such as lighting, heating and portable electrical appliances, can be a source of ignition. General electrical systems on site will be fully certified by a qualified electrical engineer and electrical equipment will have certificates of conformity (i.e. CE marks). Regular maintenance and routine inspections and testing will be carried out as per manufacturer's O&M manual and regulations. Thermographic cameras can be used as part of routine inspections to identify electrical faults, over-heating equipment and other potential ignition sources.

3.4 Discarded smoking materials

23. The Site will generally be classified as a non-smoking site and there will be designated smoking areas located at a safe distance from combustible materials to prevent

accidental ignition. Indicative locations will be at the car park, outside the administration building, turbine hall and workshop.

3.5 Hot works

24. Hot works such as cutting, grinding and welding will take place often during repair and maintenance.

25. A Permit to Work (PtW) system will be in place to ensure that appropriate controls are instigated before, during and after any and all forms of hot work. These will be described in a Risk Assessment and Method Statement (RAMS) The RAMS will also include a risk assessment associated with a particular work and describe the safe method and controls to follow and appropriate tools and equipment to be used.

26. Fire extinguishers, hoses etc. will be provided at the scene of any hot work so that they can be used immediately should a fire occur.

27. Formal site 'close-down' procedures will include inspection of the site after work has ceased to reduce the risk of any smouldering material being undetected and turning into a fire. A fire watch will also be put in place for a suitable period after hot works have ended, particularly at the end of a working day/shift to minimise the risk that any smouldering could go undetected.

28. So far as practical, combustible materials will be cleared away from the area of any hot work before hot work starts, particularly around or above the Feedstock Bunker areas (any residual Feedstock which cannot practically be moved can be damped-down thoroughly with water in advance to reduce the risk of ignition).

29. Potentially combustible materials, including mobile plant hydraulic lines, will be covered by a fire blanket, and/or damped down as appropriate, before hot work starts.

3.6 Ignition sources

30. Potential ignition sources at NBEC include: self-ignition of Feedstock and activated carbon, naked flames, space heaters, furnaces, auxiliary burners, emergency diesel generator, short circuit, electrical switches, electrical tools and electrostatic build-up and discharge. Ignition sources will be kept at least 6 metres away from combustible and flammable material. Ignition source from naked sources such as hot works is described above.

31. A hazardous area classification (zoning) assessment under the Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) will be carried out during the project execution stage which will identify explosion risk areas and recommend appropriate Atex zoning. Normally APC storage silos, fuel oil tank, gas cylinder, etc. will be classified as hazardous areas and equipment within these areas will be Atex rated to avoid potential ignition sources.

3.7 Industrial heaters

32. No heaters or hot air blowers are used for routine activities at the EfW facility.

33. Occasionally, industrial heaters or hot air blowers maybe used temporarily for drying or space heating during plant maintenance. For each instance, its use and necessary safeguards will be assessed in the RAMS to ensure it is safe to use. The maintenance of

the industrial heaters and blowers will be carried out in accordance with manufacturer's recommendations and will be incorporated into the overall plant maintenance programme.

3.8 Heavy mobile plant

34. Heavy mobile plant such as shovels, grabs and tele-handlers will be used on site for spillage management and maintenance. These mobile plant normally consist of hot exhaust and engine parts which could ignite combustible material or dust trapped near them if these come into direct contact.

35. Operators will be informed about this risk and will be responsible to ensure that combustible materials are cleared from around exhausts and other hot parts at the end of each shift. This instruction will also be included in the operational housekeeping procedure and periodic audits will be carried out to ensure the procedure is followed.

36. Mobile plants will be fitted with portable fire extinguishers so that any fires that do start can be extinguished promptly to minimise the risk of fire spreading.

37. Mobile plant, in particular electrical systems, will be maintained as per the maintenance schedule recommended by suppliers.

38. After use, the mobile plant will be parked at a designated safe parking area away from Feedstock storage.

39. Mobile shovel blades often produce sparks when scraped along a concrete or metal surface. Mobile shovels will be used for clearing Feedstock spillages in the reception hall which is normally classified as a hazardous area. A special coating will be applied to the shovels to limit or prevent spark generation.

3.9 Batteries in end of life vehicles

40. NBEC facility will not accept end of life vehicles and therefore this risk is not applicable for this project.

3.10 Leaks and spillages of oils and fuels

41. Site vehicles will be checked for any oil or combustible liquids leaking or trailing from when entering the site.

42. An emergency response plan will be put in place which will set identify procedures to follow in the event of any spills and leaks of chemicals on site.

43. Oils stored on site will be contained within tanks designed and bunded in accordance with oil storage regulations. Routine inspections will be carried out to monitor the integrity of oil and fuel storage tanks and containment.

3.11 Build-up of loose combustible material, dust and fluff

44. In general, smaller particle size, loose and free/discarded materials of a combustible material are easier to set alight particularly if these can come into contact with hot surfaces and other ignition sources. Some portion of the Feedstock is very dry and has relatively low durability which can lead to dust being generated at each of the handling stages. This dust can require only low energy ignition sources and if the concentration of

dust is not controlled then there can be the potential for an explosive mixture to occur. A regular maintenance and cleaning programme will be introduced for all site areas including site machinery and buildings. The programme will be set out within the site management procedures and will be subject to routine audit.

45. Potentially, the most vulnerable area will be in the Feedstock Bunker building and at the level where the crane grab discharges into the boiler feed chute. The design of this area will minimise ledges where material could accumulate. This area will also feature prominently in the routine procedures for vacuum cleaning.

46. Flammable materials, such as oils, greases, fuels, paints, etc., will be stored correctly and put back into store after use. Routine site inspections will include housekeeping and will act to keep the site as free from loose/discarded combustible materials and dusts as practical.

47. Dust should be cleared typically on a monthly basis (depending on the rate of dust build-up) from electrical conduits and systems, hydraulic power packs and drive motors (and any other item of equipment which may produce heat or be an ignition source).

3.12 Reactions between Feedstocks

48. Typically, the Feedstocks accepted at the site are not expected to present incompatibility problems or include unstable Feedstocks since these will be derived mainly from household type wastes. However, there could be hot loads occasionally which are discussed separately below. In the event that incompatible materials in the incoming Feedstock are identified these rejects will be stored temporarily in a designated Feedstock quarantine area within the main tipping hall and will be trucked away for offsite disposal. A written procedure will be in place setting out the steps to follow in the event of Feedstock rejection.

3.13 Self-heating

49. The organic part of the Feedstock, with high moisture content, can potentially degrade in storage. This micro-biological process generates heat which over a period of time can result in spontaneous combustion within the storage pile. The Feedstock bunker will be provided with heat detection sensors to provide an alarm and will have water cannons that will be used to douse fires and hot spots following procedures that will be put in place.

50. The Feedstock will be managed to mitigate this risk by limiting the storage period in the bunker during periods when the combustion plant is shut down. This is discussed further in the next section.

3.14 Deposited hot loads

51. Feedstock acceptance procedures will be in place and will include measures for the identification and handling/quarantine of any hot loads.

52. The Feedstock will be stored in a large bunker which will be self-contained. For relatively minor fires, these can be put out with water cannons. The wetted Feedstock can subsequently be mixed with dry material in the bunker and fed to the boiler for combustion.

53. In the event of a major incident that rendered the Feedstock too wet for combustion, then the affected material can be removed from the bunker for offsite disposal via the crane park area. Any unburnt and smouldering Feedstock within the Feedstock bunker will be extinguished first rather than moving to a quarantine area using grab crane or heavy mobile plant, which would increase the risk that the fire could spread to other parts of the building.

4 FIRE PREVENTION

4.1 Types of combustible Feedstock

54. The principal Feedstock type to be combusted at NBEC is RDF but other feedstock derived from municipal wastes and similar C&I waste may also be used, as shown in the **Supporting Information Report** (Section 2).

4.2 Storage capacity

55. Feedstock delivered by vehicles is stored in a Feedstock storage bunker sized to provide a total storage capacity of up to 5 days at maximum heat input which is equivalent to 26,000 m^3 or approximately 7,800 tonnes (fully stacked). The proposed quantity is significantly greater than the maximum pile size of 450 m^3 specified in the guidance which is understood not to apply for EfW plants. The proposed storage bunker for NBEC is consistent with EfW industry practice over many decades which has proven that a bunker provides the safest and most practical solution.

56. The risk of self-combustion is mitigated by the proposed bunker management methods that include: regular mixing, temperature monitoring, fire detection systems and automatic water cannon jets described below. Also, the proposed Feedstock storage time (i.e. c. 5 days under normal operation) is substantially below the maximum period of 3 months described in the guidance for stockpiles.

57. The Feedstock Bunker is common for the two process streams and is served by two common overhead gantry grab cranes (duty and standby) that can travel along the storage bunker.

4.3 Prevent self-combustion

58. The Feedstock will be routinely and regularly mixed to improve homogeneity and this will also help to dissipate heat trapped within the Feedstock heaps and prevent anaerobic conditions that can lead to hot spots and self-combustion.

59. Powdered Activated Carbon (PAC) is a reagent required for removal of dioxins and mercury from the flue gas. The PAC will be stored in a dedicated silo which could potential self-heat over a long period of time and therefore silo monitoring and protection systems will be provided to mitigate the risk of fire. Temperature sensors will be fitted in the PAC Silo and arranged to alarm the CCR if any temperature rise is detected. A manually initiated gaseous fire protection system will also be fitted in the silo to extinguish fire in the silo. The manual initiation point will be located far enough away from the PAC Silo to avoid danger to the operator.

4.3.1 Manage storage time

60. The fuel within the Feedstock Bunker will be mixed to improve homogeneity by the overhead crane that will also be used to load the boiler feed chutes. In general, operating procedures will be such that fuel will be well mixed within the bunker to reduce the risk that fuel is retained for lengthy periods risking decomposition and release of odours. This will also be ensured at night and over weekend periods when fuel is needed for the boiler and when deliveries will not usually take place. During weekend periods the fuel

demand from the boilers will effectively reduce the bunker to low levels resulting in the Feedstock generally being stored for periods of no more than 4-5 days.

61. Feedstock will be brought into the Tipping Hall by delivery vehicles and will be tipped directly into the main bunker for storage.

62. During annual maintenance, the plant could be shut down typically for 2 to 3 weeks. During this period the plant would mainly operate using one stream whilst the other underwent maintenance. Feedstock deliveries would be reduced over this period to prevent prolonged storage. During periods where both streams were off-line (e.g. during turbine maintenance or pressure parts inspections), then prior to planned shutdown, the Feedstock deliveries to the site will be stopped temporarily and the remaining Feedstock in the storage bunker processed to reduce storage in the bunker to a minimum. This will minimise issues with self-combustion and odour emission.

4.3.2 Monitoring and temperature control

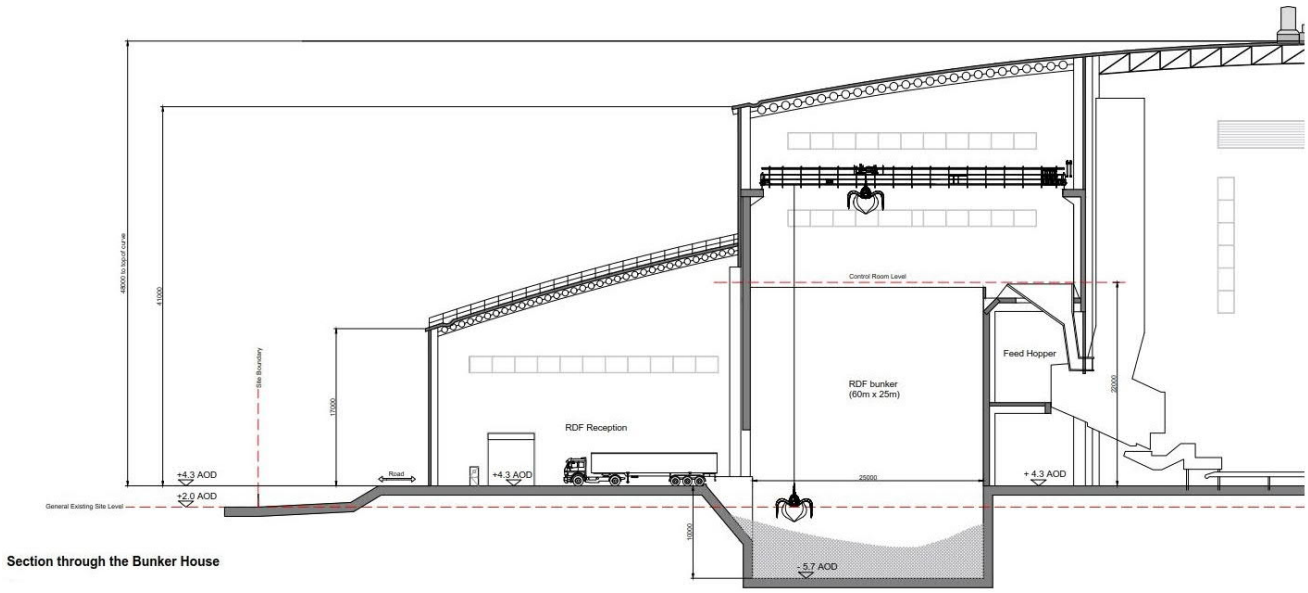
63. The temperature of the Feedstock within the bunker will be displayed using a thermal imaging camera on a continuous basis and will raise an alarm when high temperature is detected (see Section 5.3.4).

4.4 Prevent Fire Spreading

4.4.1 Feedstock storage – separation distance

64. Fuel feedstock will be stored in an enclosed Feedstock Bunker building as is normal proven practice for EfW facilities and there will be no separate Feedstock stockpiles. The bunker will be provided with firewalls. Therefore pile separation and separation distance between pile and building are not applicable for this project. Also, there will be no division wall within the bunker as it would increase the crane movements and increase the risk of collision between the cranes and the wall. The bunker arrangement for NBEC is a single bay arrangement with a pit type as shown in Figure 4-1.

Figure 4-1 Feedstock bunker arrangement



65. The Operator will implement active stockpile management where the Feedstock stored in the bunker will be mixed frequently to minimise the residence time in the bunker.

4.4.2 Fire walls

66. The site will be segregated into fire zones and requirement for fire barriers will be followed as per insurance requirements for example "Energy from Waste (EfW) – Fire Systems issued by ACE Group, see **Appendix G3**)" (the "**ACE Guidance Document**"). A fire risk assessment will be undertaken during the detailed design stage by the EPC Contractor. This will identify appropriate fire detection and protection systems, in association with appropriate civil work design principles, to control the risk of fire propagation, spread of fumes and smoke and fire water flooding and to maintain the integrity of dedicated fire partition walls in the event of fire.

67. The fire partition walls will be generally rated to:

- resist fire (both radiative heat and flaming); and
- have a fire resistance period of at least 120 minutes to allow combustible material to be isolated and to enable a fire to be extinguished within 4 hours.

68. The dividing wall between the Feedstock Bunker and the boiler will be constructed in concrete or suitable rated cladding system up to the roof level to form continuous 2-hour fire rated barrier for the full width and height of the building structure. All doors within this wall will be fire rated to 2 hours. This dividing wall will be resistant to grab crane impact and impingement of water cannon jets. The structural design of the fire barrier will ensure that its integrity will be maintained in the event the steel roof of the bunker collapses due to fire in the bunker. The control room bunker observation windows will also be fire resistant and rated for 2 hours.

69. Any exposed steel columns located at the front of the receiving bunker will be protected against structural damage caused by heat (fire). This protection may include concrete encasement, water spray, or other suitable alternatives and shall extend from the base of the column to the roof of the refuse pit enclosure. Fireproofing will be protected from mechanical damage.

70. A roof sprinkler system will be directed on to steel columns where necessary. However designated sprinkler systems to columns are not required.

4.5 Firefighting techniques

71. In addition to the water cannons, the Feedstock grab crane can assist in tackling fires by removing Feedstock which is not alight away from the location of any fire to prevent fire spread, such as by 'sweeping' un-ignited Feedstock away from any Feedstock which is partially on fire.

72. The use of the Feedstock grab crane for fire-fighting will be described in the emergency response procedures to be developed by NBEL's Operator (NB not selected at the present stage of project development) who will ensure the following:

- the plant operatives are trained and competent in the task and they are completely aware that such action must only be done without risk to their own health and safety or to others; and

- fire drills conducted with plant operators by practising sweeping Feedstocks away from a stock pile.

4.6 Quarantine area

73. A quarantine area has been allocated where hot loads will be deposited before being extinguished using sprays. This will be a dedicated area outside the Tipping Hall that meets the EA's Section 12 FPP guidance to enable the vehicle to reverse into position and discharge its load. The quarantine area will be enclosed on three sides by concrete walls and will have permanently installed water deluge sprays that will be initiated by an operator from a safe location. The quarantine area will be sloped towards the rear wall such that firewater will be captured and prevented from entering the drains. This water will be removed by tanker for off-site disposal.

74. Fire detection and protection measures will be installed in this area and the design will be finalised by the EPC Contractor at the detailed design stage taking into consideration fire risk assessment and insurers requirements.

5 FIRE MANAGEMENT SYSTEM

5.1 General

75. The fire detection and protection systems will be distributed over the entire plant area. The main indicator boards will be located in the CCR and in the weighbridge office at the main gate.

76. The fire-fighting system for the facility will include the following:

- Fire detection systems
- Firewater pumps
- Piping and valves
- Outdoor fire hydrants and hose houses
- Water sprinkler systems
- Deluge systems
- Water cannons for the Feedstock bunker
- Indoor hose stations
- Inert gas fire suppression system
- Foam systems
- Portable fire extinguishers
- All data, drawing, erection, operation and maintenance manuals
- Passive fire protection
- Firefighting water containment

5.2 Design Codes and Standards

77. The fire protection and detection systems will be designed as per the ACE Guidance Document which is compiled based on the following codes and standards:

Standard	Title
NFPA 10	Standard for portable fire extinguishers
NFPA 11	Standard for Low-, Medium-, and High-Expansion Foam
NFPA 12	Standard on Carbon dioxide extinguishing systems
NFPA 13	Standard for the installation of sprinkler systems
NFPA 14	Standard for the Installation of Stand pipe and hose systems
NFPA 15	Standard for Water Spray fixed fire protection
NFPA 16	Standard for the Installation of foam-water sprinkler and foam water spray systems
NFPA 20	Standard for the installation of stationary pumps for fire protection
NFPA 24	Standard for the installation of Private Fire Service mains and Appurtenances

Standard	Title
NFPA 30	Flammable and combustible liquids code
NFPA 68	Standard on Explosion protection by Deflagration venting.
NFPA 69	Standard on explosion prevention systems
NFPA 70	Standard for Electrical Safety in the Workplace
NFPA 72	National Fire Alarm signalling Code
NFPA 80	Fire Doors and Other Opening Protectives
NFPA 80A	Recommended Practice for Protection of Buildings from Exterior Fire Exposures
NFPA 82	Standard on Incinerators and Waste and Linen Handling Systems and Equipment
NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems
NFPA 92	Standard for Smoke Control Systems
NFPA 204	Standard for Smoke and Heat Venting
NFPA 750	Standard on water mist Fire protection systems
NFPA 850	Recommended practice for fire protection for electrical generating plant and high voltage direct current converter stations.
NFPA 2001	Standard on clean Agent fire extinguishing systems
BS 5306	Fire Extinguishing installations
BS 5839 Part 1	Fire detection and fire alarm systems for buildings
BS ISO 15004-1	Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance
FM 7-98, 6-13, 6-4, 5-4 and 1-10	FM global property loss prevention data sheets
GAPS 17.9	Solid waste disposal and incineration

78. A fire risk assessment of the facility and a Site fire/explosion prevention, suppression and detection report including fire prevention method statement will be developed by the EPC Contractor at the detailed design stage.

79. Close attention to the fire risks due to the nature of the fuel stored and conveyed will be taken into account in the EPC Contractor's design.

5.3 Fire Detection System

5.3.1 General

80. Fire detection will be installed in all buildings in accordance with BS 5839, Part 1 – 2013 and amendments to give level P1 coverage or equivalent coverage under NFPA 72 National Fire Alarm Code.

81. The design, installation and maintenance of fire detection systems will be covered by an appropriate UKAS accredited third party certification scheme. Evidence of accreditation will be incorporated within this FPP once it is available.

82. The fire detection systems shall reliably detect hot spots, sparks, smoke, or any other ignition condition that can lead to fire and the early presence of a fire in any compartment of the Plant, identify the location of the fire and initiate the fire alarm systems, alert the local FRS and where appropriate, initiate the firefighting system.

83. The system will include:

- automatic local detectors,
- sounders with flashing beacons,
- fire alarm panel and
- manual call points for manual initiation of the alarm system.

5.3.2 Fire Detectors

84. Automatic fire detectors suitable for the intended location and fire risk will be installed for each risk area. The detectors will be provided in all the areas including the ceiling voids (above false roof) and cable trenches. The detector elements and associated wiring will comply with the relevant standards and will be suitable for the working environment to provide reliable operation in accordance with the manufacturer's maintenance requirements.

85. Detector element circuits will be continuously monitored, and on occurrence of a fault an alarm is to be initiated at the fire alarm panel.

86. The arrangement and application of detectors will in accordance with the manufacturer's recommendations.

87. The coverage and siting of detectors will meet the requirement of the relevant codes as identified in section 5.2.

5.3.3 Heat Detectors

88. The heat detectors will be designed for detection of fire by rate compensating principal. The temperature classification will comply with the standards as listed in section 5.2.

5.3.4 Thermal Imaging

89. An infrared thermal imaging camera system will be part of the automatic fire detection system for the Feedstock Bunker and will be associated with the operation of the Feedstock Bunker water cannons. Sufficient thermal imaging cameras will be provided to cover all areas of the Bunker.

90. The thermal imaging cameras will provide a continuous thermal 'map' of the surface of the Feedstock within the bunker. This will allow the operator to identify and react to hot areas in the bunker and undertake mixing or feeding of feedstock as appropriate. In extreme cases, the use of water cannons which cover the entire extent of the Feedstock bunker to extinguish any smouldering or burning Feedstock may be required.

91. The fire detection system will be configured to alarm based on certain conditions automatically. The thermal imaging cameras will be set with two alarm levels at different temperatures (i.e. high temperature and high-high temperature). The temperature set points will be determined during the EPC Contractor's detailed design and in consultation with the FRS.

92. Following activation of the high temperature alarm in an area within the bunker, the area with an elevated temperature can be readily identified and if necessary, fed into the feed hopper to be combusted or extinguished, as decided by the operator.

93. Following activation of the high-high temperature alarm in an area within the bunker, the area with an elevated temperature will be targeted and the water cannons will be automatically activated to reduce the temperature in the area where self-heating has occurred.

5.4 Fire Alarm System

94. The purpose of a fire alarm system is to inform all on site that a fire may have started. This is to allow people to respond to a fire quickly, such as by evacuation or seeking to fight a fire.

5.4.1 Alarm Sounders

95. Alarm sounders will be provided in all zones including in offices, welfare facilities, weighbridges etc. in sufficient number to give clear warning of fire to personnel according to the standards as listed in section 5.2.

96. All alarm sounders will be capable of maintaining a minimum sound level of 65dB and a maximum of 100dB at any point in any zone as the warning of fire.

97. In areas where the ambient background noise level is greater than 60dB the sounders will be augmented by alarm signal lamps, which will be firmly affixed to the body of the sounders. The sounders will be capable of maintaining a minimum sound level of ambient plus 10 dB in all areas. An absolute maximum sound level of 120dB will be observed in areas of high ambient noise.

5.4.2 Alarm Signal Lamps

98. Alarm signal lamps will be provided in all zones and will fulfil the requirements of the standards as listed in section 5.2. They will be provided with a metal base, which will contain and securely hold the wiring termination facilities, the bulb holder and the mirror holder and drive assembly.

5.5 Fire Alarm Panel

99. The fire alarm panel will comply with the standards as listed in section 5.2. It will contain a display panel showing the status of all devices and arranged in area/zone

order, in a logical manner. When a fire is detected an audible warning will sound and a light on the display indicating which device has caused the alarm will flash. The audible alarm from siren will also be initiated simultaneously.

5.6 Manual Call Points

100. Manual call points will be installed as per the standards listed in section 5.2 and will incorporate a test facility whereby the alarm may be initiated without breaking the glass or dismantling the unit. They will be wall mounted and will be of the type in which breakage of the glass cover plate releases a switch to initiate an alarm without further action by the user. The operation of a call point will initiate the same sequence as when a fire detector is operated. Manual call points will be installed at exits and along the escape/ access routes with maximum distance of 30 m between stations.

5.7 Fire Suppression Systems

5.7.1 General

101. The Plant will include the following fire suppression systems:

- Fire water system
- Outdoor fire hydrants with hose houses
- Sprinkler system
- Water cannons for the Feedstock bunker
- Deluge sprinkler systems
- Foam systems
- Portable fire extinguishers
- Mobile fire extinguishers

102. The design, installation and maintenance of fire suppression systems will be covered by an appropriate UKAS accredited third party certification scheme. Evidence of accreditation will be incorporated within this FPP once it is available.

5.7.2 Fire Water System

103. The fire water system will consist of:

- Jockey pump(s)
- Electric fire water pump(s)
- Diesel engine driven fire water pump(s)
- Pipes and appurtenances
- Instrumentation and control
- Suitable building for the pump house

104. An engine driven fire water pump will be included in the event total loss of power in the facility. The fire pump will be in accordance with the standards as listed in section 5.2.

105. Full flow testing facilities shall be provided for both the main fire pumps in order that the fire pumps performance can be tested and demonstrated on a routine basis.

106. Firewater mains will be constructed as loop systems. Design, construction and installation and sizing of individual lines to the buildings will be as per the relevant

standards as listed in section 5.2. The firewater piping will meet the requirements of the ACE Guideline Document.

5.7.3 Outdoor Fire Hydrants

107. Firefighting pillar hydrants will be provided in a loop around the Site with intermediate distances of maximum 100 meters and in compliance with the relevant standards as listed in section 5.2. Each hydrant will be fitted with a stop valve in the corresponding supply line from the main ring line and a hose reel house.

5.7.4 Sprinkler System

108. Water sprinkler systems will be installed for relevant areas of the Plant as specified in the NFPA 13. The design density and area of operation shall be determined to suit the risk. The sprinkler systems shall normally be "wet" installations, with pre-action sprinkler however consideration will be made to ambient conditions which may require dry riser installations to be provided. Sprinkler heads shall either be fusible or quartzoid bulb type.

109. The temperature rating for sprinkler nozzles will be at least 30ºC above maximum anticipated ambient temperature.

5.7.5 Water Cannons

110. In addition to sprinkler system, the Feedstock Bunker will also be provided with oscillating water cannons with a manual override providing coverage of the whole bunker area. The water cannons will be designed to deliver a minimum of 946 litres per minute at 6.89 bar at the nozzle tip with at least two water cannons operating simultaneously as per the ACE Guidance Document.

111. It will be possible to operate the water cannons from the CCR or crane operator’s control room. They will be installed so that they do not interfere with operation of the grab crane and will not be damaged by the Feedstock grabs.

112. Electrical cabling to the water cannons will be a minimum of 2 hour fire resistance rating and be protected from physical damage.

5.7.6 Deluge Sprinkler Systems

113. Deluge sprinkler systems will be installed in accordance with the applicable requirements of the NFPA 15. Auxiliary equipment shall be in accordance with the requirements of the type of deluge valve used. All components parts of the system will be properly interconnected so as to provide a complete and operable open spray head deluge system capable of operating automatically or manually.

114. Each deluge water spray system will provide an evenly distributed spray of suitable density on exposed surfaces. The effects of wind or fire draft shall not affect this density.

115. Deluge valves shall be water pressure operated. Deluge valves will be installed at the level as required by the relevant standards as listed in section 5.2. The valves will be provided with all necessary auxiliary equipment for a complete installation.

116. Manual tripping devices will be installed as directed by the ACE Guidance Document and shall be of a type suitable for use with the type of automatic tripping mechanism installed.

117. Each spray system shall be designed to provide direct impingement of water on equipment to be protected except where mentioned otherwise. Nozzles shall be fixed, open, directional spray types.

118. It is intended that the deluge type sprinkler protection system shall be completely automatic in nature.

119. Transformers to be protected by deluge spray system with adequate annunciation at central control panel during actuation.

5.7.7 Foam Systems

120. The fuel oil tank, large storage silos and turbine generator area are to be protected with foam systems.

121. This will follow the requirement of the relevant standards as listed in section 5.2.

5.7.8 Portable Fire Extinguishers

122. Portable fire extinguishers are provided as per the ACE Guidance Document and will be operated by means of a lever operated valve provided with a safety pin, which shall allow controlled partial discharge.

123. Fire extinguishers will be selected to suit the fire hazard. They will be wall mounted where possible at a height of 1 m above floor level and normally located near the exits from a room or area.

124. They shall be of a size and number to match the possible initial fire. In workshops and areas subject to oil spillage, extinguishers will be provided in pairs.

125. Where extinguishers are provided externally or other areas where they may be subjected to weather they shall be hung inside protective cabinets. All portable extinguishers shall have, a filled weight of not more than 12 kg, except in areas of difficult access (e.g. where access may be via a ladder, stair or narrow passage) where the extinguishers provided shall have a filled weight of not more than 6 kg. The quantity and distribution of extinguishers shall be in accordance with the ACE Guidance Document and the FRS requirements. Extinguishers shall be conspicuously located where they will be easily and readily accessible in the event of a fire situation.

5.8 Specific Risk Areas

126. Fire protection for specific risk areas are described in the follow sections.

5.8.1 Tipping Hall

127. The Tipping Hall will include automatic sprinkler protection throughout.

5.8.2 Feedstock Storage Bunker (Internal)

128. One potential problem with fighting fire in internal storage areas is smoke, which may obscure a fire and make it difficult for the FRS to direct water direct to the seat of a fire.

Passive or automatic smoke vents in the roof over internal storage areas will be considered during the EPC Contractor's detailed design stage subject to fire risk assessment.

129. The Tipping Hall and the Feedstock bunker will be provided with automatic sprinkler protection throughout to protect the entire roof area against structural damage. The sprinklers will be arranged so that the top of all columns will be drenched when the sprinkler system is activated local to the column. However, designated sprinkler systems to columns are not required.

130. In addition to sprinkler protection, the bunkers will include water cannons (see section 5.7.5 above). The bunker area will be divided into notional zones on the basis of which the detection system will indicate the location of the fire and the water cannons can be directed into the correct zone. Water cannons will be located so as to allow for coverage of all bunker areas with at least two (2) cannons operating simultaneously.

131. Data from the fire detection system will initiate the water cannons from thermos-insulated covers and the system will provide a fire alarm at the same time.

132. Due to frequency of use and potential for operator fire exposure, automatic water cannons with manual override will be provided and the water cannons will be capable of remote operation from the CCR. The water cannons will not be installed in any area where they can affect the operation or maintenance of the Feedstock grab cranes and will be protected by steel frameworks to avoid damage from the Feedstock grabs.

5.8.3 Feedstock Feed Hoppers

133. Feedstock feed hoppers feeding the furnace will have automatic deluge protection over the entire Hopper. Manual activation of the Hopper deluge system will also be possible from the CCR.

5.8.4 Boiler & Turbine Halls

134. The turbine hall and the boiler hall will be equipped with a dry riser piping for firefighting.

135. The boiler auxiliary burner fuel supply valve train will have a wire and fusible link system or heat detector and solenoid valve such that in the event of an external fire the local fuel supply isolation valve (oil or gas) is automatically closed.

136. All areas beneath the turbine generator operating floor that are subject to oil flow, oil spray, or oil accumulation shall be protected by an automatic foam system. This coverage normally includes all areas beneath the operating floor in the turbine building.

137. Lubricating and control oil lines above the turbine operating floor will be protected with an automatic sprinkler system covering those areas subject to oil accumulation including the area within the turbine lagging (skirt).

138. Turbine generator bearings will be protected with closed head sprinklers utilising directional nozzles.

5.8.5 Ash Conveyors

139. Ash conveyors will resist ignition (i.e. Atex rated) and conveyor belt material will be fire retardant.

5.8.6 Transformers

140. Transformer protection will provide complete water spray impingement on all exposed exterior surfaces. Water spray will be applied for the transformer and its appurtenances and will include the conservator tanks, pumps, etc.

141. Dry type transformers will be used for indoor transformer installations. If appropriate enclosures for dry type transformers will be provided with suitable fire detection systems in accordance with the requirements of BS 5239 Part 1.

5.8.7 Fuel and Lubrication Oil Tanks

142. Bulk oil tanks will be bunded to 110% of the maximum tank capacity. External oil tanks will be located in accordance with the ACE Guidance Document. External fuel oil handling and storage areas will be provided with hydrant protection.

5.9 Water supplies

143. The NBEC will include a firewater tank designed in accordance with the requirements in the BS5306 and the ACE Guidance Document. The fire water will be stored in a combined raw water / fire water tank with independent volume and nozzle groups will be allocated for fire-fighting. The tank will be designed to ensure the required fire water capacity is available for fire protection at all times. The size of the fire water tank will be confirmed during detailed design stage.

144. All normally required raw water is taken from a higher extraction point than the firefighting water connection leaving the necessary fire water reserve at all times. The tank will include level indicator and level transmitter linked to the CCR. Having a combined raw water / fire water tank has the advantage of having additional raw water available for fire-fighting if required.

145. The firewater tank will be supplied from the towns water supply and also by the Rainwater Harvesting Tank.

146. The tank will store sufficient fire water for two hours (i.e. following the ACE Guidance Document) of supply at maximum hydraulic demand from all fixed fire suppression system that could reasonably be expected to operate simultaneously during a single event (e.g. Feedstock bunker protection in conjunction with other fire protection systems in the bunker area such as water cannons and feed hopper deluge system).

5.10 Fire water management

147. The most likely source of potential fires will be within the Feedstock Bunker. The run-off from fire water in these areas will be captured within the bunker with impermeable / fire resistant surface and fully contained. For relatively minor fires, the wetted Feedstock can be mixed with dry material in the bunker and fed to the boiler for combustion. In the event of a major incident that rendered the Feedstock too wet for combustion, then the affected material can be removed from the bunker for offsite disposal and contaminated fire water can be removed from the bunker by tanker for offsite treatment.

148. Other sources of fire (e.g. turbine oil fires) are very unlikely but would be contained within the main building or other external buildings (e.g. Weighbridge Office).

149. Within the main building any spent firewater would first fill the Dirty Water Tank before backfilling the internal drains and spilling out from the building to the external drains. This would flow through the interceptor tank into the Attenuation Basins which will be constructed with impermeable lining to prevent seepage of contaminated fire water into the groundwater. These Attenuation Basins would need to be isolated by the remotely actuated penstocks so that 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).

150. Fire within the weighbridge office would likely result in firewater from hoses being collected by the surface water drains which would enter the Attenuation Basin via the petrol/oil interceptor. As discussed above, the basins can be isolated from the external drain by the penstock so that the water can be tested before discharge or removal by tanker. If the firewater is tested as non-hazardous, it may be reused for the process plant if suitable.

5.11 During and after an incident

5.11.1 Training

151. NBEL's Operator will develop detailed Emergency Response Procedures (ERPs) for the plant during the commissioning phase. The ERPs will cover the followings:

- Fire identification and notifying procedures
- An evacuation plan
- Emergency communication procedures
- Fire-fighting procedures
- Responding to contamination spillages (i.e. chemicals and oils)
- Containment of firewater
- Diverting incoming Feedstock to other sites

152. All staff, contractors and visitors using the site will be trained in site wide ERPs as part of site induction so that they are aware of correct safety and fire prevention procedures to follow in the event of fire.

153. The training will include but not limited to the following:

- Identifying a potential emergency;
- Knowing what to do in the case of an incident;
- Planning for evacuation and safe re-entry;
- Knowing who to contact in the event of an emergency;
- Locating plans for emergency equipment;
- Identifying and initiating operational contingency arrangements;
- The procedure to close or isolate part or whole of the facility;
- Obtaining emergency help for causalities including first aid arrangements;
- Procedures for the notification, recording and assessing the emergencies and mishaps; and
- A programme of inspection, maintenance and upgrading of emergency equipment and personnel training.

154. Where specific responsibilities are given to specific staff for fire-fighting (e.g. using fire hose, grab crane, shovel, etc.), training will be provided to those employees. The ERPs will be maintained at the gate house and CCR.

155. On a periodic basis, fire drills will be carried out with the cooperation from local FRS to test the effectiveness of ERPs.

5.11.2 Emergency Notification

156. The plant shift supervisor or nominated deputy on duty will be responsible for notifying an emergency and acting as incident controller. NBEL's Operator will adopt the following emergency notification procedure:

- Initiate the alarm;
- Notify the following using the emergency contact list:
    a. Emergency services;
    b. Fire warden;
    c. Plant control room;
    d. Key staff such as plant manager, operations and engineering managers, health and safety officer, site security, etc.;
    e. Local authorities;
    f. Senior management;
    g. Neighbouring businesses and
    h. Environment Agency.
- Keep key contacts informed of the progress of the incident;
- Maintain emergency status until advised by the emergency services that the incident is resolved; and
- Once resolved, issue an incident report to key contacts

5.11.3 Emergency Shut Down

157. In case of an emergency shut down of the Facility, the feeding of the grate will be stopped automatically in a controlled manner to minimise the production of adverse levels of emissions. Any remaining exhaust air will be drawn through the APC System and cleaned. The boiler will then be shut down in accordance with the shutdown procedure. This procedure, together with the plant design, will ensure that the impact of any emergency shut down is minimised and an efficient return to normal service delivery can be achieved.

5.11.4 After a fire incident

158. Once a potential fire has been successfully extinguished, site personnel will make the site suitable for future operations. The precise steps will vary dependent upon, for example, the scale of the fire; but could include the following tasks:

- Disposal of all burnt materials. These would be taken off-site for landfill;

- Clean the Quarantine Area (if used) and ensure all unburnt combustibles are removed;
- Investigate the cause of the fire;
- Once the cause of the fire is identified, disseminate this information to staff members to minimise the potential for the incident to reoccur;
- Check all equipment and make sure it is undamaged and is working appropriately; and
- Dispose of the fire water

159. All required steps will be completed before the site can become fully operational again.

5.11.5 Continued Validity of Plan

160. The ERP and associated contingency arrangements will be reviewed after any emergency incidents on site or at least annually during the audit process to ensure that the system remains effective.

161. The ERP will be updated by the HSE manager annually and to reflect any changes in operational practices, relevant staff changes or following an emergency as necessary to support continuous improvement.

APPENDIX G1: FIRE PREVENTION EQUIPMENT LAYOUT

APPENDIX G2: WINDROSE DIAGRAM

APPENDIX G3: "ENERGY FROM WASTE (EFW) – FIRE SYSTEMS (DOCUMENT NUMBER "EIB_GD_EFW_FIRE_10439_131122", ISSUED BY ACE GROUP (THE "ACE GUIDANCE DOCUMENT")