Contract No		**Client Contract No**	
Client Name	WSP (on behalf of Britannia Refined Metals)		
Project Name	BRM E-Scrap Facility EPCM		
Project Location	Northfleet, Kent		
Document Class			

REVISION	**O1**	**Signature**	**A1**	**Signature**	**A2**	**Signature**
DATE	6th April 2023					
ORIG. BY	G SOMUANO	guillermo.somuano				
CHECK BY	N HORNBY	william.hornby				
APP BY	C JONES	chris.jones2				

Plan Revision

Plan version: Revision O1

Date of plan: 25/01/2023

Site details

Site name: Britannia Refined Metals Ltd (BRM) E-Scrap Facility

Site address: Northfleet, Gravesend

Operator name: Britannia Refined Metals Limited

Who this plan is for

This Fire Protection Plan has been written to cover the physical and operational fire protection systems for the proposed Britannia Refined Metals Ltd (BRM) E-scrap facility. As such the report is intended for the regulatory bodies such as the Environment Agency, the Fire Brigade and the local authority who shall review the proposed systems. The operational practices and procedures will generally be transferred from the existing facility and staff, contractors and visitors will be briefed and trained on these as the facility becomes operational.

Table of Contents

1 Introduction

This document has been produced to define the proposed fire safety requirements at the BRM E-scrap facility and to demonstrate that its operations, which entail waste handling and storage will meet the functional objectives of the Environment Agency (EA) guidelines in relation to the management of fire risk, namely:

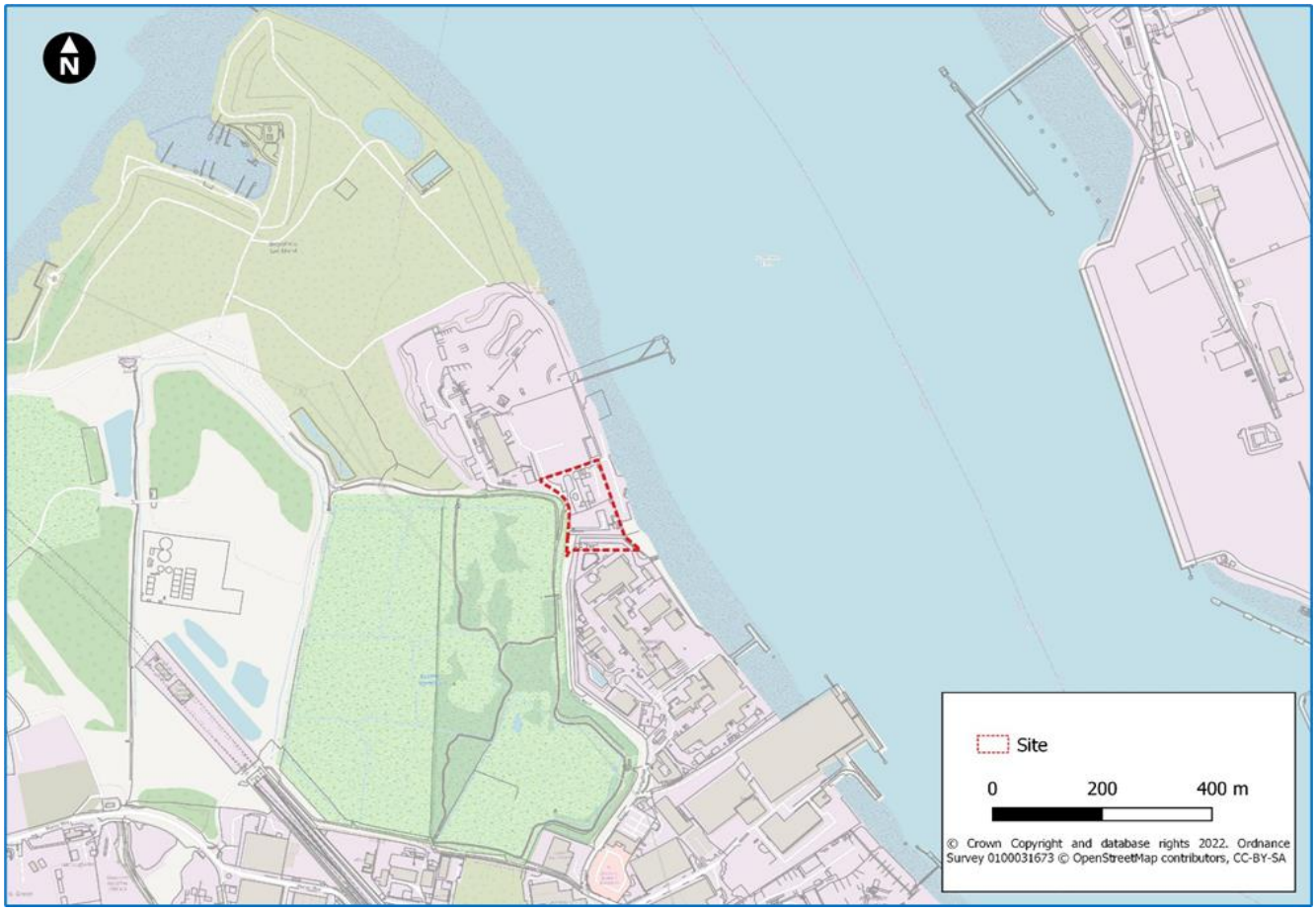
- Minimize the likelihood of a fire happening
- Aim for a fire to be extinguished within four hours
- Minimise the spread of fire within the site and to neighbouring sites

The BRM E-scrap facility is located on the South-bank of the River Thames in Northfleet, Kent, and will include the following:

- Main process building, including material storage bunkers;
- UK Power Networks substation, Switch room, Comms and Data room (Motor Control Centre (MCC) Room;
- Process equipment consisting conveyors, overband magnet, primary and secondary shredders, and samplers;
- Ancillary equipment including fire detection and suppression, dust extraction and abatement, dust suppression, photo-voltaic (PV) cells, automated bagging and vehicle loading systems;
- An office and welfare building for operational staff;
- Fire water tank and associated pump house; and
- Weighbridge

The facility will be operated on land, owned by BRM, adjacent to the BRM Lead Refinery. It is located at Manor Way, Northfleet, Gravesend, Kent, DA11 9BB at National Grid Reference 561209, 175806 (TQ612758). The site location is identified at Figure 1.1.

Figure 1.1 Site Location



The site will be bounded by security fences and bounded to the east by flood defences that, in addition to retaining firewater within the site will also frustrate/prevent access by trespassers. Beyond the flood defences is the River Thames, the site is bounded to the south by the Lead Refining facility operated by BRM, and beyond that is the industrial Seacon Terminals Ltd freight facility.

To the west (and on the opposite side of Manor Way a private highway that serves commercial and industrial facilities), is Botany Marsh, which comprises a network of drainage ditches, ponds, former grazing marsh, rough grassland and scrub. Immediately north of the site is road that provides access to the wharf and flood defences. Beyond this are commercial/industrial sites fronting the river, which include Northfleet Wharf and Concrete Plant. The nearest residential properties can be found south of the A226/Galley Hill Road, approximately 750m south of the facility.

The Lead Refining facility and the E-Scrap facility, both of which will be operated by BRM as two separate installations for the purposes of the Environmental Permitting Regulations 2016 (as amended). Some infrastructure and systems are shared between the two facilities, but other items are operated distinctly.

Sensitive receptors are located within 3km of the installation are outlined at Table 1.1 and are presented at Figures 1.2. Figure 1.3 summarises wind direction data from London City Meteorological Station, in windrose format. This meteorological station is located 18.3km northwest of the facility.

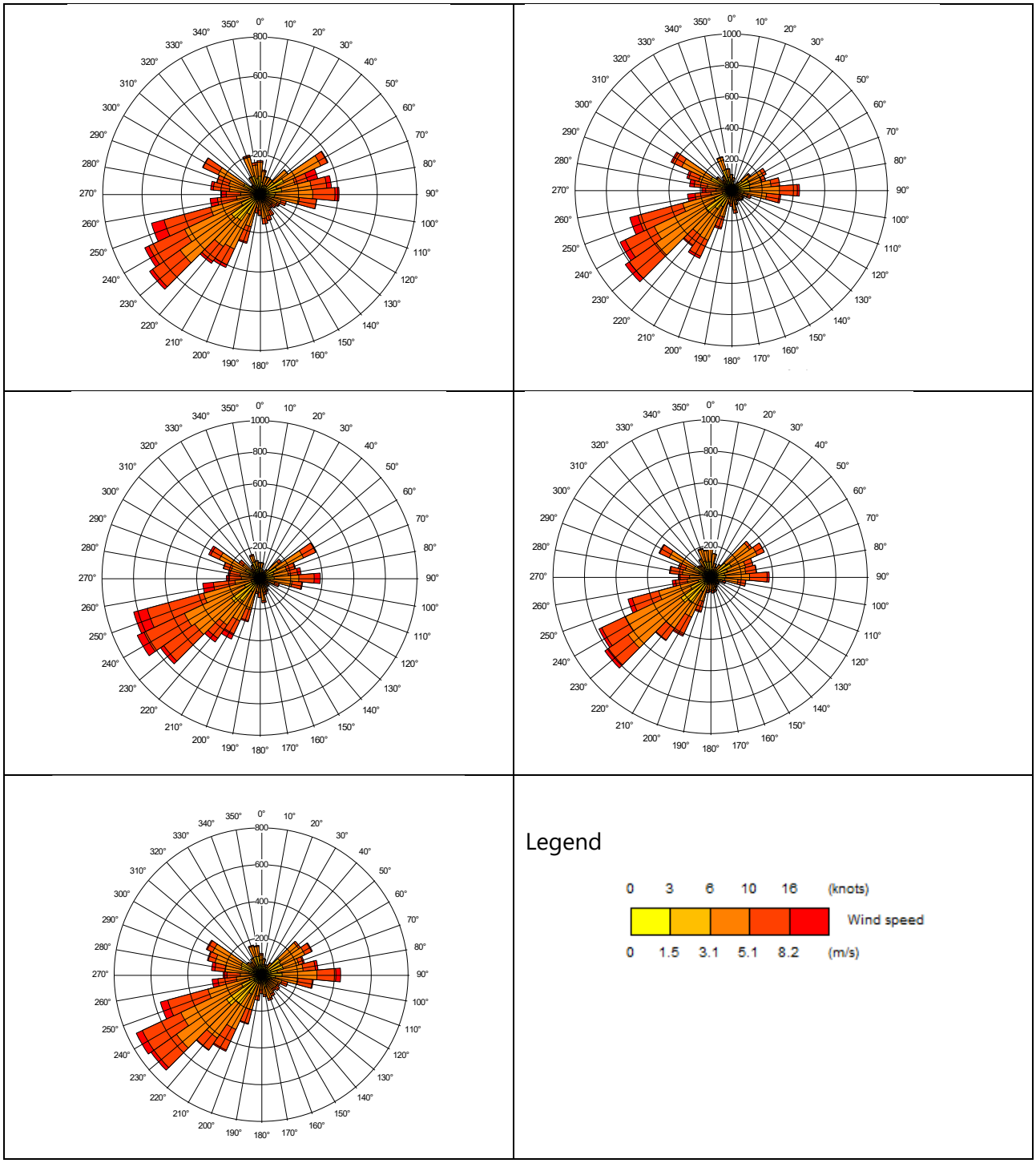
Table 1.1 Noise Sensitive Receptors (NSRs)

Receptor Ref	Type	Distance from source (m)
R1	School	910
R2	Residential	870
R3	Residential	1,160
R4	Residential	1,160
R5	Residential	2,930
R6	Residential	2,720
R7	Residential	2,290
R8	Residential	1,560
R9	Residential	1,610
R10	Residential	1,680
R11	Residential	1,870
R12	Residential	2,030
R13	Residential	1,730
R14	Residential	1,780
R15	Residential	1,580
R16	Residential	1,140
R17	Residential	1,140
R18	Industrial	600

Receptor Ref	Type	Distance from source (m)
R19	Gym	790
R20	Commercial	660
R21	Cafe	860
R22	Industrial Car Park	1,140
R23	Ecological- SSSI Swancombe Peninsula	60

Figure 1.2 Sensitive Receptor Locations

Figure 1.3 Wind Rose Data



2 Types of combustible materials

2.1 Combustible wastes

Waste handled at the BRM E-scrap facility is described collectively throughout this document as E-Scrap. This is effectively a limited range of waste electronic and electrical equipment (WEEE) streams comprising:

- Printed Circuit boards
- Small shredded mixed WEEE
- Automotive waste – (Segregated WEEE components consisting of Cables/Wiring looms)
- Large Size/intact Wire cables from automotive waste
- Small Size/shredded Wire cables from automotive wastes
- Large Size/intact Wire cables from other industries
- Small Size/shredded Wire cables from other industries
- Wire cables from shredded WEEE
- Incinerator Bottom Ash (IBA)
- Copper

The waste is chemically stable, does not biologically self-heat and has low combustibility. Circuit board material is flame retardant and cable insulation is commonly self-extinguishing. Whilst the material will act as a fuel load and burn when exposed to external flame, it is considered to be a low fire hazard material.

The E-Scrap has been categorised into three distinct categories for the purposes of the Permit application. These categories of waste will be segregated whilst present at the site:

2.1.1 Simple wastes

These wastes are derived from manufactured articles and are large sized waste such as baled copper and whole wire looms.

2.1.2 E-Scrap

These wastes are very similar to simple wastes but are smaller in size and will be treated on site via shredding and sampling for commercial precious metal assay.

2.1.3 Complex wastes

These wastes will have variable chemistry, for example, the Incinerator Bottom Ash (IBA) Smelter Grade Concentrate (metal rich fractions from IBA).

2.2 Other combustible materials

Other combustible materials stored at the site will include:

- Packaging materials such bags and pallets
- Dust sweepings and dust contained in the bag filter and associated abatement plant

- Lubricants that may also contain hydrocarbons
- Unused and waste adsorbent
- Diesel

3 Using the fire prevention plan

3.1 Where the plan is kept and how staff know how to use it

This Fire Prevention Plan has been written to cover the proposed design and operation of this E-Scrap facility.

Staff will be trained in the requirements of this plan prior to the plant becoming operational.

Once operational, the Fire Prevention Plan will be available on the company intranet with hard copies available at security and other relevant locations.

3.2 Testing the plan and staff training

All staff will be trained to ensure they understand the information included in the plan, at least one drill will be undertaken before the plant is operational. The Standard Operational Practices that fall under this Fire Protection Plan will be updated if the outcome of the testing demonstrates that revision is required.

Training and testing will be carried out on an annual basis unless there are changes to the plan that require additional training.

Staff competency requirements will be outlined in the training and development plan being developed. These will be specified in conjunction with the training provider along with the equipment supplier. Testing will be carried out in line with requirements of the supplier.

4 Fire prevention plan contents

4.1 Activities at the site

The activities to be undertaken at the site are associated with the acceptance, unloading, storage and loading of the simple and complex wastes described at Section 2. These activities are summarised at Table 4.1.

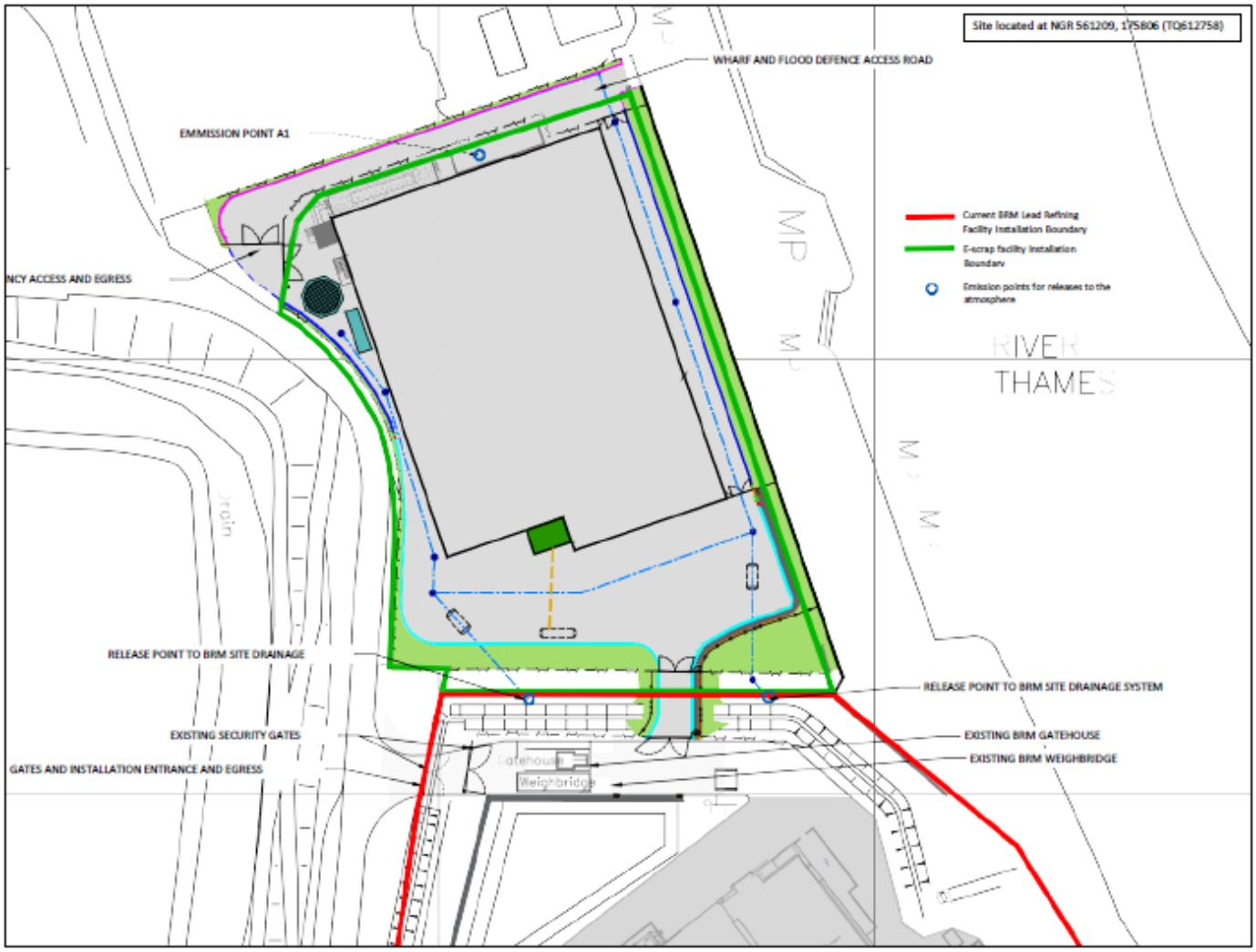
Table 4.1 Summary of Activities Undertaken at the Installation

Waste type		Receipt & inspection		Feeding	Processing	Storage	Shipping
E-Scrap	Pre-shredded small mixed WEEE	Tipping and visual inspection	Screening for foreign objects and use of overband magnet for consignments containing ferrous metals	Transfer to steel box feeders	Two stage shredding	Fixed bunkers of cast concrete and/or flexible bays of concrete legio /legato block construction	Bagged and loaded into containers
	Circuit boards						
	Small wire – from WEEE						Bulk cargo-containers
	Copper scrap – small						
	Auto wire small/shredded						
Simple waste	Baled copper	Tipping and visual inspection		Transfer to storage bay		Flexible bays of concrete legio /legato block construction	Bagged and loaded into containers
	Waste looms						Bulk cargo-containers
Complex waste	IBA waste	Limited visual inspection for foreign objects		Transfer to box feeder	Two stage shredding	Flexible bays of concrete legio /legato block construction	Bagged and loaded into containers
							Bulk cargo-containers

4.2 Site plans

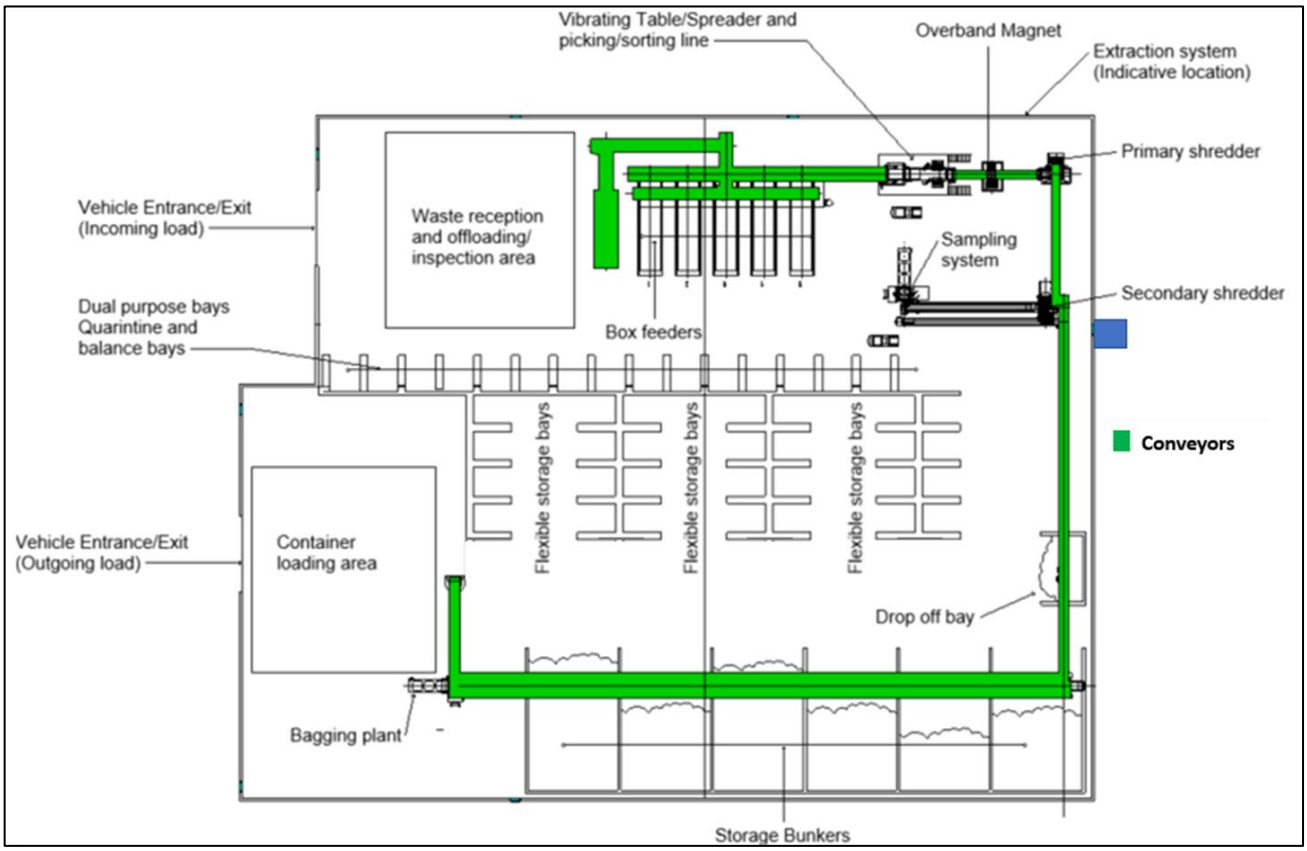
A plan confirming the external layout of the site is provided in Figure 4.1.

Figure 4.1 External Site Layout



A plan summarising the internal layout of the main building is provided at Figure 4.2.

Figure 4.2 Internal Layout of the Main Building



4.3 Manage common causes of fire

4.3.1 Arson

The perimeter of the BRM site is enclosed with a security fence to prevent unwanted access. The site has a 24-hour security present with the perimeter and building entrances being monitored by CCTV. Visitors are required to wear a security pass at all times and are not allowed in operational areas without escort or a formal induction as required.

The fire detection systems are automatic and are monitored 24 hours a day from the security office. The sprinkler fire suppression operates automatically in the event of being activated by a fire.

4.3.2 Plant and equipment

The plant and equipment within the facility are as follows:

- Loading shovels – loading tipped materials into the walking floor feeders
- Forklift trucks – Electrical power only
- UK Power Networks substation– Fire retardant oils to be used in the transformer
- Motor Control Centre Switch room

- Data room Air extraction and ventilation systems – baghouse and extraction fans located external to the building
- Conveyors – move material between processing equipment – conveyors will be predominantly enclosed and will be fitted with fire retardant belts
- Shredders – primary and secondary shredders size reduce the waste material – shredders are fitted with automatic spark detection in the outlet
- Samplers – automatically sample the shredded waste
- Bagging system – shredded waste will be loaded into bulk bags (FIBCs)
- Vehicle loading system - TBC

Maintenance requirements for the E-Scrap facility will be managed under the plant maintenance procedure.

4.3.3 Electrical faults including damaged or exposed electrical cables

Electrics certification

All electrical installations at the BRM facility will be installed by a trained and certified electrician in accordance with relevant standards. There will be no high voltage/current electrical equipment in the vicinity of waste storage areas. This will significantly reduce the probability of fire from electrical equipment failure.

The fixed waste handling equipment is electrically powered.

Electrical equipment maintenance arrangements

The equipment will be maintained in accordance with the manufacturer's recommendations, which will be incorporated into the site maintenance program.

Furthermore, electrical equipment will be PAT tested every 12 months in line with current procedures.

4.3.4 Discarded smoking materials

Smoking on site policies

BRM have a strict no smoking policy on site with the exception of designated areas, which are well away from any fire load or waste handling areas.

4.3.5 Hot works safe working practices

BRM has a workshop at the site located beyond the southern boundary of this facility for undertaking hot works in a safe and controlled environment. If hot works are required at the E-Scrap facility, local to plant/equipment, the current permit to work system will ensure that appropriate control measures are put in place to limit the risk of fire.

4.3.6 Industrial heaters

There will be no industrial heaters within the main plant building, where the waste is located.

The MCC and welfare facility may have electrical heating or cooling, and these buildings are separated/segregated from the main plant building.

4.3.7 Hot exhausts and engine parts

Lorries will discharge the waste into the receiving area and will also receive packed waste in the discharged area. Both of these areas are manned during the times when lorries are present and have automatic fire detection.

The shredders, samplers and conveyors will all be driven by electrical motors. These motors will not be located within a designated Hazardous Area under Dangerous Substance and Explosive Atmosphere Regulations 2002 (DSEAR).

4.3.8 Fire watch procedures

All waste is discharged from the conveyors and shredders prior to the plant shutting down. The waste storage bunkers are monitored by thermal imaging CCTV with automatic alarming if hot spots, or fire are detected.

4.3.9 Ignition Sources

Ignition sources in the vicinity of all waste handling areas will be limited to those produced by day-to-day operations and those contained within deliveries (e.g., smouldering load, batteries, etc.). There will be no other significant heat sources or exposed high temperature surfaces near the waste material in the process building.

All other potential ignition sources are maintained >6 metres away from combustible wastes.

The quarantine area is located within waste bunkers with concrete walls with two-hour fire resistance and sufficiently high to prevent a fire spread between the bays.

Waste delivery vehicles are inspected before they are allowed on site and any obvious smouldering or non-conforming load shall be promptly identified.

Furthermore, as waste is unloaded in the plant receiving area, operators will be able to identify any immediate hazardous load and use the mobile plant to move it into the quarantine area.

4.3.10 Batteries

No batteries should be present in the waste materials accepted by the site. Waste acceptance procedures will require initial visual inspection of the waste and should identify the presence of larger batteries prior to acceptance.

Small Li-ion batteries on circuit boards should have been removed during previous processing but can be present on the shredded circuit board waste. These represent an ignition source if they become damaged during shredding of the waste. The shredders are fitted with spark detection on the discharge. These detect any sparks or hot discharges. On detection, an alarm is activated, and the discharge belt stops. There will be an intervention procedure to discharge the material from the shredder outfeed belt such that it can be inspected, and any smouldering material extinguished and removed.

Batteries (Li-ion) will be present on electrically powered plant vehicles and will be maintained in accordance with suppliers' recommendations. Charging of the batteries will be carried out at an appropriate location.

4.3.11 Leaks and spillages of oils and fuels

Vehicles and mobile plant shall have routine inspection and maintenance to control the risk of oil spillage. Spill kits shall be provided in the facility to handle any oil spill from mobile plant. Delivery vehicles will be present in the reception area whilst the load is discharged. Any oils spills will be dealt with using the spill kits.

Surface run off from the roof and external hard standing will drain through an oil water interceptor to prevent the release of spilled hydrocarbons to surface water.

4.3.12 Build-up of loose combustible waste and dust

The processing equipment is emptied between batches with no material left in the feed hoppers, shredders or belts during non-operational times. Routine cleaning of the conveyors, equipment and facility shall be carried out to control the build-up of dust on the equipment.

4.3.13 Reactions between wastes

The E-scrap waste is non-reactive and will not degrade or biologically self-heat over time.

Lorry loads of pre-processed E-scrap are delivered into the waste reception and offloading/inspection area. It is visually inspected for any smouldering hot spots. Any suspect materials can be segregated and moved into one of the quarantine bays in the reception area. Fire extinguishers are available for staff to deal with any smouldering material as needed.

4.3.14 Hot and dry weather

The waste material does not biologically degrade, or self-heat and all material is stored under cover out of direct sunlight. As such hot and dry weather does not represent an increased fire risk for the facility.

4.4 Prevent self-combustion

4.4.1 General self-combustion measures

The waste material is chemically stable and does not biologically degrade and self-heat during storage. As such no special precautions such as stock rotation, pile turning, or pile temperature monitoring are specifically required to avoid self-heating.

Stock rotation and plant throughput is managed for production purposes with typical storage time being less than 5 days. Produced material can be stored for up to 30 days for transportation purposes.

4.4.2 Manage storage time

Due to the nature of the waste, stock rotation is not required – see sections below.

4.4.3 Monitor and control temperature

The waste material is chemically stable and does not biologically degrade or self-heat during storage. As such no special precautions such as stock rotation, pile turning, or pile temperature monitoring are specifically required to avoid self-heating.

Monitoring and controlling temperature

The building is ventilated but is not temperature controlled. The E-scrap waste is not temperature sensitive and does not self-heat hence no temperature monitoring of piled or bagged waste is required. The waste storage areas are covered by thermal imaging CCTV hence any hot spots, or fire can be rapidly detected.

Dealing with hot weather and heating from sunlight

The incoming and shredded E-scrap material does not biologically degrade and as such does not self-heat. All material is stored undercover indoors hence is not exposed to direct sunlight. No specific precautions are therefore required to deal with hot weather and heating from sunlight.

4.4.4 Reduce the exposed metal content and proportion of 'fines'

The shredding equipment and conveyors are fitted with dust extraction such that airborne fines produced during E-Scrap handling and shredding are removed for abatement from during processing. Misting systems will also be installed to settle airborne fines and dusts.

4.5 Managing Waste

4.5.1 Waste Storage

The areas containing the reception bunkers, processed loose waste bunkers and bagged waste storage bunkers are monitored by thermal imaging CCTV cameras to give early warning of any hotspots in the waste or initial fire events.

The waste piles are segregated into waste bays with the walls between the bays being formed from interlocking concrete blocks and /or insitu re-enforced concrete walls. Both maintaining a minimum 2-hour fire resistance to prevent fire spread between wastes piles.

4.5.2 Manage waste piles

Pile sizes, Volumes and Dimensions

Figure 4.2 identifies the locations of the storage bays installed at the site described below. The storage capacity of the storage bays are outlined at Table 4.1. The maximum waste pile sizes do not exceed the limits in the Environmental Agency Guidance: Fire Prevention Plans. (11 January 2021).

Table 4.2 Waste Storage Arrangements

Type of storage bay (incl Quarantine)	No of bays	Construction materials	Maximum Storage per bay	
			m^3	Tonnes*
Simple wastes – storage until packaged for export				
Storage bays	Flexible	Concrete Legio / Legato blocks	24m^3	20.4
E-Scrap – Transferred to Box Feeders pending shredding thereafter to designated storage / balance bays accorded to burning loss.				
Box Feeders	5	Feeders of steel construction	TBC	TBC
Storage Bunkers for processed material	6	Cast concrete walls with 2hr fire resistance	450m^3	383
Balance / Quarantine Bays	Flexible	Concrete Legio / Legato blocks (2hr fire resistance) fire walls	Flexible	Flexible
Complex wastes – transferred to designated storage bays				
Storage bays	Flexible	Concrete Legio blocks fire walls	24m^3	20.4
*Based on 850kg/ m^3 waste density				

4.5.3 Storing waste materials in their largest form

Shredded waste is stored in bulk waste bays prior to bagging and shipment off site. The storage inventory is sufficient for 30 days of operation. NOTE: dust extraction removes the air borne fines from above the shredded E-scrap waste and the shredded waste has no increased fire risk over the unshredded E-scrap.

Maximum pile sizes for the waste on the site

The maximum waste bunker is the fixed shredded waste storage bunker at approximately 450m^3 storage volume.

4.5.4 Waste stored in containers

Reject material (such as ferrous) is stored in rigid containers such as skips or bins.

Processed waste is bagged into big bags/flexible intermediate bulk containers (FIBCs) immediately prior to dispatch from the site. The processed and packaged waste has no increased fire risk than the incoming waste.

Material associated with the sampling process will be held on site, this comprises a (final (10kg), spare (10kg) and reserve (500kg) samples per batch of processed E-scrap. The spare and reserve will be retained until customer acceptance of the material is received.

4.6 Prevent fire spreading

4.6.1 Separation distances

BS 9999 only extends to ensuring life safety and some provisions and requirements have been made over and above these minimum measures with the purpose of property protection and to ensure business continuity.

The following fire separation and compartmentation shall be used:

- External facades – 30 minutes Resistance / 15-minute Insulation.
- External wall facing firewater tank and firewater pump enclosure – 120 minutes Resistance/120 minutes Insulation.
- Walls of electrical/UKPN substation / Data room / Switch room, 120 minutes Resistance / 120 minutes Insulation.

The PV panels provided on the roof of various buildings are not considered to pose a significant fire risk as they are in the open air. However, any electrical control room associated with them should be considered as a place of special fire hazard and thus subject to the means of escape limitations. Moreover, they should be fire separated from any adjacent room as described above.

4.6.2 Fire walls construction standards

Firewalls shall have a fire resistance of 2 hours minimum supported by test data. Legio / Legato type interconnecting concrete blocks have a significant fire resistance well in excess of the expected burn time of a waste fire.

4.6.3 Structural Fire Resistance

The required structural fire resistance is dictated by the height of a building and the overall most conservative risk profile as per BS:9999 (Fire safety in the design, management and use of buildings – Code of Practice 2017).

The main building is a simple, single storey steel frame building which supports a roof and PV panels. As such no fire resistance for the structural elements of the frame are mandated. This should not however affect the fire rating of the external wall cladding.

Fire Doors

In general, all doors should have the same rating as per the wall element they sit in and be self-closing and fitted with smoke seals.

The roller shutter doors for the vehicle entrances are not fire rated. The area of non-fire rated openings in any façade does not exceed the maximum allowable in BS9999 (Fire safety in the design, management and use of buildings – Code of Practice 2017).

Ductwork

The main building is a single compartment and as such there are no internal firewalls. Where ventilation ductwork passes through external façade, the fire integrity of the façade should be maintained.

Fire Dampers

The fire dampers should be sited within the thickness of the fire separating element. This will ensure the damper will not be displaced by movement or collapse of the duct. The dampers should be securely fixed in place and provided with breakaway joints in accordance with the manufacturer's instructions.

Fire Stopping

All joints between fire-separating elements and all openings for pipes, ducts, conduits or cables to pass through any part of a fire separating element should be:

- Kept as few as possible;
- Kept as small as practicable; and
- Fire stopped (which in the case of a flue or duct, should allow thermal movement).

The fire stopping should have at least the same fire resistance as the penetrated fire-rated element.

Protection of Essential Infrastructure

Any infrastructure that is essential for operating the plant should be protected against the effects of fire or mechanical damage. This should include all infrastructure and cabling that is required to perform a safe shutdown.

The period of resistance/protection should be at least as the time required to undertake a controlled shutdown, with consideration of a safety factor (recommended to be 30 minutes).

The equipment/infrastructure to be protected should be as a minimum:

- Cabling linking the control room / security office with the facility
- All feed cables for essential equipment to initiate and control a shutdown procedure
- Any equipment confirmed by the operator to be essential to perform a safe shutdown
- Equipment and cabling to manage a firefighting operation

Cabling should be run in metal conduit and be located away from moving parts or heat sources. Fire signal cabling should be fire rated as per the requirements in BS 5839 (Fire detection and fire alarm systems for buildings (2019).

Storing waste in bays

The waste storage bays which include the fixed bays and the modifiable smaller storage and quarantine bays will be provided with two-hour fire rated construction on three sides. The height of these firewalls will be sufficient to prevent a fire in one bay escalating to an adjacent bay through direct flame impingement or from thermal radiation.

4.7 Quarantine area

4.7.1 Quarantine area location and size

Prior to acceptance, a visual inspection of the incoming waste material will be undertaken. All incoming vehicles have to book in at the main security gate and are directed to the E-scrap facility and pass through the weighbridge. If found to be non-conforming the vehicle will be either rejected from site or directed to a quarantine area.

If a contaminated load is identified after tipping i.e., during visual inspection on the inspection floor, then this will either be rejected or held in designated quarantine bays.

How to use the quarantine area if there is a fire

Waste loads are discharged and inspected in the waste receiving area. It is possible that a load can contain hot spots, typically from damaged batteries, which become apparent when the load is tipped. This area will have fire detection and fire extinguishers available to identify a hot load and allow it to be manually quarantined and extinguished by staff.

Quarantine areas are intended for delivery and inspection of non-conforming loads and should not be used as general storage spaces. They should be kept free at all times and should be clearly and conspicuously demarcated by either signs or floor markings to prevent staff and operators from obstructing any part of them.

Procedure to remove material stored temporarily if there is a fire

This procedure will be developed as part of the programme for Operating Techniques and Operational Management.

4.8 Detecting fires

4.8.1 Detection systems

The fire risk in all parts of the facility is sufficiently low that the minimum requirement of manual detection is acceptable. The complete facility will however have enhanced fire detection and alarming system with automatic detection to at least an L2 level of coverage as defined in BS 5839-1:2017 (Fire detection and alarm systems for buildings).

The following automatic detection will be provided:

- Point type smoke or heat detectors in office and ancillary areas;
- Heat detectors in main processing area and E-scrap storage areas;
- Smoke or heat detectors in plant rooms;
- Thermal imaging detection in waste processing and storage areas;
- High Sensitivity Smoke Detection (HSSD) in high value/risk areas and areas where gaseous suppression is provided, namely switchgear rooms and electrical rooms.

Manual call points shall be located next to exits and along egress pathways, in accordance with the above standards.

In-process fire detection will be provided by spark detection downstream of shredders and linear heat detection on covered conveyors. Alarm signals will be relayed to the building fire system.

The evacuation strategy should be specific to each part/building on site and intended to be the safest possible for occupants without unnecessarily compromising the continuity of the operation. This will be dependent on the nature of the alarm. Operational alarms such as receiving a hot load or spark detection on a conveyor will require different responses to a general building alarm from smoke detection or sprinkler activation.

In most areas the evacuation strategy will operate on first knock basis (first signal); the alarm should be raised with the first input from any fire detection system, which can be a smoke detector, sprinkler flow switch valve or manual call point. For these areas, there should not be an investigation time.

The electrical switch room building will operate with a suspected fire basis, where a single fire alarm does not initiate evacuation of the complete facility. The alarm should continue to be treated as a suspected fire until it is confirmed by either a second smoke detector, a sprinkler (or other suppression system) flow switch valve, a manual call point, a heat detector or from manual confirmation.

The process fire detection will not initiate a building evacuation but will alarm locally to allow a manual investigation and intervention.

Alarm systems in use

The alarm system will be comprised of two main elements, individual detectors and sounders and the site-wide alarm system.

Individual fire zones should go into alarm mode according to the fire strategy for each part of the facility. This will be achieved by automatically triggering the alarm sound for the affected zone.

Separately, a PA/VA system should be installed throughout the facility to allow for pre-recorded messages and/or sounds to be broadcasted. The purpose of the PA/VA system is to alert occupants of a fire but also of any other emergency that requires either to pause activities or evacuate the buildings. The facility will have a total evacuation policy where all buildings are evacuated regardless of where the fire alarm is activated.

Part 3: Fire alarm devices

Audible fire alarm devices should conform to BS EN 54-3 (Fire detection and alarm systems Part 3: Fire alarm devices - Sounders) and visual alarm devices should conform to BS EN 54-23 (Fire detection and fire alarm systems Part 23: Fire alarm devices – visual alarm devices.) Power supply to the means of warning system should comply with BS EN 54-4 (Fire detection and alarm systems Part 4: Power supply and equipment.) Sounders should be provided throughout such that the sound pressure of the alarm signals is not less than 65 dB(A). Please note the sound pressure should be increased in areas of high background noise such that the alarm signal is not less than 75 dB (A).

Where the ambient noise level is expected to be above 90dB or where hearing protection is expected to be used, visual alarms (flashing beacons) should be used in addition to the audible alarm.

Design Standards for the systems

It is proposed that BS 9999:2017 (Fire safety in the design, management and use of buildings) be used as the main guidance document, as it contains recommendations that are specific to the industrial nature of the facility and the risk profile of occupants.

Once the construction and commissioning of any areas are completed and handed over to the client, the Regulatory Reform (Fire Safety) Order 2005 (RRO) becomes the governing

legislation and it is the requirement of the responsible person, in this case the plant/building operator, to undertake a suitable and sufficient fire risk assessment.

Environment Agency

The UK Environment Agency has published guidance for sites that store and manage/handle combustible waste, to limit the size of potential fires and their environmental impact, particularly with regards to smoke produced and firefighting water runoff. This guidance has been followed whilst producing this document.

4.9 Suppressing fires

4.9.1 Suppression systems in use

BS:9999 does not mandate that the facility be fitted with sprinklers.

However, for the purpose of business continuity, property protection and to meet insurer guidance, fire suppression shall be provided to the following areas:

- Main Building
    - Sprinklers giving total coverage of the building including receiving area, processing area, storage areas and bagging areas;
    - Clean agent suppression in the Electrical switch room.
- Fire pump enclosure
    - Sprinkler or clean agent/water mist suppression in the fire pump enclosure.

All suppression systems should be hydraulically actuated, and frost protected as required.

A private hydrant network is to be installed as part of the overall works, supplied from within the Lead processing facility, see Section 4.10.1.

Certification for the systems

The proposed systems shall be designed and installed to meet the required British standards and by reputable designers and contractors which are UKAS accredited. The design of the system including the proposed approach for providing supplementary firewater for manual firefighting shall be reviewed with and approved by the local fire brigade.

This firewater supply equipment shall be maintained annually as per BS 9990:2015 (Non-automated fire-fighting systems in buildings – Code of Practice) by a specialist contractor. Hydrants are flow tested on an annual basis to ensure a flow rate in excess of 1500 L/min.

4.10 Firefighting techniques

4.10.1 Active firefighting

Under the recommendations of BS 9999 (Fire safety in the design, management and use of buildings), handheld fire extinguishers should be provided according to BS 5306-0, 1, 3 (Fire

protection installations and equipment on premises) or BS EN 671 (Fixed firefighting systems – hose systems - 2012). The number and type of fire extinguishers required should be assessed and decided as part of a risk analysis exercise once the fire load, internal partitions and full details of the building are needed.

The equipment provided should be of a type appropriate for the risks and the users of the facility and placed in locations where it can be readily deployed.

The expectation is that fire extinguishers will be used for the following fire interventions:

- Response to a hotspot on a received load tipped into the receiving area;
- First response to a heat detector alarm on a conveyor or to a spark detection alarm on the outlet of the shredder;
- First response to a hot spot or minor fire detected in the storage and bagging area;
- Minor fires in welfare area;
- Manual response with a CO_2 extinguisher to an electrical fire;
- For means of escape.

Although NFPA recommends the provision of hose reels and these are a common fire safety feature in some facilities and other countries, experience has demonstrated that unless staff is specifically trained in their use and general firefighting, they tend to place occupants at risk and in most cases fail to extinguish the fire.

The recommendation is that sufficient capacity fire extinguishers be provided as use as a first response to a small fire. In the event this does not extinguish the fire, the fire brigade is called out.

Hydrant System

There is no available public hydrant system with sufficient flow and pressure. Therefore, a private hydrant network is to be installed as part of the overall works, supplied from within the Lead refining facility.

The hydrant system should be fed from a private tank and pump package located within the Lead refining facility. The tank shall have sufficient capacity to feed the hydrants with a supply for two hours manual firefighting. The volume is included in the single tank that also feeds the sprinkler system. The overall firewater system shall be hydraulically designed to ensure that operation of the hydrants does not adversely affect the sprinkler system operation.

The system shall supply at least 1,900 L/min for each hydrant (two hydrants should be assumed to operate simultaneously for the design of the hydrant system and pumping capacity).

The hydrant system should achieve an operating pressure of at least 8 barg.

Hydrants should be spaced so that there is at least one within 90m of any building entrance and a maximum of 90m apart. Hydrants should not be closer than 12m from the building.

Aboveground hydrants should be protected against impact and/or damage. The firewater tank shall have connections to allow direct connection to a fire brigade pumper truck.

Firefighting access and facilities

Firefighting facilities should generally consist of the following, and should be adequately maintained and be made available due to statutory requirements at all times:

- Facilities providing access to the site and to key information by means of Fire Brigade type locks (e.g., gates, hydrants, site information box);
- Water supplies and firefighting media: Hydrants, water tanks, water pumps, large capacity extinguishers, etc;
- Features providing access to the buildings: corridors, fire doors, fire shutters/curtains, compartmentation elements for fire access/egress routes, etc;
- Sprinkler systems;
- Emergency lighting;
- Quarantine areas.

Firefighting access will be via the main entrance to the south and a second access point to the north-west of the plot. This gives vehicle access to the whole of the South façade and the North West corner of the plot. From these positions manual access is considered to be adequate to the rest of the building.

Any other designated access points to the site for firefighting and emergency purposes should be identified in the site plan and communicated to the emergency responders at the first instance.

All roads serving vehicle access and that are also meant for emergency services should be kept clear of obstructions at all times, except in circumstances required for maintenance or special deliveries and subject to a prior risk assessment being developed.

Any alteration to the layout of a road or any damage or defect that could affect access for vehicles and emergency services should be reported immediately to the site manager.

4.10.2 Water supplies

Available water supply

Typically, the tank serving a sprinkler system should be separate from any other system. However, a combined tank can be acceptable if all of the following conditions are met:

- The proposed design is agreed with all relevant stakeholders, including the approving authorities and insurance bodies.
- The tank can hold the full combined capacity of the systems it feeds.
- The failure of one system does not prevent other systems from being used.

4.10.3 Sprinkler System

The bulk component of the E-scrap product is PVC and fire-retardant phenolic circuit board which represents a low fire risk. This is considered a Class C plastic (PVC and phenolic) in NFPA hence sprinkler design can be based on Group III commodity. Storage is solid piled type.

Firewater demand based on sprinkler demand of 8.2mm per minute/185m^2 operating area for 120minute discharge. With an allowance of 30% for losses, this makes 237m^3 total. The density of 8.2mm per minute is subject to confirmation, depending on the height of the installation.

4.10.4 Manual hose allowance

The manual hose allowance is 1900 litres per minute for 120 minutes, which is 456m^3 total for two hydrants operating simultaneously. This approach shall be reviewed, and calculations presented prior to confirming firewater pump and tank sizing.

4.10.5 Firewater Pumps

The facility shall be supplied with two off 100% capacity firewater pumps installed in a containerised pump enclosure. Each pump shall be rated for the full sprinkler/monitor and manual firefighting demand. Pump and suction/discharge manifold shall meet NFPA 20 capacity/head requirements of 150% rated capacity at 65% rated head.

Pumps shall be supplied and installed as a pre-engineered package including all controls. Pumps are to be configured as one electric driven and one diesel driven pump. Pump enclosure containing the diesel engine shall be protected with sprinkler or water mist/clean agent system.

4.10.6 Design Standards

Water-based automatic fire suppression systems should be designed to recognised standards as follows:

- NFPA 13 (Standard for the installation of sprinkler systems)
- Hydrant system:
    - Overall design, connections and valves: BS 9990 (Dry risers and Fire Hydrants - 2015) - Non automatic fire-fighting systems in buildings. This is to maintain compatibility across the site.

All fire systems should be installed by contractors registered to do so by LPS 1048 and LPS 1014 installation schemes or equivalent. All parts should be tested and certified to an approved or recognised standard (e.g., LPC or FM Global). The selection of recognised standard or means of approval shall be agreed by BRM.

The minimum site firewater availability is shown in the Table 2.2 Firewater Requirementsas calculated based on the EA guidance.

Table 2.2 Firewater Requirements

Maximum pile volume in cubic metres	Water supply needed in litres per minute (x6.67)	Overall water supply needed over 3 hours in litres	Total water available on site in litres (cubic metres)
450	3002	540,360	410,000 L (held in fire-tank) excluding additional capacity from site water supply.

The volume of the fire water tank is potentially undersized compared to the minimum EA requirement for a waste pile calculated in accordance with the Environment Agency requirements. However, based on the advice of a qualified Fire Safety Engineer the tank is considered to provide adequate volume for the site firewater systems, on the basis that additional water can be supplied by automatic tank in-fill and/or the Fire Brigade if required for a major fire scenario. This approach shall be reviewed, and calculations presented prior to confirming the tank sizing.

4.11 Managing fire water

The main building will be self-bunded, purpose designed and constructed to meet the requirements of the permitted activities. Access to the building will be raised to mitigate flood risks and retain firewater. Sealed fire exits will also be installed.

All operational areas will be installed with impervious concrete hardstanding, preventing pathways for firefighting water to migrate to groundwater. Approximately 93% of the facility will be installed with hard surfacing.

In relation to the setting and sensitivity of the site:

- The site is located within a groundwater Source Protection Zone 3.
- The site is not located within 100m of a private drinking water abstraction point.

4.11.1 Containing the run-off from fire water

During firefighting operations, water is used to contain and control the fire. Consequently, there is normally a large amount of pooling and firefighting water runoff, which needs to be managed and considered for firefighting operations. As water comes in contact with waste

and other materials it becomes contaminated and needs to be prevented from reaching bodies of water, environmentally sensitive areas and from overflowing the drainage system.

It is a requirement from the Environment Agency to consider the environmental effects of runoff firefighting water in case of a fire, particularly one involving waste.

All parts of the facility where a fire involving waste is feasible should include a method for spent firefighting water management, which should be suitable and sufficient for the expected delivery volume and duration of a typical fire incident. This is taken to be equivalent to the volume of the firewater tank (410m^3 if sprinklers used).

Give the low fire risk of the E-scrap product, the preferred firewater retention approach is to retain any firewater within the building as described above. The building perimeter will have raised edges e.g., raised threshold on doorways and ramps on vehicle access door to give sufficient retention volume. In the event of a major release of firewater, the retained water will be removed by suction truck by a specialised waste company.

The site provides additional containment with raised kerbs and automatic shut off to the surface water system. Full details are given in the Drainage Strategy (808678-WOD-ZZ-XX-RP-C-00002_S3_P01.1).

4.11.2 During and after an incident

The information provided below should be regarded as advisory only pending confirmation of the Operating Techniques and Emergency Plan.

Dealing with issues during a fire

The facility will receive up to five deliveries of waste every day. In the event of a fire, incoming lorry shipments will be diverted and parked away from the E-scrap facility. Given the low frequency of waste shipments, no more than three lorries are expected to be affected by any given fire event.

Notifying residents and businesses

As part of the BRM emergency response plan, as soon it is confirmed that a fire shall require fire brigade intervention, the Site Incident Controller or Site Main Controller will determine the level of incident and communicate this to the fire brigade. One of the Emergency Management Team will call the EA Incident Hotline to report any fire incident.

In case of serious incidents where a significant amount of smoke propagates beyond the site boundary, the Site Main Controller will form a task to inform adjacent sites of the incident and evacuate (if necessary) in coordination with the fire brigade and other civil protection authorities.

Clearing and decontamination after a fire

Fire damage of stored E-scrap material will not prevent it being processed by the plant. The main impact of a fire on the E-scrap material is the need for it to be dried prior to processing/packaging/shipping. This will be done by storing the material in the waste storage bays and periodically turning it over until it is adequately dry.

Making the site operational after a fire

The main considerations for making the site operational after a fire are removal of contaminated firewater and repair of any damage to the buildings and equipment. Retained firewater will be tankered off site.

The Site Emergency Response Plan includes a designated Recovery Controller who is responsible for returning the plant to safe operation.