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**Melksham Verdant Battery Energy
Storage System (BESS) – Emergency
Response Plan (ERP)**

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Prepared for:

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Abbreviations

ARC	Abbott Risk Consulting Ltd
BESS	Battery Energy Storage System
BMS	Battery Management System
COSHH	Control of Substances Hazardous to Health
DNO	Distribution Network Operator
ECU	Environmental Conditioning Unit
ERP	Emergency Response Plan
EM	Electro-Magnetic
FDSS	Fire Detection and Suppression System
FRS	Fire and Rescue Service
HV	High Voltage
IM	Incident Manager
LEL	Lower Explosive Limit
LFP	Lithium Ferrous Phosphate
NFPA	National Fire Protection Agency
O&M	Operation and Maintenance
OCC	Operational Control Centre
OCCIC	Operational Control Centre Incident Commander
OSC	On Site Controller
PPE	Personal Protective Equipment
RVP	Rendezvous Point
TR	Thermal Runaway

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1.0 Introduction

This Emergency Response Plan (ERP) has been developed for the Battery Energy Storage System (BESS) Site and associated infrastructure on land at Studley Farm, Atworth, Melksham, Wiltshire, SN12 8JN.

The main objectives of the ERP are to provide instruction and information on how to:

- Contain and control an incident to minimise the effects, and to limit damage to persons, the environment and property.
- Implement measures necessary to protect persons and the environment from the effects of incidents.
- Identify the organisations and key post holders involved.
- Communicate the necessary information to the Emergency Services and authorities concerned in the area.
- Ensure the safe and legal removal and disposal of any waste generated, and where environmental measures have failed, provide for the restoration and clean-up of the environment.

2.0 Purpose and Use

The purpose of this document is to provide details of the ERP in accordance with His Majesty's Government Emergency Preparedness, Response and Recovery Guidance¹. This ERP provides the guidelines and is not an exhaustive or prescriptive list of response activities. This actions to be implemented will vary dependent on the specifics of the incident prevailing.

3.0 Incident Classification

Table 3-1 details the site incident classification (level of significance) that has been adopted in this ERP:

Table 3-1 – Incident Classification

Level	Extent of Incident	Example ²
1	An incident which is self-contained and manageable within the capabilities of the facilities Incident Response Plan, attracting only local media attention.	Minor fires, spillage, injury, which can effectively be dealt with by personnel on site or remotely without external assistance

¹ <https://www.gov.uk/government/publications/emergency-preparedness-and-recovery>

² Further details on specific hazards and potential classification are at Section 6.0

Level	Extent of Incident	Example ²
2	An incident requiring support from internal or external responders.	This is an incident of significant proportions not immediately endangering life or property, but which could do so if not controlled
3	Any major incident or potential emergency causing or threatening death, injury or disruption to people or the environment and requiring an immediate response by the police, fire, and ambulance services.	Serious incidents involving casualties, loss of life or significant damage to environment. The incident response requires the establishment of: • Support from the Emergency Services • Site management and personnel call-in • Communication procedures • Means of dealing with the incident • Medical, welfare and public relations support.

4.0 Key Roles and Responsibilities

In the event of an incident, the Operational Duty Shift Engineers (ODSE) in the Operation Control Centre (OCC) make recourse to the ERP Incident Specific Checklists [Appendix B] held at the OCC. They will take immediate action depending on incident severity and liaise with the OCC Incident Controller (OCCIC). This ERP identifies three key roles; the OCCIC, the On-Site Controller (OSC) and the Incident Manager (IM), their responsibilities are detailed in Table 4-1.

Table 4-1 – ERP Role and Responsibilities

Role	Responsibility
ODSE	The ODSE will be the first to be notified of the incident, either through the offsite monitoring of the infrastructure status or via a telephone call from a member of the public or alerted emergency services. The ODSE is based at the OCC and will inform the OCCIC of the situation.
OCCIC	The OCCIC will take control of the immediate incident. The IM will be based at the OCC. They will be able to deploy a Field Service Engineer to the BESS site. The OCCIC can also deploy a keyholder to BESS. The OCCIC will decide on escalation to the OSC and brief the OSC accordingly.
OSC	The OSC will take responsibility for control of site and risk management beyond the immediate incident. The OSC will decide on escalation to the IM and brief the IM accordingly. The role of the OSC will be held by a fully qualified Operations & Maintenance (O&M) contractor working on behalf of the Asset Operations Team.
IM	The IM has overall company responsibility for liaising with senior management, ensure support with communications and manage the media, liaise with outside agencies and stakeholders, and provide support to the Emergency Services where required. A fully qualified O&M contractor will be the IM.

5.0 Site Details and Emergency Locations

5.1 Site Description

The purpose of the facility is to support the flexible operation of the local electricity network operated by the Distribution Network Operator (DNO) by balancing supply and demand, storing excess renewable energy for later consumption when demand is high.

5.2 Key Location Identifiers

5.3 Rendezvous Point (RVP), Evacuation and Site Assembly Point

Given the compact nature of the site the BESS RVP and Site Assembly Point (and Evacuation Assembly Area) are all located at the main access point to the site, see red circle in Figure 5-2. A site access road leads to the BESS Compound. The OSC is to conduct a risk assessment of the RVP location, considering the prevailing situation, and ensure that vehicle access to the site remains unobstructed. The What3Words locations of the access points and RVPs are at Table 5-1.

In the event of the need to evacuate the site all personnel in attendance, that are not essential to the emergency services, are to assemble outside the site access but remain available to assist the Emergency Services with guidance, advice and expertise. Personnel are to exit via the main entrance and make their way to the evacuation point cognisant of any emergency response traffic transiting to and from the Site. The OSC will confirm that all personnel are accounted for and relay this information to the Emergency Services in attendance.

5.4 Site Location

The site is on land east of 'The Channel', Burstall, IP8 4JL, Figure 5-1. Fig 5-2 illustrates the Site layout and the Access Point and Evacuation Assembly Area (circled in red). The What3Words locations are approximate and may be update once the exact layout and location is confirmed.

Table 5-1 – Site Location Identifiers

Point	What3Words	Street / Description
Northern access to Site and Evacuation Assembly Point	///handbook.duet.functions	Prior to reaching Studley Farm

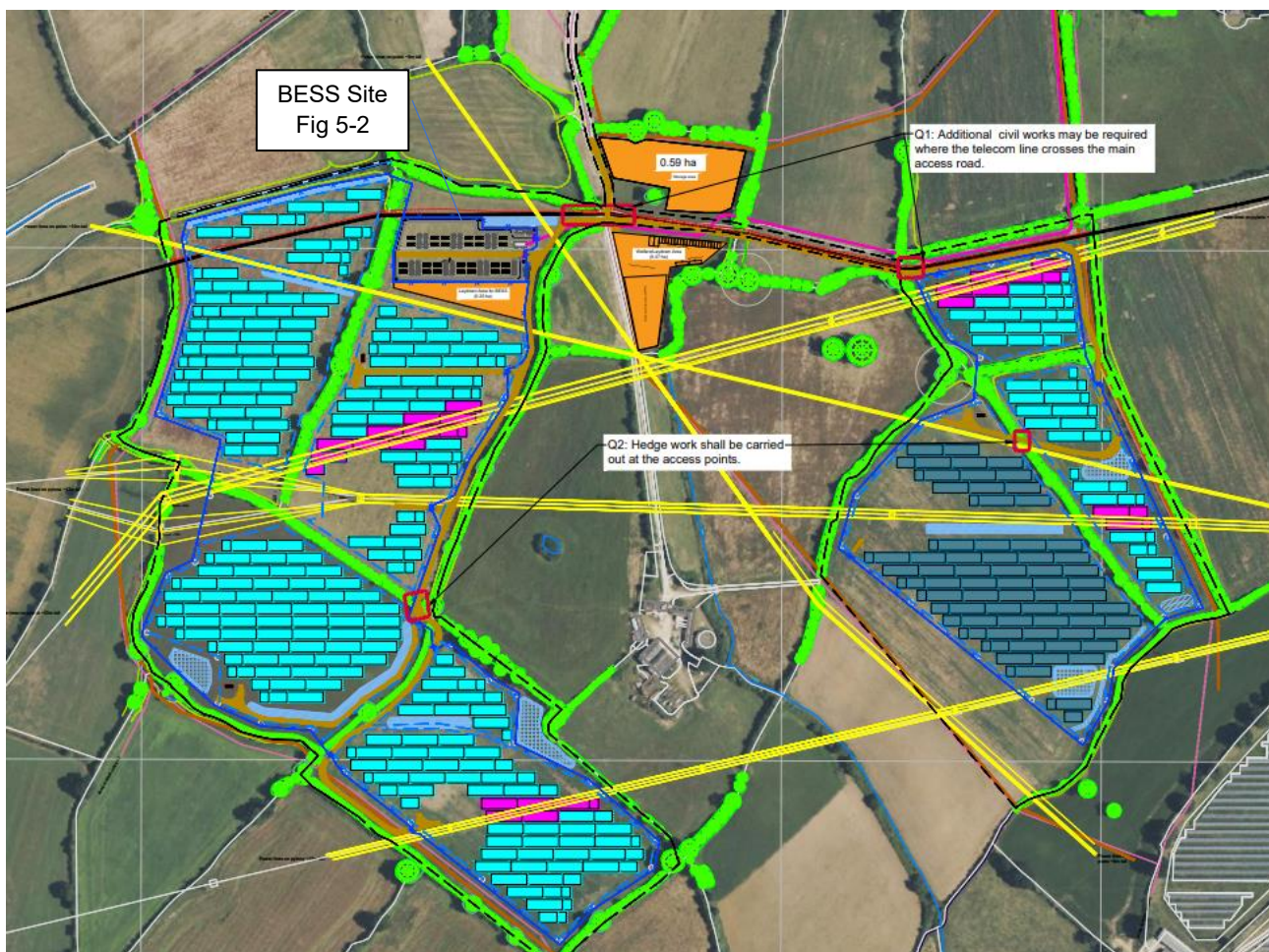


Figure 5-1 Site Location

5.5 BESS Compound Layout

The BESS compound is laid out as per Figure 5-2. At each access gate to the BESS compound an Emergency Services Box is fixed to the fence. This provides the Emergency Services with all the relevant details required to safely access the BESS Compound.

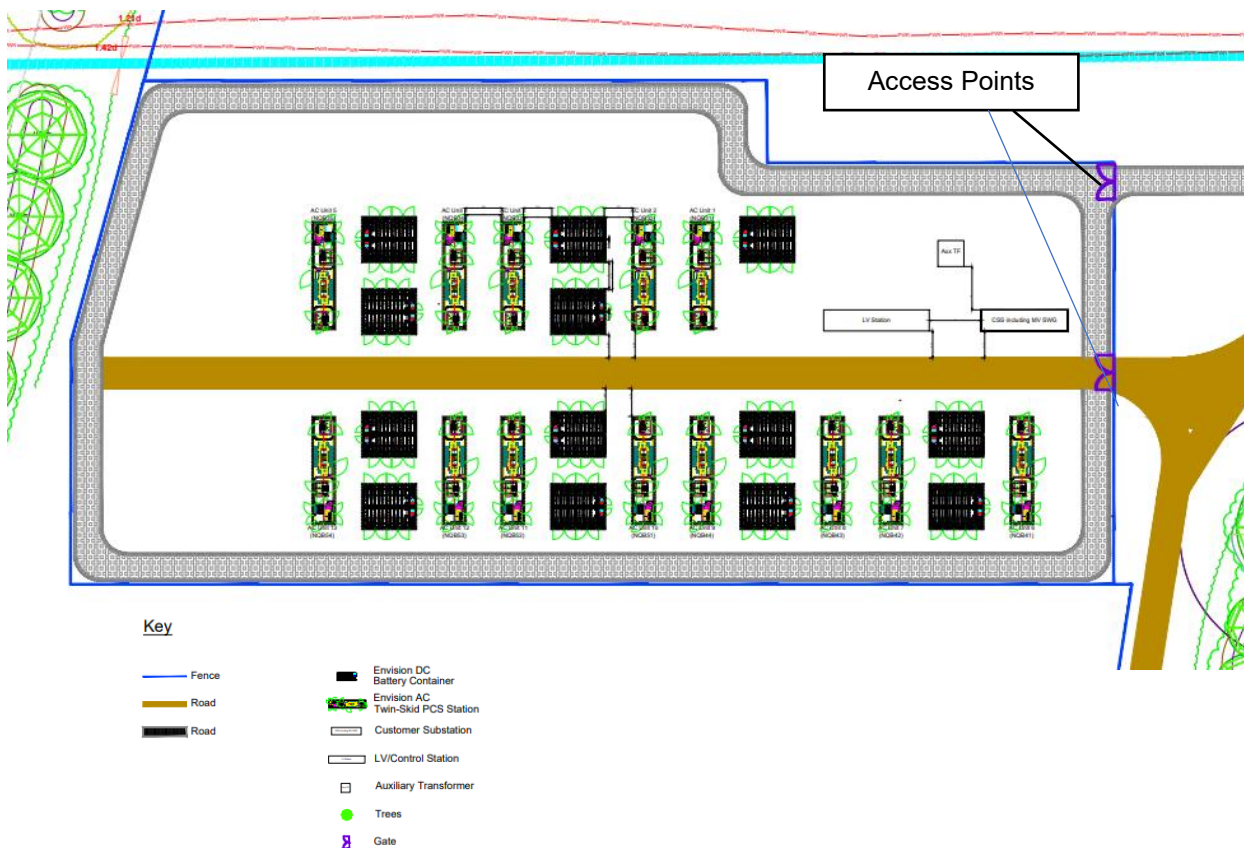


Figure 5-2 BESS Compound Layout

6.0 Potential Hazards

6.1 Hazardous Materials

Any hazardous materials used in the BESS development are justified and captured in the BESS Hazardous Materials Register. No hazardous substances are stored at the Site other than the constituent materials that make up the BESS units and associated infrastructure. Details of which are contained in the following sections.

6.2 Electrolyte Fire Risk – Over-Heating

The BESS Unit is designed for the operation at ambient temperatures up to 50°C. The containers are sealed units with a minimum Ingress Protection commensurate to the operating environment. However, in the event of abnormal heating or other forms of misuse, the electrolyte and its decomposition by-products may vaporise and vent from the cells. Accumulation of liquid electrolyte is unlikely in the case of abnormal heating. The emission of gases from the cells is an early sign of a thermal runaway (TR).

TR is not always inevitable, and the nature of the cell design is such that early warning signs of a stressed cell can be detected by the BESS Battery Management System (BMS). Initial signs of cell degradation are an increase in the time it takes the cells to reach full charge (maximum voltage) and a decrease in the time it takes to discharge. These indicators are picked up by the BMS and if persistent the BMS will isolate (prevent charge

and discharge) to the battery and inform the centralised OCC. In turn an engineer will be dispatched to remove the battery and replace it with a serviceable item.

If these indicators are not present, and the cell enters early stages of short-circuit the over-pressure in the cell will result in the venting of off-gas which is detected by the off-gas detectors built into the container. This will result in the container disabling the charge and discharge (the act of charging and discharging the batteries generates heat, which is what we want to avoid) and setting the Environmental Conditioning Unit (ECU) to maximum volume setting. This has a twofold effect, it clears the container of combustible gas and cools the internals, taking the energy out of the cells (Lithium-Ion like other batteries do not perform well in low temperature conditions).

6.3 Electrolyte Fire Risk - Spill

Electrolyte is a flammable substance if spilled although this is only possible in event of mechanical damage. Guidance at installation and transport ensures careful handling of equipment and inspection once installed. The only moving parts of the BESS are the battery modules fans and the ECU. The likelihood of electrolyte spillage from the BESS is highly improbable. It is exceedingly challenging to inflict mechanical damage that would lead to electrolyte leakage in the cells.

Even in the rare event of damage to a single cell capable of causing electrolyte leakage, it remains highly improbable for multiple cells to experience such an incident. Additionally, the cells are contained within packs (multiple cells constitute the battery), which are securely housed within a sealed and compartmentalised enclosure. For the electrolyte liquid to escape from the BESS, extensive mechanical damage would need to occur to the external enclosure, the BESS, pack, and the individual cell. Consequently, the risk of liquid electrolyte release to the external environment is exceedingly remote.

6.4 Electrical Fire Risk

BESS Units and associated infrastructure contain energized electrical equipment. All equipment is appropriately rated and manufactured following industry guidelines. When operated under normal conditions and as long as the BESS remains closed, there are no electrical safety concerns associated with product handling. The BESS has been equipped with multiple protective measures for safety, even in anticipated abuse scenarios. All cells that make up the battery are monitored by the BMS. Furthermore, the exterior of each battery module inside the BESS is isolated from internal components, and connectors are designed to be safe to touch. Finally, the racks and modules are installed within separate enclosures that are separated to provide an air gap in the event of a fire.

6.5 Thermal Runaway

Thermal Runaway (TR) is the term used to describe an internal short-circuit in one of the battery cells that can lead to cell over-pressure and the venting of combustible gases. Should this gas ignite then the cell will increase in over-pressure and the resulting fire will be self-sustaining until all the material in the cell is expended. Short-circuits in cells are generally a result of:

- Cell penetration by a foreign object (not usually an issue for a BESS as the batteries are housed in sturdy containers).

- Impurities in the electrolyte (deposited during the manufacturing process), which over time can lead to the formation of dendrites (electrolytic crystals) which puncture the membrane isolating the anode and cathode – this can, but not always, result in a short-circuit and TR. Dendrite formation was a common problem in early Nickel Manganese Cobalt battery chemistries but is not prevalent in Lithium Ferrous Phosphate and emerging battery chemistries.
- Over-temperature in the cell because of:
 - Over-charging (which is controlled by two separate BMS – battery and rack).
 - High ambient temperature – controlled by the ECU.

6.6 Preventing TR

BESS are configured to allow cells to operate within the design envelope in terms of temperature, voltage and current. As such the operating conditions such as; battery temperature, voltage, and current management are kept in bounds via the BMS and battery cooling systems (can be fans or liquid cooling dependent on BESS type). Battery cells, packs, and racks are properly approved to Underwriters Laboratories (UL) / International Electrotechnical Commission (IEC) standards to mitigate hazards related to electrical, mechanical, chemical, and fire. Thermal management provided by air or liquid cooling system, that maintains the battery cells within their operating limits reducing the risk of cell overheating or degradation (which could lead to a TR event). The BMS monitors the system conditions at the module, rack, and enclosure level and will electrically isolate or shutdown the affected racks. Current interrupt devices, breakers, fuses, or other passive surge arresting elements will open the circuit in the case of failure.

6.7 Further Preventative Measures

BESS design follows the principle of the explosion prevention system (exhaust) National Fire Protection Agency (NFPA)855 recommended and defined under NFPA69. The BESS is designed to remove the flammable battery gas upon detection by the fire control system and prevent an explosion from occurring. BESS are fitted with automated Fire Detection and Suppression System (FDSS) that activate on detection of a flame. Manual firefighting response can help in mitigating the consequences from TR by-products (e.g., hose streams knocking down any smoke plume). BESS walls are provided with a fire resistance rating and gas sampling ports are available for the emergency response team to locally access any internal gaseous atmosphere in more detail on approach.

6.8 Fire Mitigation

In addition to the FDSS, BESS are equipped with an active ventilation system with combustible gas detection. The combustible gas sensor continuously measures the gas level within the cabinet. When the combustible gas concentration is equal to or higher than 25% LEL (lower explosive limit), a first level alarm will be raised and trigger the active ventilation system to exhaust combustible gas. If the combustible gas concentration rises above 50% LEL, it will trigger a second level alarm and force the system to shut down.



Appendix A - Emergency Contact Details

Entity	Role	Availability	Point of Contact	Mobile Number / Alternative	Email Address
Belectric Solar Ltd,	Operations & Maintenance	24/7, 365 days			
Melksham Calne Green Ltd	Owner	Office hours 08:00-17:00			
Emergency Services					
Police	999 for emergency calls Dial 101 for non-emergency issues and state the address, you will then be directed to the most relevant station.				
Local Policing Team	Dial 101				
Fire and Rescue Service (FRS)	999 for emergency calls				
Health Services	Ambulance Service 999 for emergencies. 111 otherwise.				
Nearest 24/7 A&E	Royal United Hospital, Bath, Combe Park, Bath, Avon BA1 3NG				

Appendix B – Incident Specific Checklists

1. Action to be taken in the event of a fatality or serious injury

Ser	Fatality / Serious Injury Immediate Actions	Time Completed or NA
1	Phone 999 and ask for the Ambulance Service. Provide full site address as given in the Site Location at Section 5.4 of this ERP.	
2	If required call OCC and have the site isolated (specific to electrical incidents or incidents resulting from equipment failures).	
3	Administer 1 st Aid, if required and qualified to do so or contact Duty 1 st Aider for assistance.	
4	If possible, ensure that casualty is not left alone.	
5	Supervise emergency service personnel on arrival at site. If appropriate provide a hard copy of this ERP.	
6	All employees and contractors are responsible for reporting all incidents occurring on site as soon as possible and within one working day of occurrence. All injuries and close misses must be reported to the line supervisor and / or Regional Manager.	
7	Maintain a documented timeline (this checklist) and all relevant details (time of initial call, time of response to actions etc.)	

2. Action to be taken in the event of a Fire or Explosion

Ser	Fire / Explosion Immediate Actions	Time Completed or NA
1	Phone 999 and ask for the FRS, Police and Ambulance as dictated by the incident. Provide full site address as given in the Site Location at Section 5.4 of this ERP.	
2	Ensure all site staff are accounted for and evacuate as appropriate.	
3	If required call OCC and have the site isolated if this has not occurred automatically.	
4	Administer 1 st Aid, if required and qualified to do so or contact Duty 1 st Aider for assistance.	
5	If possible, ensure that any casualties are not left alone.	
6	Ensure isolation of the switchgear and the DNO connection has been completed, using the Site Emergency Stop, confirm with the OCC if required.	
7	If it is possible and safe, maintain operation of the Low Voltage equipment to maintain site communication, data analysis and temperature gathering from within each BESS.	
8	All personnel on site including contractors must leave the working area in an orderly manner and assemble at the Site Assembly Point. Carry out the roll call using the site attendance log held by the OCC, contact details at Appendix A.	
9	Supervise emergency service personnel on arrival at site. If appropriate provide a hard copy of this ERP.	

Ser	Fire / Explosion Immediate Actions	Time Completed or NA
10	Where there is the potential for firefighting water to leave site, then interceptor penstock valves must be shut, and any drainage outfalls blanked.	
11	Maintain a documented timeline (this checklist) and all relevant details (time of initial call, time of response to actions etc.).	

3. Action to be taken in the event of a Flood.

Ser	Flood Immediate Actions	Time Completed or NA
1	The OCC, OCCIC or IM shall immediately confirm the nature and extent of the flood warning by either: Online - https://floodwarninginformation.service.gov.uk/warnings and inputting the site postcode SN12 Or calling Floodline on 0345 988 1188 – this is a 24-hour service.	
2	Ensure all site staff are accounted for and evacuate as appropriate.	
3	Avoid danger arising from flood water in contact with live electrical equipment. If required call OCC and have the site isolated if this has not occurred automatically.	
4	Only where safe to do so, take action to isolate any burst pipes or improve the flow of drainage systems or outlets.	
5	Respond to instructions from the Emergency Services and ensure that all colleagues are evacuated and accounted for. Advise the Emergency Services who to contact should they require specialist advice or assistance with regards to the site.	
6	Maintain a documented timeline (this checklist) and all relevant details (time of initial call, time of response to actions etc.).	

4. Action to be taken in the event of an Oil or Chemical Spill

Ser	Oil / Chemical Immediate Actions	Time Completed or NA
1	In the event of the spill occurring on site, if safe to do so, the following actions must be undertaken: • Work will be stopped immediately • All possible ignition sources will be extinguished/isolated if the spilt material is flammable • The spill will be contained using spill kits • The source will be identified and sealed as practical • Granules / pads will be used to mop up as much spill as possible	
2	Raise the alarm, evacuate the area and report to the Site Assembly Point.	
3	Ensure all personnel are accounted for. Carry out the roll call using the site attendance log held by the OCC.	
4	Contact the Environmental Team, contact details in Appendix A: Emergency Contact Details. Provide the following information: • Site contact name, telephone number and location. Confirm spill location - on site, public road etc. • Confirm if the spillage has been contained. • Identify if there are any water courses nearby. • If possible, confirm the estimated quantity of substance lost. • If possible, confirm the volume of the asset leaking.	

Ser	Oil / Chemical Immediate Actions	Time Completed or NA
5	Refer to the appropriate Control of Substances Hazardous to Health (COSHH) assessment ensuring suitable precautions are observed including the wearing of correct PPE.	
6	If safe to do so and you are trained, inspect outfalls, and deploy emergency spill containment equipment to prevent the spread of spillages.	
7	As required: Call the Emergency Services by dialling 999, and provide the necessary details. The FRS have specialised teams, including an environmental officer and a chemical hazardous substances officer, to help with the containment and recovery.	
8	Supervise any Emergency Services personnel arriving on site. If appropriate, give them the hard copy of this ERP.	
9	As required: Contact the Environment Agency on 0800 80 70 60 providing specific details of the incident including any pollution to water or land.	
10	Working with environmental emergency contingency provider, provide support and coordination to clear up the spillage and stabilise the incident. Refer to COSHH data sheets, held in OCC, for specific information.	
11	Dispose of contaminated containment materials in accordance with the prevailing Waste Management Procedure.	
12	Maintain a documented timeline (this checklist) and all relevant details (time of initial call, time of response to actions etc.).	

5. Action to be taken in the event of a Gas Leak or Escape

Ser	Gas Leak Immediate Actions	Time Completed or NA
1	Remove yourself and any others in the vicinity from any source of danger. Take precautions to ensure no one can enter a dangerous area.	
2	Raise the alarm, evacuate the area and report to the Site Assembly Point.	
3	Ensure all personnel are accounted for. Carry out the roll call using the site attendance log held by the OCC.	
4	Call the Emergency Services by dialling 999, providing the necessary details. Bearing in mind the potential for escaping gases to cause a fire, or for fumes to affect personnel.	
5	Where it is safe to do so, take action to contain the extent of any gas leak, considering any dangers associated with the gas. Close any isolation valves and ventilate the area.	
6	Supervise any Emergency Services personnel arriving on site. If appropriate, give them the hard copy of this ERP.	
7	Emergency Services vehicles must not enter any HV compounds or pass under overhead HV conductors unless they have been isolated.	
8	Maintain a documented timeline (this checklist) and all relevant details (time of initial call, time of response to actions etc.).	