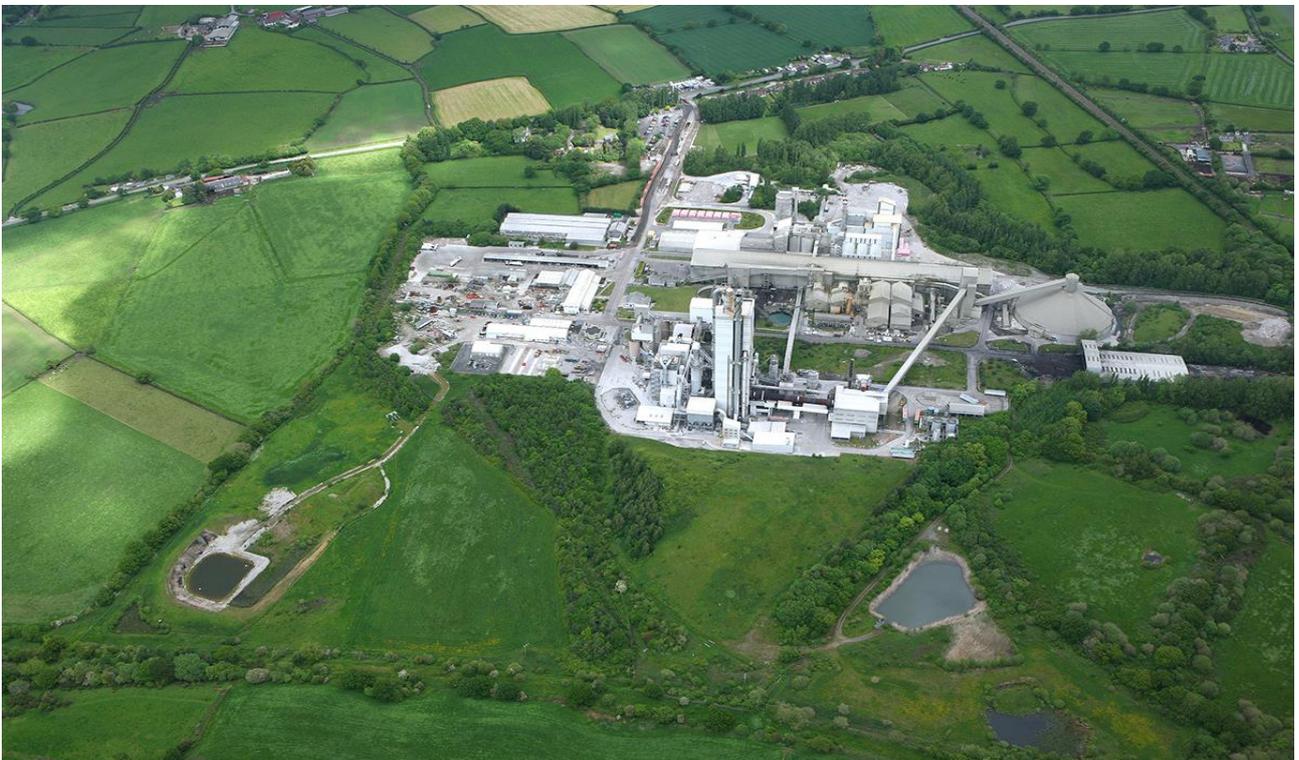


**HEIDELBERG MATERIALS**

# **Padeswood Carbon Capture Plant - FEED Phase**

## **Environmental Critical Equipment Identification Procedure**

Document no. Rev 0: 215000-00190-000-EN-PRO-00005



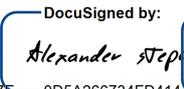
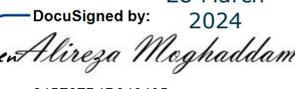
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### PROJECT 215000-00190-000 - 215000-00190-000-EN-PRO-00005: Padeswood Carbon Capture Plant - FEED Phase - Environmental Critical Equipment Identification Procedure

Rev	Description	Originator	Reviewer	Worley Approver	Revision Date	Customer Approver	Approval Date
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Rev 0	Issued for Design	DocuSigned by:  O Mancell Smith <small>47B40CE7C0BA47E...</small>	DocuSigned by:  Alexander Stephen <small>0D5A266734FD414...</small>	DocuSigned by:  Alireza Moghaddam <small>245E27B4D340405...</small>	28 March 2024		

## Revision History

Rev	Status	Section	Description of Change
A	IDC	All	Initial Issue
B	IFR	All	Issued for Review
0	IFD	All	Issued for Design

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# 1. Introduction

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## 1.1 Project Background

Heidelberg Materials (HM) has become a partner in the HyNet Northwest consortium, which aims to create the world's first low-carbon industrial cluster in the region of Northwest England. The proposed hydrogen and carbon capture and storage (CCS) industrial cluster will play a critical role in the UK's transition to net zero greenhouse gas emissions and the fight against climate change. As part of 'Making Net Zero Possible', Asset Improvement programme options to decarbonise COMPANY cement plant are being considered. Carbon Capture (CC) is one of the key technologies being developed as a route to decarbonisation. COMPANY cement plant located at Padeswood which currently produces about 110 ton per hour (tph) of clinker, has been selected by DESNZ as a track 1 phase 2 carbon capture project. The PROJECT will enable carbon capture from the existing cement kiln 4 and from a new Combined Heat and Power (CHP) plant designed to provide the heat and electricity required to operate the Carbon Capture and Compression (CCC) plant. Captured CO<sub>2</sub> will be transported by pipeline to the HyNet CO<sub>2</sub> main pipeline at Northop Hall AGI for onward transportation to storage offshore in depleted gas fields operated by Eni UK. The PROJECT will enable the production of net zero cement for use in the UK construction industry.

Ahead of this CONTRACTOR has been engaged by COMPANY to undertake a pre-FEED study for the carbon capture development. The pre-FEED study was completed in March 2023. Based on the pre-FEED study, an amine-based post combustion CO<sub>2</sub> capture technology has been selected as a suitable technology for capturing 95% of the CO<sub>2</sub> emissions from cement plant.

A consortium between Mitsubishi Heavy Industries (MHI) and Worley as the selected FEED contractor for the Heidelberg Material (HM) Padeswood CCS Project shall deliver an overall FEED package utilizing MHI's Carbon capture technology.

The capture plant can be considered a green field development, but some elements of the integration with the cement plant will be considered brown field. Green field elements will be developed by MHI and Worley, while brownfield elements will be developed by both HM and MHI/Worley.

## 1.2 Document Purpose

This document comprises the Environmental Critical Equipment (ECE) Identification plan for the Heidelberg project ('PROJECT'),

The purpose of this document is to define the methodology to be followed in identifying which systems and equipment are deemed as environmental critical for the PROJECT. The document also highlights the requirements for Performance Standards to be produced for these systems and equipment and provides guidance on compiling the ECE Register.

This methodology broadly follows the Energy Institute's approach detailed in the "Guidelines for the identification and management of environmental barriers" (Ref 1). Although this guidance

is primarily aimed at the upstream offshore industry, with terminology commonly used for offshore, the identification approach is broadly adaptable to onshore facilities (as highlighted in the guidelines).

The CONTRACTOR will be required to follow this plan to identify ECE and accordingly work with the respective vendors to ensure the ECE meets the required Performance Standards.

### **1.3 Scope**

This document is concerned with Environmental Critical Systems, their function and associated Critical Equipment that are required to be in place further to the requirements of Environmental Basis of Design (Ref 2).

It is to be applied to all process facilities and utilities in all units and equipment that features in the PROJECT Equipment Lists (Ref 3) for Operations.

## 1.4 References

Ref	Document/Title	Document Number
<b>Ref 1</b>	Guidelines for the identification and management of environmental barriers, 2 <sup>nd</sup> Edition, Energy Institute, November 2020	REF/ISBN: 9781787252226
<b>Ref 2</b>	Environmental Basis of Design	215000-00190-MS-EP-TEM-0008
<b>Ref 3</b>	Equipment List	215000-00190-000-PR-LST-00009
<b>Ref 4</b>	ENVID Report	215000-00190-000-EN-REP-00004
<b>Ref 5</b>	SHEQ Critical Items Procedure	OP008 SHE Critical Items (Ver1)

## 2. Abbreviations, Definitions & References

### 2.1 Abbreviation & Descriptions

Abbreviation	Description
<b>ALARP</b>	As Low As Reasonable Possible
<b>BAT</b>	Best Available Technique
<b>BOD</b>	Biological Oxygen Demand
<b>CCUS</b>	Carbon Capture Use and Storage
<b>CEMS</b>	Continuous Emission Monitoring System
<b>CMIMS</b>	Computerised Maintenance & Inspection Management System
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>COD</b>	Chemical Oxygen Demand
<b>EA</b>	Environment Agency
<b>ECE</b>	Environmental Critical Equipment
<b>ECS</b>	Environmental Critical Systems
<b>ENVID</b>	Environmental Impact Identification
<b>EPC</b>	Engineering Procurement Contractor
<b>FEED</b>	Front End Engineering Design
<b>GDP</b>	Group Defined Practice
<b>GIS</b>	Group Industry Standard
<b>HAZID</b>	Hazard Identification
<b>HAZOP</b>	Hazard Operability
<b>HM</b>	Heidelberg Materials
<b>HSE</b>	Health Safety and Environment
<b>HSSE</b>	Health, Safety, Sustainability and Environment
<b>ISO</b>	International Organisation for Standardisation
<b>LHV</b>	Lower Heating Value
<b>MEE</b>	Major Environmental Event
<b>MWth</b>	Megawatt thermal
<b>P&amp;ID</b>	Piping and Instrument Diagram
<b>PAH</b>	Polyaromatic Hydrocarbons
<b>PFD</b>	Process Flow Diagram
<b>SCE</b>	Safety Critical Equipment
<b>TOC</b>	Total Organic Carbon
<b>TSS</b>	Total Suspended Solids
<b>UK</b>	United Kingdom

Table 2-1: Abbreviations

### 2.2 Definitions

Term	Definition
COMPANY	Heidelberg Materials
CONTRACTOR	Consortium of Worley Europe Limited and Mitsubishi Heavy Industries Limited (MHI)
LICENSOR	MHI entering a Licensing Agreement with the CLIENT
PROJECT	Padeswood Carbon Capture Plant
DELIVERY PARTNER	Company other than the prime COMPANY and CONTRACTOR associated with the delivery of the PROJECT.

Term	Definition
SUPPLIER/VENDOR	Company / organisation supplying equipment, materials or services.
SUB-SUPPLIER	The organisation selected by the SUPPLIER/VENDOR to supply the part of equipment and services.
WORK	Shall mean all and any of the WORKs and / or services and / or materials required to be provided under the Contract with CLIENT.

Table 2-2: Definitions

### 3. Technical Definitions Pertaining to ECE/ECS

The following technical definitions are adapted from the Energy Institute Guideline (Ref 1) and apply to all documents related to the ECE.

Item	Definition
<b>Cause</b>	Event, situation, or condition that results, or could result, directly or indirectly in an accident or incident
<b>CMIMS</b>	Computerised Maintenance & Inspection Management System (CMIMS). A computerised system that allows detailed management of activities and data related to the maintenance and inspection of assets.
<b>Consequence</b>	Direct, undesirable result of an accident sequence usually involving a fire, explosion, or release of toxic material. Consequence descriptions may be qualitative or quantitative estimates of the effects of an accident in terms of factors such as health impacts, economic loss, and environmental damage.
<b>Environmental Critical Equipment</b>	ECE items are the constituent components of an ECS or its sub-systems. ECE is defined as any equipment, the failure of which could give rise to an Environmental Event.
<b>Environmental Critical System</b>	An ECS is any part of the facility, plant or computer programs, or any part of those whose failure will either cause or contribute to an Environmental Event, or the purpose of which is to prevent or limit the effect of an Environmental Event.  ECSs are intended to be high-level aspects of the operation that have a common function, e.g., "Wastewater system". Within an ECS there may be sub-systems and items of equipment that are Environmentally Critical.
<b>Environmental Event</b>	An Environmental Event is an unintended release to the environment of a substance the consequence of which attracts regulatory attention and has the potential to cause an environmental impact if it has a pathway to the environment.  For the purposes of defining ECE within the PROJECT, an Environmental Event also includes an event which may lead to any of the following:  Non-compliance with European environmental regulations. Non-compliance with the legally binding permit conditions.  Note that non-compliance with environmental legislation refers to equipment failure that is likely to result in an investigation and potential enforcement action by legal authorities. An Environmental Event is therefore directly linked to the laws and standards governing and controlling potential pollution from the PROJECT, and also has the potential to harm CLIENT reputation and potentially lead to a temporary suspension of the operational permit.
<b>Hazard</b>	Condition or practice with the potential to cause harm to people, the environment, assets /business performance, or reputation.

Item	Definition
<b>Hazardous Event</b>	A hazardous event is an undesired event at the end of the fault tree, and at the beginning of an event tree. In other words: the center point in a Hazard 'Bowtie' as illustrated in Figure 3-1 below.
<b>Major Accident</b>	In relation to the major accident hazards definitions, the following shall be considered applicable to the PROJECT:  An event involving a fire, explosion, the release of a dangerous substance causing, or with a significant potential to cause, death or serious personal injury to persons within the facility or engaged in an activity in connection with it.  Any other event arising from a work activity involving death or serious personal injury to five or more persons at the facility or engaged in an activity in connection with it.  Any Major Environmental Event (MEE) resulting from any event referred to in the points above.
<b>OIVAS</b>	Operational Integrity Assurance Verification Scheme (OIVAS): compilation of all the Performance Standards, means of assurance and verification schemes for a field/asset.
<b>Performance Standard</b>	A Performance Standard is a statement (either qualitative or quantitative) which defines the performance required of a system or item of equipment in order to satisfactorily fulfil its purpose. The Performance Standards define the functionalities to be fulfilled and checked during the maintenance and inspection operations to ensure ECE equipment functionality, reliability, availability and survivability.  Each ECE has its intrinsic "Performance Standard".
<b>Risk</b>	A measure of loss / harm to people, the environment, compliance status, reputation, assets or business performance in terms of the product of the probability of an event occurring and the magnitude of its impact.

Table 3-1: Technical Definitions

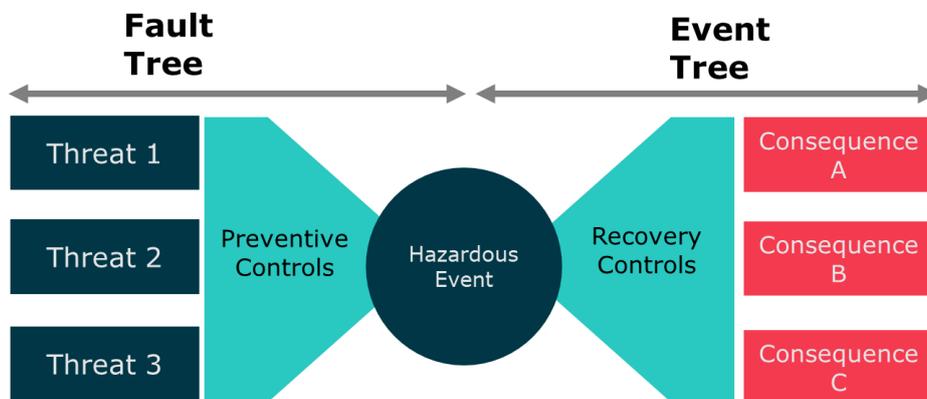


Figure 3-1: Hazard Bowtie

## 4. Roles and Responsibilities

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### 4.1 Project Manager

The Project General Manager is accountable for:

- Ensuring that adequate resources required to perform all ECE requirements are allocated.

### 4.2 Engineering Manager

The Engineering Manager is accountable for execution of the ECE process including:

- Delivering an ECE Register for the PROJECT.
- Approving Performance Standards and Written Schemes of Examinations for ECS.
- Integrating the ECE Procedure into the PROJECT Environmental Management System, and Transition Plan from Project to Operations.

### 4.3 Quality Manager

The PROJECT Quality Manager is responsible for:

- Ensuring mandatory certification requirements for equipment which are part of the ECE are clearly documented and maintained throughout the life cycle of the project.
- Ensuring criticality assessment of equipment for the PROJECT to ensure compliance with UK/European regulations and CLIENT standards is supported by this procedure.
- Accountable for implementing a program of verification of ECE further to criticality assessments.
- Tracking and sharing the results of verification with the Engineering and HSE Managers.

### 4.4 HSE Manager

- Provide the procedure for conducting ECE identification.
- Maintain appropriate knowledge pertaining to relevant UK/European regulations and CLIENT standards.
- Maintain the ECE Register.

### 4.5 Process Engineer

A Project Process Engineer has responsibility for implementation of this procedure, and for the review and upkeep of ECE Registers. This role shall:

- Understand the range of equipment and equipment performance that are encompassed by the PROJECT Environmental Critical Systems (ECS).
- Set the boundary of inclusion to the ECS, i.e., where necessary or requested be able to clarify which equipment is included within an ECS for ECE identification, and which equipment is excluded.

- Prepare the supporting documentation (Performance Standards and Written Schemes of Examination), in accordance with the procedure and within the Project’s document management system.

## 4.6 Environmental Engineer

The Environmental Engineer is to support the implementation of this procedure and is accountable for:

- Supporting the Process Engineer in determining the PROJECT’s ECSs and associated ECE.
- Support the Engineering team in the preparation of Performance Standards and Written Schemes of Verification.
- Support the Quality Manager and relevant engineering personnel in the determination of criticality ratings for environmental equipment for design, procurement and construction.
- Guide the Engineering team on the relevant Compliance Requirements for Environmental Critical System and Equipment determination to ensure the process delivers a safe and high-quality project.
- Establish Workshops or Training as required to ensure successful implementation of the procedure.
- Establish the auditing program so that ECS for the PROJECT will meet approved and defined Performance Standards.

## 4.7 Maintenance Engineer

The Maintenance Engineer is accountable for:

- Reviewing the ECE listing and advising on maintenance required to keep various equipment compliant with the European regulations and COMPANY Standards.
- Developing preventative maintenance program for ECE.

## 4.8 Operations Engineer

The Operations Engineer is accountable for:

- Identifying any operating requirements associated with the PROJECT ECE.
- Integrating ECE operating requirements into the PROJECT’s various Process Operating Procedures.

## 4.9 Deliverables

Expected deliverables from CONTRACTOR in terms of the ECE identification process are listed in the table below.

Deliverable	Responsible Party
<b>ECE Register</b>	All
<b>Performance Standards</b>	Process Engineer
<b>Written Schemes of Examination</b>	Process Engineer
<b>Preventative Maintenance Program</b>	Maintenance Engineer

Deliverable	Responsible Party
<b>Auditing Program</b>	Environmental Engineer

Table 4-1: Table of Deliverables

## 5. Methodology

---

### 5.1 ECE Identification Procedure Overview

Prior to the ECE Identification the PROJECT legislative and regulatory requirements will have been defined within the PROJECT's Environmental Basis of Design (Ref 2) while the associated environmental and social hazards will have been identified via the ENVID (Ref 4).

This process involves the following steps:

- Identify the systems that interact with the hazards.
- Estimate the consequence of failure of the identified systems and whether the failure would lead to an "Environmental Event".
- Define a system as an ECS if the failure of the system, or a sub-systems or equipment that it contains, is deemed to result in an Environmental Event.
- Write Performance Standards to define what the ECS, sub-systems and equipment are required to achieve, and to establish maintenance and assurance activities to ensure that the requirements of the Performance Standards can be met. These include a Written Scheme of Examination/Verification by a competent Environmental Auditor.

Figure 5-1 illustrates the methodology for the PROJECT ECE identification as well as suggested information sources for this purpose. Section 5.2 then discusses each step in more detail.

This methodology should be applied to identify ECE for the operational phases of the PROJECT.

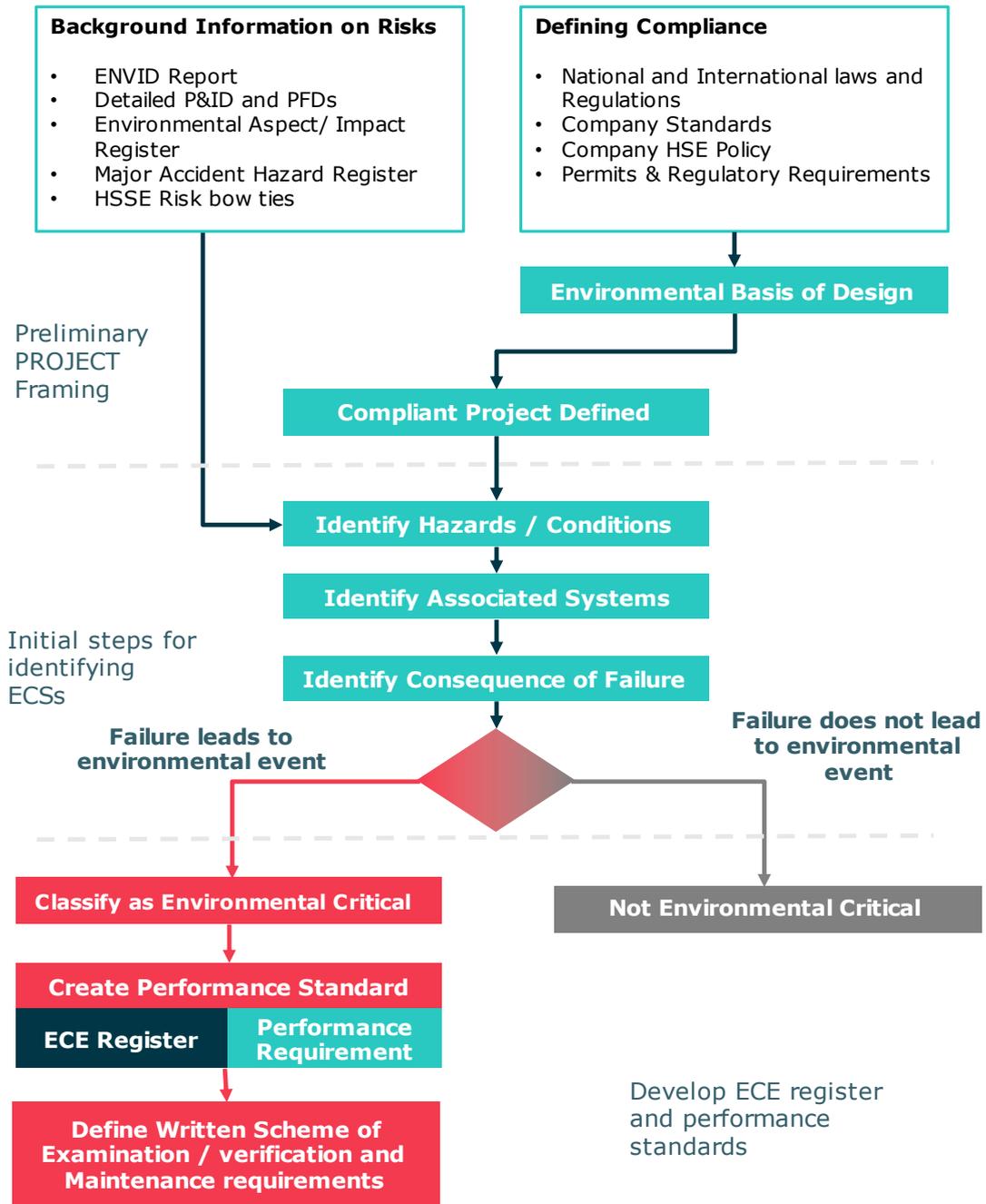


Figure 5-1: ECE Identification and Register methodology

## 5.2 Key Steps

Key steps in identification and management of the ECEs are as follows:

Step	Description
<b>Identify hazards or conditions</b>	<p>The hazard or condition that could result in an Environmental Event e.g., release of chemical or hydrocarbon inventory should be identified at the facility.</p> <p>This should be undertaken with reference to various project documents, including ENVID report, Environmental Aspect and Impact Register, Risk Registers, Major Accident and Major Environmental Event (MEE) scenarios. If necessary, re-evaluation of the environmental hazards will also be carried out in the ECE identification workshop.</p>
<b>Identify associated systems</b>	<p>The systems which control the environmental hazards should then be identified and reviewed. These systems will contain sub-systems and equipment that interact with and control the hazard, in order to prevent or mitigate the Environmental Event.</p> <p>The intent of these systems is to reduce the risk associated with an Environmental Event to the facility's ALARP level. The systems are generally identified during hazard analysis reviews (HAZID, HAZOP etc.). Their effectiveness is evaluated through a range of quantitative risk assessment techniques.</p> <p>Examples of systems include processing system tanks and vessels used to contain hazardous substances, monitoring systems used to prevent spillages or control emissions to air, and monitoring systems used to ensure that the environmental commitments can be met (e.g., continuous emissions monitoring systems). Subsystems and equipment might include specific components of those systems such as slug catchers or specific valves.</p> <p>ECSs also include those used to mitigate the effects of an Environmental Event e.g., oil and chemical spill response equipment.</p>
<b>Estimate the consequence of the system(s) failing</b>	<p>The consequence of system failure shall be evaluated. The type of hazard, magnitude (e.g., volume of a spill, release rate and duration), properties (e.g., contents of spill and their environmental profile) and the location should be recorded. Also, the consequence of a failure in meeting an environmental permit condition or other legislative requirements shall be estimated.</p>
<b>Would the system failure lead to an Environmental Event?</b>	<p>The next step is to evaluate whether the consequence is likely (within the lifetime of the facility) to result in an Environmental Event and to define that Environmental Event.</p>
<b>Classify system as an ECS</b>	<p>If failure of the system is likely to result in an Environmental Event, then the system shall be classified as Environmental Critical. The system now needs to be taken forward for additional management, for example inclusion in the maintenance system.</p>
<b>Write Performance Standard</b>	<p>Following classification as Environmentally Critical, a Performance Standard shall be defined for the system. More detail is provided in Section 3</p>
<b>Compile ECE Register</b>	<p>Based on the information gathered in the above stages, the ECE register shall be compiled. Further details are given in Section 0.</p>

Table 5-1: Identification and management of ECEs

### 5.3 Other considerations

The process should include consideration of non-routine items such as:

- Commissioning and start-up
- Turnarounds / shutdowns
- Construction equipment
- Third party equipment

An example of the process for identifying ECS is included in **Appendix B**. The worked example refers to management of water usage/discharge.

## 6. Performance Standards

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Performance Standards are a statement of the performance required / criteria against which the initial and continued suitability of the ECS is assessed.

They include the requirements that ensure that the ECS can fulfil its intended function with the required availability and reliability throughout its service. They also establish the actions necessary to meet these requirements, which will predominantly include maintenance routines linked to the specific items of equipment within the system.

They detail the standards that need to be checked and verified later when the systems are operational and to ensure that appropriate management and maintenance processes are put in place.

The checking activity is required under element 4.5 of ISO 14001 Environmental Management Standard.

Performance Standards should include the following information:

- Scope of the ECS: This shall define the boundaries of the system being described in the Performance Standard, including reference to appropriate drawings.
- Compliance requirements: These shall include, for example, relevant environmental legislation.
- Hazard management role: The hazards identified in the initial steps of ECE identification shall be highlighted.
- Function: The function of the system, including design, construction and maintenance standard(s) to meet these criteria shall be defined. Where appropriate, reference should be made Best Available Technology (BAT) Studies.
- Availability / reliability: The extent to which the system needs to be available shall be defined in order to meet compliance requirements.
- Interaction with safety critical equipment: Any overlaps with safety critical equipment shall be described.
- Reference documents: The relevant documents e.g., Environmental Aspects/ Impacts Registers, Permit commitments Registers, Environmental Legislation, and relevant drawings should be referenced.

ECE Performance Standards should be developed with reference to relevant Heidelberg Materials and MHI standards and company procedures. Component/equipment type specific standards should be referenced where available and relevant.

All ECE shall be maintained in accordance with the requirements defined by the Performance Standard as well as the HM SHEQ Critical Items Procedure (Ref 5) and verified using a Written Scheme of Examination/Verification.

A template Performance Standard is supplied in **Appendix A**.

## 7. Compiling the ECE Register

The ECE Register is compiled by the Environmental Engineer using the equipment details defined during preparation of the Performance Standards. It is important to keep the ECE register robust, rigorous and satisfactory in meeting permit conditions including commitments made in the permit application variation and Environment Agency (EA) environmental regulations.

Regular annual reviews are required of ECE, and if it is determined that equipment should not be classified as ECE, updates to the Performance Standard and Written Scheme of Examination/Verification shall be made.

Key steps in compiling the ECE register are as follows:

Description	
<b>Step 1</b>	<p><b>Prepare the ECE Register template:</b></p> <p>The ECE Register may be prepared as a Microsoft Excel spreadsheet. The template shall be populated with project specific information such as project title and document control details.</p>
<b>Step 2</b>	<p><b>Record the hazards / conditions:</b></p> <p>The ECE register shall contain details of the hazards / conditions that require to be managed.</p>
<b>Step 3</b>	<p><b>List the Environmental Events:</b></p> <p>The Environmental Events that could occur as a result of failure to control the hazards / conditions shall be incorporated into the template.</p>
<b>Step 4</b>	<p><b>Identify the ECS:</b></p> <p>The ECS being used to control each of the hazards / conditions shall be listed. This entry should acknowledge the corresponding Environmental Event(s).</p>
<b>Step 5</b>	<p><b>Identify the ECE:</b></p> <p>ECE comprises those items of equipment whose function is critical to preventing the occurrence of an Environmental Event. Often this considered to be the "last line of defense" in preventing the Environmental Event. The ECE within each ECS shall be listed, acknowledging the corresponding Environmental Event(s) with reference to P&amp;IDs and equipment tag numbers. Highlight the environmental performance criteria for the equipment.</p>
<b>Step 6</b>	<p><b>Define the maintenance requirements:</b></p> <p>Maintenance requirements shall be based on ensuring the ECE meet the associated Performance Standards. High level maintenance requirements for each item of ECE shall be defined in conjunction with the technical safety and maintenance departments. Maintenance requirements should take into account requirements under the operational case for safety and the Performance Standards for safety critical elements. Later the Maintenance Management System shall include maintenance requirements for each item of ECE down to system / subsystem level.</p>

Table 7-1: Steps to Compiling ECE Register

## **Appendix A. Performance Standard Template**

<b>Performance Standard: Environmental Critical System</b>		<b>Project</b>
		<b>System</b>
Extent of Environmental Critical System		
Compliance Requirements		
Hazard Management Role		
Function		
<b>Environmental Critical Equipment</b>		
Availability / Reliability		
Interaction with Safety Critical Equipment		
Maintenance and Assurance		
Reference Documentation		

## **Appendix B. Worked Example**

## Identifying Environmental Critical Systems and Equipment Regarding Management of Wastewater Usage

In this example, a potential non-compliance scenario due to failure of the continuous monitoring system for water use and discharge is demonstrated. Table B-1 demonstrates the stages in identification /classifying an ECS. A worked example of the performance standard for the ECS is shown in Table B-2.

Term/step	Definition
<b>Define Environmental Events</b>	The Environmental Events were defined in terms of the project-specific permit commitments, Environmental aspects and impacts register.
<b>Identify hazards / conditions</b>	The hazard / condition identified is wastewater and associated pollutants being discharged from the facility without metering or monitoring
<b>Identify associated systems</b>	The systems utilised to meter wastewater discharges and monitor and control pollutants in the wastewater are part of the Monitoring and Metering system.
<b>Estimate consequences of system failure</b>	In the event of system failure, the potential consequences are: <ul style="list-style-type: none"> <li>• Non-compliance with requirements for metering and monitoring</li> <li>• Unable to verify compliance with discharge quality standards</li> <li>• Unable to verify water usage/discharge rates</li> <li>• Potential financial fines/restrictions imposed by the Environment Authority</li> <li>• Reputational damages</li> </ul>
<b>Would system failure lead to an Environmental Event?</b>	Yes, failure could potentially lead to an Environmental Event. The Environmental Events which may occur are a potential breach of water discharge quality limits as described in the PROJECT environmental Basis of design.
<b>Classify as Environmental Critical</b>	Monitoring and metering system is identified as Environmental Critical.
<b>Write Performance Standard</b>	The Performance Standard is compiled in line with the template provided (see Section 3 for more details).
<b>Compile ECE Register</b>	
<b>Prepare ECE Register template</b>	See Table A-2 below.
<b>Record the hazards / conditions</b>	The hazards as identified above are included in the register.
<b>List the Environmental Events</b>	The Environmental Events as identified above are listed in the register.
<b>Identify the Environmental Critical Systems</b>	The Environmental Critical Systems are listed as headings in the register. The corresponding Environmental Events are identified.
<b>Identify the Environmental Critical Equipment</b>	Details of the system function were obtained from a number of sources including Environmental Statement, Environmental Basis of design, P&IDs, PFDs and associated BAT studies. The components of the system were identified and considered, to establish whether or not their individual failure would result in an Environmental Event.  A description of the equipment, the tag numbers and reference drawings were then added to the register if available.
<b>Define the maintenance requirements</b>	Appropriate maintenance and inspection routines are subsequently developed by the maintenance function and embedded in operational systems.

Table B-1: Identifying Environmental Critical Systems

Performance Standard: Environmental Critical System	Project	Padeswood Carbon Capture Plant
	System	Continuous Monitoring and Metering System
Extent of Environmental Critical System	<p>Includes monitoring and metering equipment upstream of the discharge points or 'users' whose failure may lead to non-compliance in with regulatory standards or Heidelberg Materials environmental and social standards.</p> <p>Equipment items include all meters and supporting software that would monitor and be used to prevent an unplanned emission or discharge or a failure to monitor use of resources for reporting purposes. Equipment numbers and drawing numbers can be found in ECE Register [Insert document number].</p>	
Compliance Requirements	<p>The monitoring and metering system must, as a base case, be able to monitor all water usage and discharge from the facility regulated by law and managed under Heidelberg Materials accepted standards.</p> <p>In the event that monitoring and metering failures occur then there is a risk of discharges exceeding permitted limits.</p> <p>The system must be able to meter and continuously monitor water discharges for Flow rate; pH; Temperature; Total organic Carbon (TOC); Total Suspended Solids (TSS); Chemical Oxygen Demand (COD); Biological Oxygen Demand (BOD); Total Phosphorous; Total Nitrogen; Nitrate; Total Monoaromatic Hydrocarbons (MAH) and Total Polyaromatic Hydrocarbons (PAH).</p>	
Hazard Management Role	<p>The monitoring and metering system controls the environmental quality of discharges and addresses the hazard of non-compliance with discharge quality standards. It also ensures the company can track and report its use of resources.</p>	
Function	<p>The continuous water monitoring and metering system enables compliance with UK/European water discharge standards as described in "compliance requirements" above.</p>	
Environmental Critical Equipment	<ul style="list-style-type: none"> <li>• Water Meter at supply point, and at each end user &lt;+/- 10% uncertainty&gt;</li> <li>• Water Sampling package at end-discharge point [insert tag]</li> </ul>	
Availability / Reliability	<p>The availability of monitoring and metering is the design base case, and its availability shall be prioritised. Monitoring the discharges is a permit commitment and shall be available for 100% of the time that the facility is operating.</p> <p>The Continuous Monitoring System shall be available for 100% of the time that the facility is in operation.</p>	
Interaction with Safety Critical Equipment	<p>There is no overlap with Safety Critical Equipment (SCE).</p> <p><i>SCE interaction should be confirmed by the safety discipline.</i></p>	
Maintenance and Assurance	<p>Generally, meters and analysers shall be calibrated in accordance with manufacturer's recommendations. Equipment and components should be maintained and calibrated in line with manufacturer recommendations.</p>	
Reference Documentation	<ul style="list-style-type: none"> <li>• Heidelberg Environmental Statement [Insert document number or provide website link]</li> <li>• Permits and Regulatory Commitments Register [Insert document number]</li> <li>• Project ECE Register [Insert document number]</li> <li>• Register of Safety Related Devices [Insert document number]</li> <li>• Laboratory Sampling Procedure for Environmental Compliance [Insert document number]</li> </ul>	

Table B-2: Illustration of a sample ECS Performance Standard

## **End of Document**

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