

# ENVIRONMENTAL RISK ASSESSMENT

HyGear EPR/NP3606MX/A001

JER9139

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03 February 2022

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Appendix A H1 Assessment

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# 1 INTRODUCTION

- 1.1.1 This Environmental Risk Assessment (ERA) has been carried out in support of an application for an environmental permit for the Hydrogen Generation System (HGS) at Saint-Gobain Glass United Kingdom Ltd's (referred to herein as Saint-Gobain) glass production facility at Weeland Rd, Goole, DN14 0FD.
- 1.1.2 This ERA includes an assessment of risks to the environment and human health due to the proposed operation of the HGS. The Environment Agency's Risk Assessments for your environmental permit covers a range of environmental risks. Those aspects relevant to the operation of the HGS are covered in the following sections.
- 1.1.3 Section 3 provides the environmental risk assessment of 'Amenity and Accident' hazards associated with the operation of the HGS. This document provides the relevant risk assessments covering these aspects. The assessment of point source 'Emissions to Air' (Section 4) is supported by the H1 assessment software tool, which can be found in the Appendix A to this Environmental Risk Assessment.
- 1.1.4 This document provides the relevant risk assessments covering the above aspects.

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## 2 RECEPTORS

- 2.1.1 The site is located within the existing Saint-Gobain glass production facility, located to the east of Eggborough, Yorkshire. The proposed development site on which the HGS will be constructed is currently used as the external hydrogen storage area. The national grid reference is SE 57013 23816.
- 2.1.2 A site location plan showing the proposed permit boundary is provided as Drawing 1. The permitted area of the site, is approximately 0.15 ha.
- 2.1.3 The land surrounding the site consists of largely arable farmland. There are some industrial units to the west and east of the Saint-Gobain Glass Factory. Immediately to the east of the site sites the Celotex Factory.
- 2.1.4 There is a disused railway line to the west of the site. This railway line was used for deliveries to the above-mentioned power station. The A19 road is to the west of the site.
- 2.1.5 The closest residential properties are located approximately 300 m to the Southwest of the site, on Tranmore Lane.
- 2.1.6 There are no sensitive ecological receptors within 1 km of the site. The closest sensitive ecological receptor is Forlorn Hope Meadow Site of Special Scientific Interest approximately 7 km to the south west of the site.

### 3 AMENITY AND ACCIDENTS

3.1.1 This section provides an assessment of risks to environmental amenity and from accidents that could arise from operation of the HGS. The assessment has been completed in accordance with the EA’s *Risk Assessments for your environmental permit*<sup>1</sup>.

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

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

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

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

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

Table 3-2: Odour risk assessment and management plan

Table 3-3: Noise and vibration risk assessment and management plan

Table 3-4: Fugitive emissions risk assessment and management plan

Table 3-5: Accidents risk assessment and management plan

3.1.5 The risk assessment methodology has used a scoring mechanism whereby scores are assigned to:

- the likelihood of the hazard occurring; and
- the consequence of the hazard to the environment or human health.

3.1.6 Scores are assigned as very low, low, medium or high.

3.1.7 The risk assessment has been completed by scoring the hazard areas outlined above using a risk matrix as shown in Table 3-1 below.

3.1.8 In completing the assessment, prevention and control measures proposed by the operator are assumed to be in place. Where relevant, details of these measures are identified within the assessment.

**Table 3-1: Risk Matrix**

Consequence	Probability			
	High	Medium	Low	Very Low
High	High	Medium	Low	Low
Medium	Medium	Medium	Low	Very Low
Low	Low	Low	Low	Very Low
Very Low	Low	Very Low	Very Low	Very Low

**Table 3-2: Odour risk assessment and management plan**

<b>Hazard</b>	<b>Receptor</b>	<b>Pathway</b>	<b>Risk Management</b>	<b>Probability of exposure</b>	<b>Consequence</b>	<b>What is the overall risk?</b>
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
Odour emissions from operation of the HGS	Local residents (nearest receptor approx. 300 m from the permit boundary)  Saint-Gobain site adjacent to site boundary.	Air	Natural gas is the only potentially odour source at the facility. It is handled within a fully contained system up to the point of use. Should leaks occur, for safety reasons, the system would be isolated, and repairs made.  In the event of a complaint, the complaints procedure is followed to record and act on the complaint and instigate appropriate action.	Low	Very Low - Minor odour annoyance (at worst)	Very Low

**Table 3-3: Noise and vibration risk assessment and management plan**

<b>Hazard</b>	<b>Receptor</b>	<b>Pathway</b>	<b>Risk Management</b>	<b>Probability of exposure</b>	<b>Consequence</b>	<b>What is the overall risk?</b>
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
Noise from operation of the HGS and associated plant including compressors and chiller unit.	Local residents (nearest receptor approx. 300 m from the permit boundary)  Saint-Gobain site adjacent to site boundary.	Air	Noise levels from operation of the HGS and associated plant have been assessed and the impact at receptors is concluded to be below the levels at which adverse effects are likely to occur. See Appendix D to the supporting information document for full details of the noise assessment.  In the event of a complaint, the complaints procedure is followed to record and act on the complaint and instigate appropriate action.	Low	Low	Low

**Table 3-4: Fugitive emissions risk assessment and management plan**

<b>Hazard</b>	<b>Receptor</b>	<b>Pathway</b>	<b>Risk Management</b>	<b>Probability of exposure</b>	<b>Consequence</b>	<b>What is the overall risk?</b>
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
<b>To Air</b>						
Dust	Local residents (nearest receptor approx. 300 m from the permit boundary)  Saint-Gobain site adjacent to site boundary.	Air	There are no significant dust-generating activities or dusty materials used or stored within the installation.  In the event of a complaint, the operator will follow a complaints procedure to record the complaint and take appropriate action or provide further monitoring as necessary	Very Low - significant dust generation is not anticipated for operation of the installation.	Very Low	Very Low
<b>To Water</b>						
Leak of oil from compressors	Nearest Surface water receptor is approx. 240 m from site	Surface water drainage system	The only oil on site is used within the natural gas compressor and the hydrogen compressor. Only very small volumes of oil are required, 30 litres per year. The hydrogen compressor has its own leak tray  A procedure is in place to ensure that any damaged or leaking containers are dealt with and to allow regular inspections for any signs of deterioration.	Very low.	Very Low	Very Low
Leak of Glycol from HGS	Nearest Surface water receptor is approx. 240 m from site	Surface water drainage system	Glycol is used within the closed circuit cooling system and it is not stored on site. Leak and pressure tests will be regularly performed as part of the maintenance on site.	Very low.	Very Low	Very Low



Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
<b>Litter</b>						
Waste release from containers	Local residents (nearest receptor approx. 300 m from the permit boundary)  Saint-Gobain site adjacent to site boundary.	Windblown to air	Minimal solid waste generation is anticipated on site. In general staff will only be required on site during testing and routine inspections. All staff will be trained in waste management procedures by their supervisors. All wastes produced during maintenance tasks will be immediately removed from the installation following completion of the relevant maintenance task.	Very Low - significant waste on site is not anticipated	Very Low	Very Low
<b>Pests</b>						
Flies and other pests or vermin	Local residents (nearest receptor approx. 300 m from the permit boundary) Saint-Gobain site adjacent to site boundary.	Land/Air	Not relevant to the operation.	N/A	N/A	N/A
<b>Visible Plumes</b>						
Visible Plume	Local residents (nearest receptor approx. 300 m from the permit boundary) Saint-Gobain site adjacent to site boundary.	Air	Exhaust gases are released at high temperature (200-250 °C) minimising the risk of visible plumes.	Low	Low	Low

**Table 3-5: Accidents risk assessment and management plan**

<b>Hazard</b>	<b>Receptor</b>	<b>Pathway</b>	<b>Risk Management</b>	<b>Probability of exposure</b>	<b>Consequence</b>	<b>What is the overall risk?</b>
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
Operator error	Air	Air	<p>During maintenance work there is the potential for services valve to be accidentally opened or left open within drainage and the HGS which would cause a release of flammable gases and possible risk of explosion.</p> <p>All maintenance staff are fully trained in the site operations and provided work instructions for services. All service valves are capped and padlocked.</p> <p>There is also risk of collision of vehicles such as forklifts into the HGS, collision barriers will be installed and only trained staff will be authorised to drive on site.</p>	Very Low	High	Low
Loss of power	Air	Air	<p>In the event of a power loss the HGS would not be able to be operated and hydrogen for the Saint-Gobain site would be brought into the site via tanker.</p> <p>Hydrogen venting may occur in the case of a sudden shutdown.</p>	Very Low	Very Low	Very Low
Leakage during use of natural gas	Local residents (nearest receptor approx. 300 m from the permit boundary), Saint-Gobain site adjacent to site boundary.	Air	<p>Natural gas is handled within a fully contained system up to the point of use. Should leaks occur the system would be immediately isolated and repairs made.</p> <p>Incidents will be recorded and investigated appropriately according to the site incident procedure.</p> <p>Significant incidents will be reported to the EA in accordance with the requirements of the permit.</p>	Very Low – regular inspection and maintenance is undertaken	Low – environmental risks from a leak would be odour (see <b>Error! Reference source not found.</b> above) or global warming effects from methane.	Very Low
Fire causing emissions to air	Air	Direct release of combustion gases to air	Hydrogen and natural gas are highly flammable and will be stored in fully contained systems which will be regularly checked and maintained. Should any leaks occur, the system will be isolated and repairs made.	Low	<p>Low / Medium</p> <p>Uncontrolled release of combustion gases to air – impacts likely to be short term</p>	Low

Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk? If it occurs, who is responsible for what?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains? The balance of probability and consequence.
Failure to contain firewater	Surface water, 240 m	Surface water drainage system	Fire response systems should ensure a rapid response thereby addressing the fire at the earliest point. Firefighting using water/foam would not be used to tackle a fire in the HGS or hydrogen storage banks. Should a fire occur then the fuel supply to the HGS would be stopped and fire would be allowed to burn out. A mist system would be applied to the hydrogen storage bank for cooling. However this would be lost as vapour and would not generated fire waters needing containment.	N/A	N/A	N/A
Vandalism	Air	Various	A 2.4 m palisade fence will surround the site and the site gate is always locked. The hydrogen production plant controls are in a locked room and monitored remotely. The site is also within the Saint-Gobain site where access is controlled to prevent unauthorised access.	Very low due to security measures in place.	Low.	Very Low, given the very low probability of any unauthorised access to the site
Flooding	Structures on site and neighbouring Saint-Gobain site.	Surface water drainage system	There is a low risk of flooding from fluvial, tidal, sewer, groundwater and artificial sources. A new surface water drainage system will be connected to the existing system serving the adjacent Saint-Gobain site. As this area was already previously covered under the Saint-Gobain drainage system this will not increase the current run-off volume of water to the Saint-Gobain system and therefore will not increase the flood risk. The surface water discharges to an attenuation pond in the Saint-Gobain site.	Low	Low	Low

## 4 EMISSIONS TO AIR

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

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

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

4.1.3 Air emissions screening using the H1 software has the assessment is provided in Appendix A.

### 4.2 Emissions release point

4.2.1 There are a total of three continuous point source emissions to air, one from each of the three HyGen 50 units. The primary air pollutants of concern with the potential to impact on human health and/or the environment from these emission points are NO<sub>x</sub> and CO.

4.2.2 There are further vents from the process which are not in use under normal operation and there are vents on the hydrogen storage banks that will only be used in an emergency. Emissions from these vents would be both infrequent and of short duration. Further discussion on the emissions from each of these vents is provided in section 4.3 of the Supporting Document and concludes that the impacts from any of these vents would be insignificant. On this basis emissions from these vents have not been considered within this assessment.

4.2.3 Data informing the assessment has been provided by HyGear and is summarised in Table 4-1 below.

**Table 4-1: Summary of Emissions Assessed**

Substance	Units	Value
Stack height	m	3.42
Internal diameter	M	72.1 mm
Temperature	°C	200 - 250 °C
Actual volumetric flow	Am <sup>3</sup> .s <sup>-1</sup>	0.073
Actual moisture	%	8%
Actual O <sub>2</sub> (wet)	%	6 - 18%
Normalised volumetric flow	Nm <sup>3</sup> .s <sup>-1</sup>	0.031
NO <sub>x</sub> concentration (dry) <sup>1</sup>	mg.Nm <sup>-3</sup>	< 36 mg/Nm <sup>3</sup>
CO concentration (dry) <sup>1</sup>	mg.Nm <sup>-3</sup>	< 1 mg/Nm <sup>3</sup>

1. Normalised concentrations at 0°C, dry, 1013mbara, 3 vol.% O<sub>2</sub>

4.2.4 A range for temperature and oxygen content of the flue gases is provided. Data used in H1 has been based on 6% oxygen and an exit temperature of 200 °C as these gave the greatest flow rate and consequently the highest mass emission.

4.2.5 In considering NO<sub>x</sub> emissions a conversion factor of 70% NO to NO<sub>2</sub> has been applied on the basis that 100% conversion is considered an unrealistic assumption, particularly in the near field.

## 4.3 Emissions screening

- 4.3.1 Estimated emissions have been screened for significance against the default long-term and short-term environmental standards included within the H1 tool.
- 4.3.2 Emissions which are lower than 1% of the relevant emissions standard for long-term exposure and lower than 10% of the relevant limit for short-term exposure are screened out as insignificant. Figure 4-1 below shows the emissions screening. Nitrogen dioxide and carbon monoxide both screen out as insignificant.

Air Impact Screening Stage One									
Screen out Insignificant Emissions to Air									
This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.									
Number	Substance	Long Term	Short Term	Long Term			Short Term		
		EAL	EAL	PC	% PC of EAL	> 1% of EAL?	PC	% PC of EAL	> 10% of EAL?
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	%		µg/m <sup>3</sup>	%	
1	Nitrogen Dioxide	40.0	200	0.351	0.876	No	4.63	2.31	No
2	Carbon monoxide	-	10,000	0.0139	-		0.365	0.00365	No

Figure 4-1: Air Impact Screening Stage One

## 4.4 Photochemical Ozone Creation Potential

- 4.4.1 The photochemical ozone creation potential (POCP) has been calculated in accordance with the H1 guidance<sup>1</sup>. NO<sub>2</sub> emissions from the installation contribute to photochemical ozone creation. The POCP was calculated as 0.31.

<sup>1</sup> Environment Agency, H1 Annex F: air emissions [withdrawn] <https://www.gov.uk/government/publications/h1-annex-f-air-emissions>

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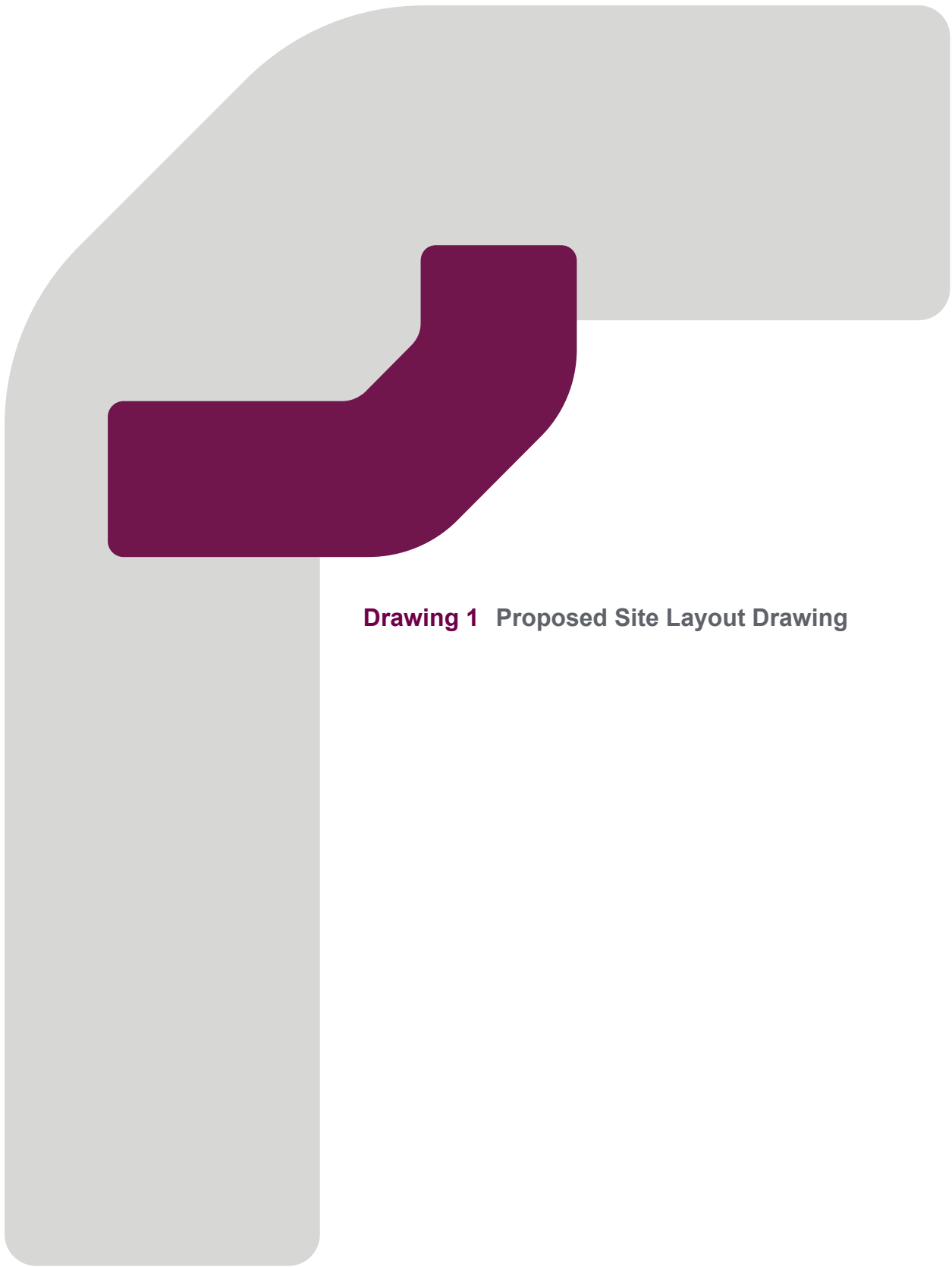
## 5 CONCLUSIONS

- 5.1.1 The environmental risk assessment report has been undertaken to assess the likelihood of risk from amenity and accidents associated with the operation of the HGS.
- 5.1.2 The results of the ERA have shown that the risk of fugitive emissions, and accidents range from 'very low' to 'low'.
- 5.1.3 The H1 risk assessment software tool has been used to support this Environmental Risk Assessment. The completed H1 software can be found within Appendix A to this Environmental Risk Assessment.
- 5.1.4 Stack emissions to air for relevant air pollutants have been subject to detailed modelling and it has been concluded that the proposed development will not result in significant adverse impact to human or ecological receptors.

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## REFERENCES

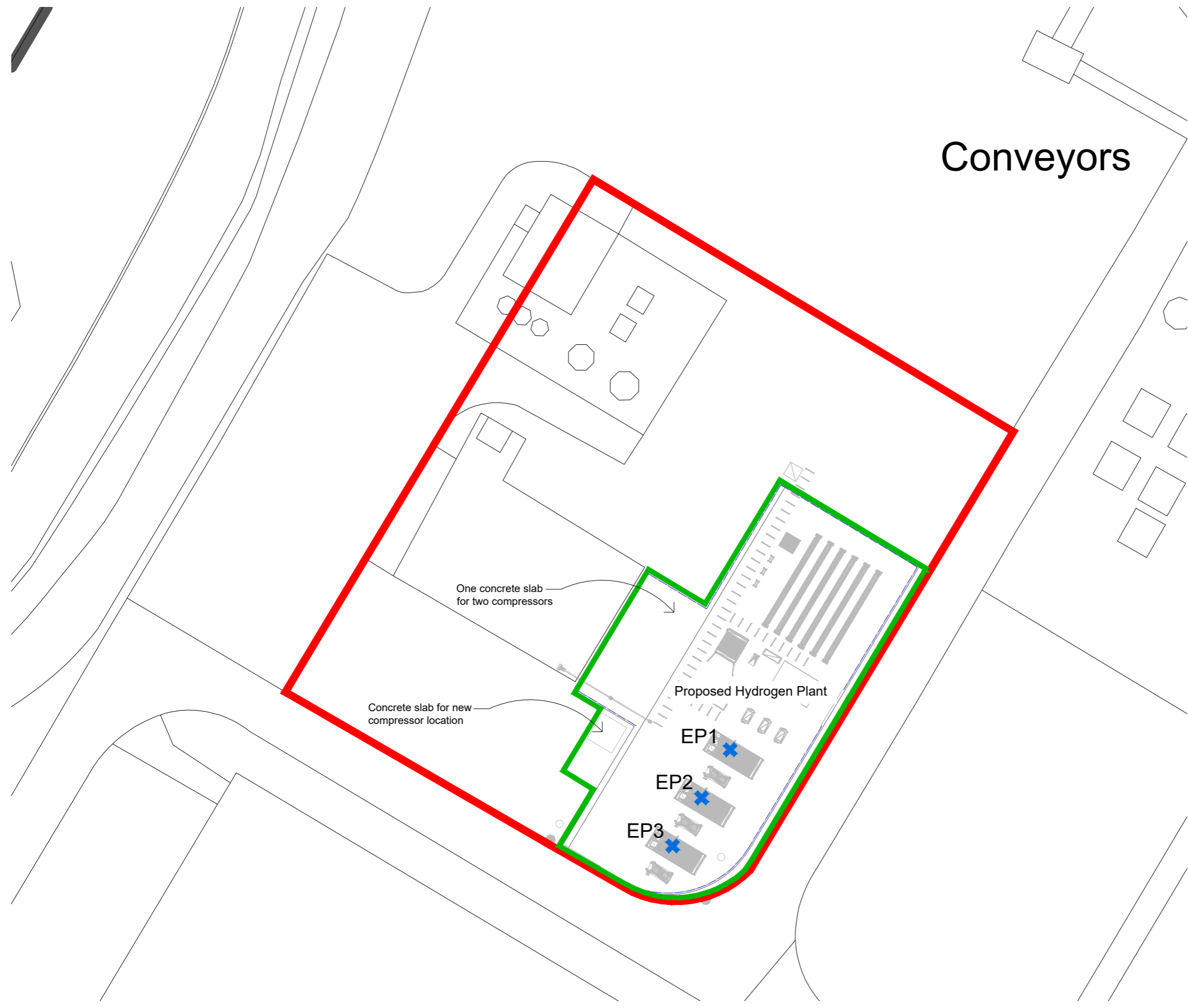
<sup>1</sup> Environment Agency (2021), Risk assessments for your environmental permit. Available at: <https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>



**Drawing 1** Proposed Site Layout Drawing



# Conveyors



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- Legend**
- ✕ Emission Point to Air
  - Permit Boundary



Rev	Description	By	CB	Date



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Client -  
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 Title Proposed Site Layout Plan

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**Appendix A**  
**H1 ASSESSMENT**

# ENVIRONMENTAL RISK ASSESSMENT

## HyGear EPR/NP3606MX/A001

2022-02-03

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