# Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Vale Europe Limited

Clydach Nickel Refinery
Clydach
Swansea
SA6 5QR

Permit number

EPR/BL4567IZ

# Clydach Nickel Refinery
# Permit number EPR/BL4567IZ

## Introductory note

### This introductory note does not form a part of the permit

The main features of the permit are as follows.

Vale Europe Ltd operates a nickel refinery producing approximately 40,000 tonnes per annum of nickel pellets, powders and coated products using the 'nickel carbonyl' process. The nickel refinery plant operates continuously and has the following elements:

Process gas plant – The carbon monoxide (CO) and hydrogen ($H_2$) needed for nickel refining are produced by the steam reforming of natural gas. The natural gas is de-sulphurised, mixed with steam and then decomposed over a catalyst at 800$^{o}$C to give hydrogen, carbon monoxide, carbon dioxide ($CO_2$) and methane ($CH_4$). The yield can be up to 2800m$^3$/hr hydrogen and 400m$^3$/hr carbon monoxide. There is a small storage capacity for purified hydrogen and carbon monoxide but most goes directly to the process. Carbon dioxide is also recovered for use as an inert purge gas.

Kiln Plant – Impure nickel oxide imported from Canada as fine granules is stored in silos prior to transfer to the kiln plant which has two lines of rotary kilns. The oxide is reduced by counter current flow of hydrogen at temperatures between 300$^{o}$C and 500$^{o}$C producing impure nickel. This passes by gravity to an activation kiln where a sulphur containing gas and hydrogen are passed over the impure nickel. The activated material is passed to volatilisation kilns, where it is reacted with carbon monoxide. In the volatiliser the nickel is converted to gaseous nickel carbonyl $Ni(CO)_4$ this gas is passed through a cyclone and filtered before entering a ring main. Unreacted metallic process intermediates are transferred to a stabilisation kiln where partial oxidation makes the residues non-pyrophoric, before their return to Canada for reprocessing. The off gas from the reduction kiln is passed through cyclones and scrubbers. The remaining hydrogen is heated and returned to the reduction process. Gas from the activation kiln is cycloned and scrubbed before being returned to the reduction plant. Gas from the stabilisation kiln is cleaned by ceramic filters and then passed to the gaseous effluent plant. The carbon monoxide and nickel carbonyl gas are circulated around a ring main feeding the pellet and powder plant area:

Pellet and powder plant – This plant consists of 19 pellet units, 8 powder decomposers and a fluid bed decomposer. In the pellet units nickel carbonyl gas decomposes onto pre-heated pellets increasing their size. Pellets of the required size are removed, screened and packed. The powder decomposers operate at higher temperatures, the nickel carbonyl decomposes in the vessel head space and powder falls under gravity into a consolidator before being removed, sieved, blended and packed. The fluid bed decomposer is used to produce speciality coated powders such as nickel-coated graphite.

Aqueous effluent plant – This plant is designed to treat all process effluent streams including surface and storm water. The treatment involves dosing with caustic soda, thickening and sand filtration, with the treated water being discharged to the River Tawe and the thickener sludge being dewatered followed by thermal drying. The sand filter backwash is returned to the raw effluent sump from where it is fed forward into the plant.

Gaseous effluent plant – Gas from the volatilisation kilns and the pellet and powder plants is incinerated to destroy residual nickel carbonyl. The waste gases then pass through a bag filtration plant, which remove solids before exhausting to the main stack.

The status log of the permit sets out the permitting history, including any changes to the permit reference number.

| **Status log of the permit** | | |
|---|---|---|
| **Description** | **Date** | **Comments** |
| Application received | 20/12/01 | Application duly made 20/12/01 |
| Operator requests Commercial Confidentiality for diagrams of the foam & fibre coating process | 28/12/01 | Request agreed to. Notice of Determination sent to Operator 31/12/01 |

| | | |
|---|---|---|
| 1st Schedule 4 Notice Issued | 24/1/02 | 1st Schedule 4 Notice Response received 23/4/02 |
| 2nd Schedule 4 Notice Issued | 7/06/02 | 2nd Schedule 4 Notice Response received 18/7/02 |
| Request from Agency (1) to extend determination date to 29/11/02. | 18/7/02 | Operator agrees to the extension to determination period. 23/07/02 |
| Request from Agency (2) to extend determination date to 28/03/03. | 19/11/02 | Operator agrees to the extension to determination period. 27/11/02 |
| 3rd Schedule 4 Notice Issued | 17/3/03 | 3rd Schedule 4 Notice Response received 25/7/03 |
| Operator informs the Agency of change of company registered office. | 22/9/03 | Information added to application. |
| Request from Operator (1) to extend determination date to 22/09/03. | 27/7/03 | Agency agrees to extension to determination period. 27/7/03 |
| Request from Operator (2) to extend determination date to 22/10/03. | 15/9/03 | Agency agrees to extension to determination period. 15/9/03 |
| Additional information received on flood defence pumps | 19/9/03 | Information added to application. |
| Request from Agency (3) to extend determination date to 31/10/03. | 14/10/03 | Operator agrees to the extension to determination period. 15/10/03 |
| Request from Operator (3) to extend determination date to 14/11/03 | 15/10/03 | Agency agrees to extension to determination period. 15/10/03 |
| Permit Issued | 14/11/03 | ---- |

| Status log of the permit | | |
|---|---|---|
| **Description** | **Date** | **Comments** |
| Application EPR/BL4567IZ/V002 | Application received 27/01/2005 | Application returned. Dealt with instead as a Regulation 16 notification of change. |
| Application EPR/BL4567IZ/V003 | 08/12/2008 | Application duly made 29/01/2009 |
| Variation Issued | 30/01/2009 | |
| Application EPR/BL4567IZ/V004 | Application received 30/07/2010 | Application duly made 30/07/2010 |
| Additional Information Received | | 19/08/2010 |
| Variation issued | 28/09/2010 | |
| Application EPR/BL4567IZ/V005 | Application received 02/04/12 | Application duly made 23/05/12 |
| Additional information received | 19/06/12 | Document entitled 'Clarification: "Atmospheric Dispersion Modelling Study of Releases from Proposed Advanced Energy Project", P1028/R015 Rev 1, page 19' received. |
| Additional information received | 28/06/12 | Appendix H to the application document 'Supporting document in respect of application to vary environmental permit reference BL4567IZ under the Pollution Prevention and Control (England and Wales) Regulations 2010' [sic], reference P1028/R007-Rev 1. |
| Request for further information issued | 06/07/12 | Further information requested relating to the operation of the RTO and potential impacts associated with abnormal operation. |
| Additional information received | 26/07/12 | Information relating to existing soil acidity in the locality and background metals concentrations at a range of monitoring stations. |
| Additional information received | 27/07/12 | Document entitled 'Assessment of the impact of releases from the Vale AEP on the North and South bank of the River Tawe', document reference P1028/R020, issue date 26/07/12. |
| Response to request for further information dated 06/07/12 received | 09/08/12 | |
| Additional information received | 10/08/12 | Revised version of document entitled 'Atmospheric dispersion |

| Status log of the permit | | |
|---|---|---|
| **Description** | **Date** | **Comments** |
| | | modelling study of releases from proposed advanced energy project', reference P1028/R015 Rev 2, dated July 2012. This replaces the original version of this document that was included as Appendix 14 of the document 'Supporting document in respect of application to vary environmental permit reference BL4567IZ under the Pollution Prevention and Control (England and Wales) Regulations 2010' [sic], reference P1028/R007-Rev 1 when the application was received. |
| Variation and consolidation issued<br>EPR/BL4567IZ/V005 | 14/12/12 | Notice of variation and consolidation issued (incorporating a new, consolidated permit). |
| Regulation 60(1) Notice of request for information | 27/07/16 | |
| Regulation 60(1) response received | 30/11/16 | Implementation of BAT conclusions under IED |
| Variation application received | 21/12/16 | Application to vary the process for removing and drying solids from the waste water |
| Variation application received. | 23/06/17 | Variation application to remove Pyrolysis plant received. |
| Natural Resources Wales Non-Ferrous Metals Sector Review 2016 Permit EPR/BL4567IZ<br>Variation issued<br>EPR/BL4567/V006 | 16/10/17 | Varied and consolidated permit issued in modern IED condition format. |

End of introductory note

# Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number
**EPR/BL4567IZ**

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/BL4567IZ/V006 authorising,

**Vale Europe Limited** ("the operator")

whose registered office is

**Suite 1, 3rd Floor**
**11-12 St James's Square**
**London**
**SW1Y 4LB**

company registration number **00137114**

to operate a regulated facility at

**Clydach Nickel Refinery**
**Clydach**
**Swansea**
**SA6 5QR**

to the extent authorised by and subject to the conditions of this permit.

| Signed | Date |
|---|---|
| Stephen Attwood | **16/10/2017** |

Authorised on behalf of Natural Resources Wales

# Conditions

# 1 Management

## 1.1 General management

1.1.1 The operator shall manage and operate the activities:

(a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformance, closure and those drawn to the attention of the operator as a result of complaints; and

(b) using sufficient competent persons and resources.

1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.

1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

## 1.2 Energy efficiency

1.2.1 The operator shall:

(a) take appropriate measures to ensure that energy is used efficiently in the activities;

(b) review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and

(c) take any further appropriate measures identified by a review.

## 1.3 Efficient use of raw materials

1.3.1 The operator shall:

(a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;

(b) maintain records of raw materials and water used in the activities;

(c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and

(d) take any further appropriate measures identified by a review.

## 1.4 Avoidance, recovery and disposal of wastes produced by the activities

1.4.1 The operator shall take appropriate measures to ensure that:

(a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities;

(b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

(c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.

1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

# 2 Operations

## 2.1 Permitted activities

2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

## 2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit.

## 2.3 Operating techniques

2.3.1 (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by Natural Resources Wales.

(c) If notified by Natural Resources Wales that the activities are giving rise to pollution, the operator shall submit to Natural Resources Wales for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan , and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

2.3.2 The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:

(a) the nature of the process producing the waste;

(b) the composition of the waste;

(c) the handling requirements of the waste;

(d) the hazardous property associated with the waste, if applicable; and

(e) the waste code of the waste.

2.3.3 The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.

## 2.4 Improvement programme

2.4.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by Natural Resources Wales.

2.4.2 Except in the case of an improvement which consists only of a submission to Natural Resources Wales, the operator shall notify Natural Resources Wales within 14 days of completion of each improvement.

# 3 Emissions and monitoring

## 3.1 Emissions to water, air or land

3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1(a), S3.2(a) and S3.4.

3.1.2 The limits given in schedule 3 shall not be exceeded.

3.1.3 Total annual emissions from the emission points set out in schedule 3 shall not exceed the relevant limit in table S3.3.

3.1.4 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination

## 3.2 Emissions of substances not controlled by emission limits

3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.

3.2.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution, submit to Natural Resources Wales for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;

(b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

## 3.3 Odour

3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales,

unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.3.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to odour, submit to Natural Resources Wales for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour; and

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

## 3.4 Noise and vibration

3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.4.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to noise and vibration, submit to Natural Resources Wales for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

## 3.5 Monitoring

3.5.1 The operator shall, unless otherwise agreed in writing by Natural Resources Wales, undertake the monitoring specified in the following tables in schedule 3 to this permit:

(a) point source emissions specified in tables S3.1(b) and S3.2(b);

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1(a), S3.1(b), S3.1(c), S3.1(d), S3.2(a) and S3.2(b) unless otherwise agreed in writing by Natural Resources Wales.

3.5.4 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by Natural Resources Wales. For activity A3 referenced in schedule 1, table S1.1, newly installed CEMs, or CEMs replacing existing CEMs, shall have MCERTS certification and have an MCERTS certified range which is not greater than 1.5 times the daily emission limit value (ELV) specified in schedule 3 table S3.1(c). The CEM shall also be able to measure instantaneous values over the ranges which are to be expected during all operating conditions. If it is necessary to use more than one

range setting of the CEM to achieve this requirement, the CEM shall be verified for monitoring supplementary, higher ranges.

3.5.5 The Operator shall monitor daily the water temperature of the canal abstraction at NGR SN 6955 0145.

# 4 Information

## 4.1 Records

4.1.1 All records required to be made by this permit shall:

(a) be legible;

(b) be made as soon as reasonably practicable;

(c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and

(d) be retained, unless otherwise agreed in writing by Natural Resources Wales, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:

(i) off-site environmental effects; and

(ii) matters which affect the condition of the land and groundwater.

4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by Natural Resources Wales.

## 4.2 Reporting

4.2.1 The operator shall send all reports and notifications required by the permit to Natural Resources Wales using the contact details supplied in writing by Natural Resources Wales.

4.2.2 A report or reports on the performance of the activities over the previous year shall be submitted to Natural Resources Wales by 31 January (or other date agreed in writing by Natural Resources Wales) each year. The report(s) shall include as a minimum:

(a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;

4.2.3 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by Natural Resources Wales, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:

(a) in respect of the parameters and emission points specified in schedule 4 table S4.1;

(b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.2 ; and

(c) giving the information from such results and assessments as may be required by the forms specified in those tables.

4.2.4 The operator shall, unless notice under this condition has been served within the preceding four years, submit to Natural Resources Wales, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.

## 4.3 Notifications

4.3.1 (a) In the event that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—

(i) inform Natural Resources Wales,

(ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and

(iii) take the measures necessary to prevent further possible incidents or accidents;

(b) in the event of a breach of any permit condition the operator must immediately—

(i) inform Natural Resources Wales, and

(ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;

(c) in the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.

4.3.2 Any information provided under condition 4.3.1 (a)(i), or 4.3.1 (b)(i) where the information relates to the breach of a limit specified in the permit, shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where Natural Resources Wales has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform Natural Resources Wales when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to Natural Resources Wales at least 14 days before the date the monitoring is to be undertaken.

4.3.4 Natural Resources Wales shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

(a) any change in the operator's trading name, registered name or registered office address; and

(b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

(a) any change in the operator's name or address; and

(b) any steps taken with a view to the dissolution of the operator.

In any other case:

(a) the death of any of the named operators (where the operator consists of more than one named individual);

(b) any change in the operator's name(s) or address(es); and

(c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

(a) Natural Resources Wales shall be notified at least 14 days before making the change; and

(b) the notification shall contain a description of the proposed change in operation.

4.3.6 Natural Resources Wales shall be given at least 14 days notice before implementation of any part of the site closure plan.

4.3.7 Where the operator has entered into a climate change agreement with the Government, Natural Resources Wales shall be notified within one month of:

(a) a decision by the Secretary of State not to re-certify the agreement;

(b) a decision by either the operator or the Secretary of State to terminate the agreement; and

(c) any subsequent decision by the Secretary of State to re-certify such an agreement.

## 4.4 Interpretation

4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.

4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "without delay", in which case it may be provided by telephone.

# Schedule 1 - Operations

| Table S1.1 activities | | | |
|---|---|---|---|
| **Activity reference** | **Activity listed in Schedule 1 of the EP Regulations** | **Description of specified activity** | **Limits of specified activity** |
| A1 | S2.2 A(1)(a) | Producing nickel pellets and powder by the nickel carbonyl process. | Receipt of raw materials to nickel powder and pellets being transported off-site. |
| A2 | S4.2 A(1)(a)(v) | Producing nickel carbonyl gas for directly associated processes | Receipt of raw materials to material being transferred to nickel coating process. |
| A5 | S4.2 A(1)(a)(i) | Producing of gasses including hydrogen and oxides of carbon | Gases for use within boundaries of site |
| **Directly Associated Activity** | | | |
| A6 | Gaseous effluent plant | Burning and filtering waste gases | Gaseous waste as generated within boundaries of site |
| A7 | Water discharges to foul sewers | Discharge of ammonia from the installation. | From interceptors to point of entry to sewer |
| A8 | Main effluent plant | Discharge of process water and | |
| A9 | site drainage from the installation. | From interceptors to point of entry to controlled waters | |

| Table S1.2 Operating techniques | | |
|---|---|---|
| **Description** | **Parts** | **Date Received** |
| Permit application | The following parts of the application:<br>• The response to question 2.1 given in section 2.1<br>• The response given to question 2.2 given in section 2.2<br>• The response to question 2.3 given in section 2.3<br>• The responses to question 2.4 given in sections 1.3, 2.4 and 2.10<br>• The response to question 2.5 given in section 2.5<br>• The response to question 2.6 given in section 2.6 • The response to question 2.7 given in section 2.7 • The response to question 2.8 given in section 2.8<br>• The response to question 2.9 given in section 2.9<br>• The response to question 2.10 given in section 2.10<br>The response to question 2.11 given in section 2.11 | 20/12/01 |
| Response to 1st Schedule 4 Part 1 Notice | Response to question 1 | 23/04/02 |
| Response to 2nd Schedule 4 Part 1 Notice | Responses to questions 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 | 18/07/02 |
| EPR/BL4567IZ/V004 Response to further queries | Plan referenced: 301-146-X-01 Refinery Works Plan | 19/08/10 |
| Responses to improvement conditions | The proposals approved in writing by the Environment Agency under improvement condition IC8(c). | As set out in table S1.3 of schedule 1. |
| Variation application | Introduction and process description document received with variation application | 21/12/16 |

| Table S1.3 Improvement programme requirements | | |
|---|---|---|
| **Reference** | **Requirement** | **Date** |
| IC1 | Removed | N/A |
| IC2 | Removed | N/A |
| IC3 | Removed | N/A |
| IC4 | Removed | N/A |
| IC5 | Removed | N/A |
| IC6 | Removed | N/A |
| IC7 | Removed | N/A |

| Table S1.3 Improvement programme requirements | | |
|---|---|---|
| **Reference** | **Requirement** | **Date** |
| IC8 | The Operator shall:<br><br>(a) Review all point-source emissions to air at the installation with a view to reducing their total number;<br>(b) Submit to the Environment Agency at the Reporting Address for approval written proposals for the reduction in number of point-source emissions to air, incorporating any existing such programmes at the installation. The proposals shall include a proposed timetable for their implementation; and<br>(c) Implement the proposals in accordance with the written approval of Natural Resources Wales. | Completed<br><br>Completed<br><br>In respect of item (b), in accordance with the written approval of Natural Resources Wales. |
| IC9 | The Operator shall:<br><br>(a) Review and quantify (where possible) annually all point-source and fugitive emissions for nickel to air.<br>(b) Detail improvements made on the installation to minimise nickel releases from point sources and fugitive releases.<br>(c) Submit to Natural Resources Wales at the Reporting Address for approval.<br><br>Submission Annually each August. | Annually until 31 August 2022 |

# Schedule 2 - Waste types, raw materials and fuels

| Table S2.1 Raw materials and fuels | |
|---|---|
| **Raw materials and fuel description** | **Specification** |
| - | - |

# Schedule 3 – Emissions and monitoring

**Table S3.1(a) Point-source emissions to air – nickel refinery plant**

| **Emission point ref. & location** [as shown in Schedule 7] | **Height (m)** | **Source** | **Location of emission point** |
|---|---|---|---|
| A1 | 36 | Kiln Plant 'Born' Heater | Point 1 on site plan |
| A2 | 36 | Kiln Plant 'Born' Heater | Point 2 on site plan |
| A3 | 23 | Pellet Decomposer 1 | Point 3 on site plan |
| A4 | 23 | Pellet Decomposer 3 | Point 4 on site plan |
| A5 | 23 | Pellet Decomposer 5 | Point 5 on site plan |
| A6 | 23 | Pellet Decomposer 7 | Point 6 on site plan |
| A7 | 23 | Pellet Decomposer 9 | Point 7 on site plan |
| A8 | 23 | Pellet Decomposer 11 | Point 8 on site plan |
| A9 | 23 | Pellet Decomposer 13 | Point 9 on site plan |
| A10 | 23 | Pellet Decomposer 15 | Point 10 on site plan |
| A11 | 23 | Pellet Decomposer 17 | Point 11 on site plan |
| A12 | 23 | Pellet Decomposer 21 | Point 12 on site plan |
| A13 | 23 | Pellet Decomposer 2 | Point 13 on site plan |
| A14 | 23 | Pellet Decomposer 4 | Point 14 on site plan |
| A15 | 23 | Pellet Decomposer 6 | Point 15 on site plan |
| A16 | 23 | Pellet Decomposer 8 | Point 16 on site plan |
| A17 | 23 | Pellet Decomposer 10 | Point 17 on site plan |

| | | | |
|---|---|---|---|
| A18 | 23 | Pellet Decomposer 12 | Point 18 on site plan |
| A19 | 23 | Pellet Decomposer 14 | Point 19 on site plan |
| A20 | 23 | Pellet Decomposer 16 | Point 20 on site plan |
| A21 | 23 | Pellet Decomposer 18 | Point 21 on site plan |
| A25 | 25 | Hydrogen Plant Vaporiser | Point 25 on site plan |
| A26 | 25 | Hydrogen Plant Vaporiser | Point 26 on site plan |
| A27 | 40 | Hydrogen Plant Reformer Furnace and Flue Gas Heaters | Point 27 on site plan |
| A28 | 40 | Hydrogen Plant Reformer Furnace and Flue Gas Heaters | Point 28 on site plan |
| A30 | 20 | Hydrogen Plant Ruston Boiler | Point 30 on site plan |
| A31 | 20 | Hydrogen Plant Ruston Boiler | Point 31 on site plan |
| A34 | 2 | Filtered extract from FMW container cleaner | Point 34 on site plan |
| A36 | 2 | Filtered extract from Pellet and Powder Plant vacuum cleaning system | Point 36 on site plan |
| A37 | 2 | Filtered extract from Pellet and Powder Plant vacuum cleaning system | Point 37 on site plan |
| A39a | 2 | Filtered extract from Kiln Plant central vacuum cleaning system | Point 39a on site plan |
| A40 | 7 | Filtered extract from FMW off-loading area – lower belt extraction | Point 40 on site plan |
| A41 | 7 | Filtered extract from FMW off-loading area – container common extraction | Point 41 on site plan |
| A42 | 12 | Filtered extract from FMW off-loading area – tower belt extraction | Point 42 on site plan |
| A43 | 24 | Filtered extract from FMW off-loading area – transfer lower oxide silo and recovery conveyor system | Point 43 on site plan |
| A44 | 24 | Filtered extract from FMW off-loading area – oxide silo extraction | Point 44 on site plan |
| A45 | 24 | Filtered extract from FMW off-loading area – transfer lower oxide silo and recovery conveyor system | Point 45 on site plan |
| A46 | 3 | Filtered extract from FMW off-loading area – recovery conveyor system | Point 46 on site plan |
| A47 | 3 | Filtered extract from FMW off-loading area – recovery conveyor system | Point 47 on site plan |
| A48 | 10 | Filtered extract from Kiln Plant concentrate bagging vent | Point 48 on site plan |
| A54a | 100 | Main stack – electrostatic precipitators, sulphur dioxide plant, kiln line 1 head seal extract, kiln line 2 head seal extract | Point 54a on site plan |

| | | | |
|---|---|---|---|
| A54b | 100 | Main stack – electrostatic precipitators, sulphur dioxide plant, kiln line 1 head seal extract, kiln line 2 head seal extract | Point 54b on site plan |
| A55 | 30 | Hydrogen lute pot relief vent | Point 55 on site plan |
| A56 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 56 on site plan |
| A57 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 57 on site plan |
| A58 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 58 on site plan |
| A59 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 59 on site plan |
| A60 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 60 on site plan |
| A61 | 25 | Kiln head seal area extract, Reduction Kilns and Volatiser Kiln line 2 roof vent | Point 61 on site plan |
| A62 | 17 | Powder Plant Air Mixers | Point 62 on site plan |
| A78 | 23.5 | T123 Powder Plant dust extraction | Point 78 on site plan |
| A79 | 12 | Nitrogen purge vent | Point 79 on site plan |
| A80 | 12 | Nitrogen purge vent | Point 80 on site plan |
| A81 | 17 | 400 Unit mid-stream vent | Point 81 on site plan |
| A82 | 17 | 500 Unit mid-stream vent | Point 82 on site plan |

| Table S3.2(a) Point-source emissions to water (other than sewer) and land | | |
|---|---|---|
| **Emission point ref. & location** | **Source** | **Receiving water** |
| W1 [as shown in Schedule 7] | Main Effluent Treatment Plant Outfall | River Tawe |
| W2 [as shown in Schedule 7] | Uncontaminated storm water overflow | River Tawe |
| W3 [as shown in Schedule 7] | Overflow from river water tanks | River Tawe |
| W4 [as shown in Schedule 7] | Discharge from river water tanks | River Tawe |
| W5 [as shown in Schedule 7] | River water rotary screen backwash | River Tawe |
| W6 [as shown in Schedule 7] | Backwash from river water cartridge filters | River Tawe |
| W7 [as shown in Schedule 7] | 30” emergency untreated trade discharge | River Tawe |
| W8 [as shown in Schedule 7] | Warehouse drain and weighbridge toilet and old research laboratory | River Tawe |
| W9 [as shown in Schedule 7] | Canal Water Overflow | Swansea Canal |
| W10 [as shown in Schedule 7] | Flood defence pump system | River Tawe |

# Schedule 3a – Emissions and monitoring until 29 June 2020

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| A1 and A2 | See table S3.1(a) | Sulphur dioxide | 80 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 mg/m$^3$ | | | BS EN 15058 |
| A3 to A21 | See table S3.1(a) | Sulphur dioxide | 80 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 mg/m$^3$ | | | BS EN 15058 |
| A25 and A26 | See table S3.1(a) | Sulphur dioxide | 80 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 mg/m$^3$ | | | BS EN 15058 |
| A27 and A28 | See table S3.1(a) | Sulphur dioxide | 80 mg/m$^3$ | | | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Carbon monoxide (as CO) | 15 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS EN 15058 |
| A30 and A31 | See table S3.1(a) | Sulphur dioxide | 80 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 mg/m$^3$ | | | BS EN 15058 |
| A34 to A47 | See table S3.1(a) | Particulate matter | 5 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |
| A48 | See table S3.1(a) | Particulate matter | 5 mg/m$^3$ | | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14181 |
| | | Nickel compounds (as Ni) | 3 mg/m$^3$ | | | BS EN 14385 |
| | | Gas flow rate m$^3$/hour | None set | | | |
| A54a | See table S3.1(a) | Sulphur dioxide | 150 mg/m$^3$ | | | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Carbon monoxide (as CO) | 450 mg/m$^3$ | | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 15058 |
| | | Particulate matter | 10 mg/m$^3$ | Daily average | Continuous | BS EN 14181 |
| | | Particulate matter | 5 mg/m$^3$ | Monthly average | Continuous | BS EN 14181 |
| | | Nickel compounds (as Ni) | 1 mg/m$^3$ | | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14385 |
| A54b | See table S3.1(a) | Sulphur dioxide | 150 mg/m$^3$ | | 6-monthly (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 450 mg/m$^3$ | | | BS EN 15058 |
| | | Particulate matter | 10 mg/m$^3$ | Daily average | Continuous | BS EN 14181 |
| | | Particulate matter | 5 mg/m$^3$ | Monthly average | Continuous | BS EN 14181 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Nickel compounds (as Ni) | 1 mg/m$^3$ | | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14385 |
| A62 | See table S3.1(a) | Particulate matter | 5 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |
| A78 | See table S3.1(a) | Particulate matter | 5 mg/m$^3$ | | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |

| Table S3.2(b) Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (incl. Unit)** | **Reference period** | **Monitoring frequency** | **Monitoring standard or method** |
| W1 as shown on emissions plan in Schedule 7 | See table S3.2(a) | Flow rate | 15000 $m^3$/day | | Daily | |
| | | Flow rate | 625 $m^3$/hour | | Daily | |
| | | pH maximum | 9 | | Continuous | |
| | | pH minimum | 6 | | Continuous | |
| | | Temperature | 20(°C) above canal extraction temperature | | Continuous | |
| | | Suspended Solids | 10 mg/l | | Continuous | |
| | | Total Copper | 1 mg/l | | Daily | |
| | | Soluble Copper | 0.5 mg/l | | Daily | |
| | | Total Nickel | 2.5 mg/l | | Daily | |
| | | Soluble Nickel | 2 mg/l | | Daily | |
| | | Total Cobalt | 1 mg/l | | Daily | |
| | | Soluble Cobalt | 0.5 mg/l | | Daily | |
| | | Fixed & Free Ammonia as N | 5 mg/l | | Weekly | |
| | | Oxygen demand (PV4) | 3 mg/l | | Weekly | |

| Table S3.3 Annual mass limits for emissions to air from nickel refinery plant | |
|---|---|
| **Substance** | **Limit (kg)** |
| Nickel compounds expressed as Ni | 2500 |
| Sulphur dioxide | 15000 |
| Oxides of nitrogen | 130000 |

| Table S3.4 Point-source emissions to sewer | | |
|---|---|---|
| **Emission point ref. & location** | **Source** | **Sewer** |
| S1 [as shown in Schedule 7] | Purge liquor from carbon dioxide wash tower | Dwr Cymru Welsh Water |
| S2 [as shown in Schedule 7] | Foul water | Dwr Cymru Welsh Water |

# Schedule 3b – Emissions and monitoring from 30 June 2020

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| A1 and A2 | See table S3.1(a) | Sulphur dioxide | 80 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| A3 to A21 | See table S3.1(a) | Sulphur dioxide | 80 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Carbon monoxide (as CO) | 15 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| A25 and A26 | See table S3.1(a) | Sulphur dioxide | 80 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| A27 and A28 | See table S3.1(a) | Sulphur dioxide | 80 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14181 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Carbon monoxide (as CO) | 15 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| A30 and A31 | See table S3.1(a) | Sulphur dioxide | 80 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 15 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| A34 to A47 | See table S3.1(a) | Dust | 5 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |
| A48 | See table S3.1(a) | Dust | 5 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14181 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Nickel compounds (as Ni) | 3 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14385 |
| | | Gas flow rate m$^3$/hour | None set | | | |
| A54a | See table S3.1(a) | Sulphur dioxide | 150 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | 6-monthly (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 450 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| | | Dust | 5 mg/m$^3$ | Daily average | Continuous | BS EN 14181 |
| | | Dust | 5 mg/m$^3$ | Periodic over a minimum of 30 minutes and maximum of 8 hours. | Annually | BS EN 13284-1 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Nickel compounds (as Ni) | 1 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14385 |
| A54b | See table S3.1(a) | Sulphur dioxide | 150 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | 6-monthly (minimum 16 weeks interval between monitoring ) | BS 6069-4.4:1993 |
| | | Oxides of Nitrogen (as $NO_2$) | 100 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 14792 |
| | | Carbon monoxide (as CO) | 450 $mg/m^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | | BS EN 15058 |
| | | Dust | 5 $mg/m^3$ | Daily average | Continuous | BS EN 14181 |
| | | Dust | 5 $mg/m^3$ | Periodic over a minimum of 30 minutes and maximum of 8 hours. | Annually | BS EN 13284-1 |

| Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (including unit)** | **Reference Period** | **Monitoring frequency** | **Monitoring standard or method** |
| | | Nickel compounds (as Ni) | 1 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | 6-monthly (minimum 16 weeks interval between monitoring ) | BS EN 14385 |
| A62 | See table S3.1(a) | Dust | 5 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |
| A78 | See table S3.1(a) | Dust | 5 mg/m$^3$ | Periodic over minimum 30 minutes, maximum 8 hour period | Annually (minimum 16 weeks interval between monitoring ) | BS EN 14181 |

| Table S3.2(b) Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements | | | | | | |
|---|---|---|---|---|---|---|
| **Emission point ref. & location** | **Source** | **Parameter** | **Limit (incl. Unit)** | **Reference period** | **Monitoring frequency** | **Monitoring standard or method** |
| W1 as shown on emissions plan in Schedule 7 | See table S3.2(a) | Flow rate | 15000 $m^3$/day | Daily | Continuous | MCERTS |
| | | Flow rate | 625 $m^3$/hour | hourly | Continuous | MCERTS |
| | | pH maximum | 9 | Continuous | Continuous | ISO 10523 |
| | | pH minimum | 6 | Continuous | Continuous | ISO 10523 |
| | | Temperature | 20($^o$C) above canal extraction temperature | Continuous | Continuous | |
| | | Suspended Solids | 10 mg/l | Continuous | Continuous | BS EN 13284-2 |
| | | Total Copper | 0.5 mg/l | Daily Average | Daily | ISO 17294-2<br>ISO 11885<br>ISO 15586 |
| | | Soluble Copper | 0.5 mg/l | As above | Daily | |
| | | Total Nickel | 2.0 mg/l | As above | Daily | |
| | | Soluble Nickel | 2 mg/l | As above | Daily | |
| | | Total Cobalt | 0.5 mg/l | As above | Daily | |
| | | Soluble Cobalt | 0.5 mg/l | As above | Daily | |
| | | Arsenic (AS) | 0.3 mg/l | As above | Daily | |
| | | Cadmium (Cd) | 0.1 mg/l | As above | Daily | |
| | | Lead (Pb) | 0.5 mg/l | As above | Daily | |
| | | Zinc (Zn) | 1.0 mg/l | As above | Daily | |
| | | Mercury (Hg) | 0.05 mg/l | As above | Daily | |
| | | Fixed & Free Ammonia as N | 5 mg/l | | Weekly | ISO 5664 |
| | | Oxygen demand (PV4) | 3 mg/l | | Weekly | |

| Table S3.3 Annual mass limits for emissions to air from nickel refinery plant | |
|---|---|
| **Substance** | **Limit (kg)** |
| Nickel compounds expressed as Ni | 2500 |
| Sulphur dioxide | 15000 |
| Oxides of nitrogen | 130000 |

| Table S3.4 Point-source emissions to sewer | | |
|---|---|---|
| **Emission point ref. & location** | **Source** | **Sewer** |
| S1 [as shown in Schedule 7] | Purge liquor from carbon dioxide wash tower | Dwr Cymru Welsh Water |
| S2 [as shown in Schedule 7] | Foul water | Dwr Cymru Welsh Water |

# Schedule 4 – Reporting until 29 June 2020

Parameters for which reports shall be made, in accordance with conditions of this permit, are listed below.

**Table S4.1 Reporting of monitoring data – nickel refinery plant**

| Parameter | Emission or monitoring point/reference | Reporting period | Period begins |
|---|---|---|---|
| Sulphur dioxide mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67 | Annually | 01/01 |
| Sulphur dioxide mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Oxides of nitrogen mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67, A77 | Annually | 01/01 |
| Oxides of nitrogen mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Carbon Monoxide mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67 | Annually | 01/01 |
| Carbon Monoxide mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Dust mg $m^{-3}$ | A34 to A47 inclusive | Annually | 01/01 |
| Dust mg $m^{-3}$ | A62 and A78 | Annually | 01/01 |
| Dust mg $m^{-3}$ | A48, A67, A77 | 6-monthly | 01/01, 01/07 |
| Dust mg $m^{-3}$ | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Nickel compounds expressed as Ni kg/month | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Nickel compounds expressed as Ni kg/month | A48 | 6-monthly | 01/01, 01/07 |
| Nickel compounds expressed as Ni mg $m^{-3}$ | A48, A67, A77, A54a, A54b | 6-monthly | 01/01, 01/07 |
| Gas flow rate $m^3$/hr | A67, A77 | Annually | 01/01 |
| Gas flow rate $m^3$/hr | A48 | 6-monthly | 01/01, 01/07 |
| Bypass of abatement time hh:mm | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07 01/10 |
| CEM availability % | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Flue switching | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/hr | W1, W3, W4, W5, W6, W7, W8, W9 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

| Table S4.1 Reporting of monitoring data – nickel refinery plant | | | |
|---|---|---|---|
| **Parameter** | **Emission or monitoring point/reference** | **Reporting period** | **Period begins** |
| Maximum flow $m^3$/day | W1, W3, W4, W5, W6, W7, W8, W9 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mean flow $m^3$/hr | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mean flow $m^3$/day | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH maximum | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH minimum | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mean pH | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Suspended solids mg $l^{-1}$ | W1, W5, W6 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total copper mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble copper mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total nickel mg/l | W1, W7 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble nickel mg/l | W1, W7 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total cobalt mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble cobalt mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total ammonia (free and fixed ammonia as nitrogen) mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Oxygen demand (PV4) mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | Canal Abstraction at NGR SN 6955 0145 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/hr | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/day | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Suspended solids mg $l^{-1}$ | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Fixed ammonia (as N) mg/l | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Free ammonia (as N) mg/l | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH maximum | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

| | | | |
|---|---|---|---|
| pH minimum | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

**Table S4.1 Reporting of monitoring data – nickel refinery plant**

| Parameter | Emission or monitoring point/reference | Reporting period | Period begins |
|---|---|---|---|
| Sludges and solid wastes containing metals sent for landfill and/or treatment and/or recovery | N/A | Annually | 01/01 |
| Other process wastes sent for landfill | N/A | Annually | 01/01 |
| Mass release to air of Nickel compounds expressed as Ni | N/A | Annually | 01/01 |
| Mass release to air of Sulphur dioxide | N/A | Annually | 01/01 |
| Mass release to air of oxides of nitrogen | N/A | Annually | 01/01 |
| Mass release to water of total nickel | N/A | Annually | 01/01 |
| Mass release to water of soluble nickel | N/A | Annually | 01/01 |
| Mass release to water of total copper | N/A | Annually | 01/01 |
| Mass release to water of soluble copper | N/A | Annually | 01/01 |
| Mass release to water of total cobalt | N/A | Annually | 01/01 |
| Mass release to water of soluble cobalt | N/A | Annually | 01/01 |

**Table S4.2 Reporting forms – nickel refinery plant**

| Parameter | Reporting format |
|---|---|
| Air quarterly | As agreed in writing by Natural Resources Wales |
| Air 6-monthly | As agreed in writing by Natural Resources Wales |
| Air annual releases $SO_2$ | As agreed in writing by Natural Resources Wales |
| Air annual releases $NO_2$ | As agreed in writing by Natural Resources Wales |
| Air annual releases CO | As agreed in writing by Natural Resources Wales |
| Air annual releases dust | As agreed in writing by Natural Resources Wales |
| Water | As agreed in writing by Natural Resources Wales |
| Sewer | As agreed in writing by Natural Resources Wales |

| | |
|---|---|
| All media/annual releases | As agreed in writing by Natural Resources Wales |

# Schedule 4 – Reporting from 30 June 2020

Parameters for which reports shall be made, in accordance with conditions of this permit, are listed below.

**Table S4.1 Reporting of monitoring data – nickel refinery plant**

| Parameter | Emission or monitoring point/reference | Reporting period | Period begins |
|---|---|---|---|
| Sulphur dioxide mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67 | Annually | 01/01 |
| Sulphur dioxide mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Oxides of nitrogen mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67, A77 | Annually | 01/01 |
| Oxides of nitrogen mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Carbon Monoxide mg $m^{-3}$ | A1 to A21 inclusive, A25 to A28 inclusive, A30, A31, A67 | Annually | 01/01 |
| Carbon Monoxide mg $m^{-3}$ | A54a, A54b | 6-monthly | 01/01, 01/07 |
| Particulates mg $m^{-3}$ | A34 to A47 inclusive | Annually | 01/01 |
| Particulates mg $m^{-3}$ | A62 and A78 | Annually | 01/01 |
| Particulates mg $m^{-3}$ | A48, A67, A77 | 6-monthly | 01/01, 01/07 |
| Particulates mg $m^{-3}$ | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Nickel compounds expressed as Ni kg/month | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Nickel compounds expressed as Ni kg/month | A48 | 6-monthly | 01/01, 01/07 |
| Nickel compounds expressed as Ni mg $m^{-3}$ | A48, A67, A77, A54a, A54b | 6-monthly | 01/01, 01/07 |
| Gas flow rate $m^3$/hr | A67, A77 | Annually | 01/01 |
| Gas flow rate $m^3$/hr | A48 | 6-monthly | 01/01, 01/07 |
| Bypass of abatement time hh:mm | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07 01/10 |
| CEM availability % | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Flue switching | A54a, A54b | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/hr | W1, W3, W4, W5, W6, W7, W8, W9 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

**Table S4.1 Reporting of monitoring data – nickel refinery plant**

| Parameter | Emission or monitoring point/reference | Reporting period | Period begins |
|---|---|---|---|
| Maximum flow $m^3$/day | W1, W3, W4, W5, W6, W7, W8, W9 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mean flow $m^3$/hr | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

| | | | |
|---|---|---|---|
| Mean flow $m^3$/day | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH maximum | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH minimum | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mean pH | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Suspended solids mg $l^{-1}$ | W1, W5, W6 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total copper mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble copper mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total nickel mg/l | W1, W7 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble nickel mg/l | W1, W7 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total cobalt mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Soluble cobalt mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Arsenic | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Cadmium | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Lead | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Zinc | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Mercury | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Total ammonia (free and fixed ammonia as nitrogen) mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Oxygen demand (PV4) mg/l | W1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | Canal Abstraction at NGR SN 6955 0145 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/hr | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Maximum flow $m^3$/day | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Suspended solids mg $l^{-1}$ | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Fixed ammonia (as N) mg/l | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Free ammonia (as N) mg/l | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

| | | | |
|---|---|---|---|
| pH maximum | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| pH minimum | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |
| Temperature (°C) | S1 | 3-monthly | 01/01, 01/04, 01/07, 01/10 |

**Table S4.1 Reporting of monitoring data – nickel refinery plant**

| Parameter | Emission or monitoring point/reference | Reporting period | Period begins |
|---|---|---|---|
| Sludges and solid wastes containing metals sent for landfill and/or treatment and/or recovery | N/A | Annually | 01/01 |
| Other process wastes sent for landfill | N/A | Annually | 01/01 |
| Mass release to air of Nickel compounds expressed as Ni | N/A | Annually | 01/01 |
| Mass release to air of Sulphur dioxide | N/A | Annually | 01/01 |
| Mass release to air of oxides of nitrogen | N/A | Annually | 01/01 |
| Mass release to water of total nickel | N/A | Annually | 01/01 |
| Mass release to water of soluble nickel | N/A | Annually | 01/01 |
| Mass release to water of total copper | N/A | Annually | 01/01 |
| Mass release to water of soluble copper | N/A | Annually | 01/01 |
| Mass release to water of total cobalt | N/A | Annually | 01/01 |
| Mass release to water of soluble cobalt | N/A | Annually | 01/01 |

**Table S4.2 Reporting forms – nickel refinery plant**

| Parameter | Reporting format |
|---|---|
| Air quarterly | As agreed in writing by Natural Resources Wales |
| Air 6-monthly | As agreed in writing by Natural Resources Wales |
| Air annual releases $SO_2$ | As agreed in writing by Natural Resources Wales |
| Air annual releases $NO_2$ | As agreed in writing by Natural Resources Wales |
| Air annual releases CO | As agreed in writing by Natural Resources Wales |
| Air annual releases particulates | As agreed in writing by Natural Resources Wales |
| Water | As agreed in writing by Natural Resources Wales |

| | |
|---|---|
| Sewer | As agreed in writing by Natural Resources Wales |
| All media/annual releases | As agreed in writing by Natural Resources Wales |

# Schedule 5 - Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

## Part A

| | |
|---|---|
| Permit Number | |
| Name of operator | |
| Location of Facility | |
| Time and date of the detection | |

| **(a) Notification requirements for any activity that gives rise to an incident or accident which significantly affects or may significantly affect the environment** | |
|---|---|
| **To be notified Immediately** | |
| Date and time of the event | |
| Reference or description of the location of the event | |
| Description of where any release into the environment took place | |
| Substances(s) potentially released | |
| Best estimate of the quantity or rate of release of substances | |
| Measures taken, or intended to be taken, to stop any emission | |
| Description of the failure or accident. | |

| **(b) Notification requirements for the breach of a permit condition** | |
|---|---|
| **To be notified immediately** | |
| Emission point reference/ source | |
| Parameter(s) | |
| Limit | |
| Measured value and uncertainty | |
| Date and time of monitoring | |
| Measures taken, or intended to be taken, to stop the emission | |

| **Time periods for notification following detection of a breach of a limit** | |
|---|---|
| **Parameter** | **Notification period** |
| | |
| | |

| | |
|---|---|
| | |

| **(c) In the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment:** | |
|---|---|
| **To be notified immediately** | |
| Description of where the effect on the environment was detected | |
| Substances(s) detected | |
| Concentrations of substances detected | |
| Date of monitoring/sampling | |

## Part B - to be submitted as soon as practicable

| | |
|---|---|
| Any more accurate information on the matters for notification under Part A. | |
| Measures taken, or intended to be taken, to prevent a recurrence of the incident | |
| Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission | |
| The dates of any unauthorised emissions from the facility in the preceding 24 months. | |

| | |
|---|---|
| **Name*** | |
| **Post** | |
| **Signature** | |
| **Date** | |

* authorised to sign on behalf of the operator

# Schedule 6 - Interpretation

*"accident"* means an accident that may result in pollution.

*"application"* means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

*"authorised officer"* means any person authorised by Natural Resources Wales under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

*"emissions to land"* includes emissions to groundwater.

*"emissions of substances not controlled by emission limits"* means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit**.**

*"EP Regulations"* means The Environmental Permitting (England and Wales) Regulations SI 2010 No.675 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

*"groundwater"* means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

*"MCERTS"* means the Environment Agency's Monitoring Certification Scheme.

"year" means calendar year ending 31 December.

*"background concentration"* means such concentration of that substance as is present in:

- for emissions to surface water, the surface water quality up-gradient of the site; or
- for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.

*"hazardous property"* has the meaning given in Schedule 3 of the Hazardous Waste (England and Wales) Regulations 2005 No.894 and the Hazardous Waste (Wales) Regulations 2005 No. 1806 (W.138).

*"Industrial Emissions Directive"* means Directive 2010/75/EU Of The European Parliament and of the Council of 24 November 2010 on industrial emissions

*"quarter"* means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

*"recovery"* means any of the operations provided for in Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

*"Waste code"* means the six digit code referable to a type of waste in accordance with the List of Wastes (Wales) Regulations 2005 and in relation to hazardous waste, includes the asterisk.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

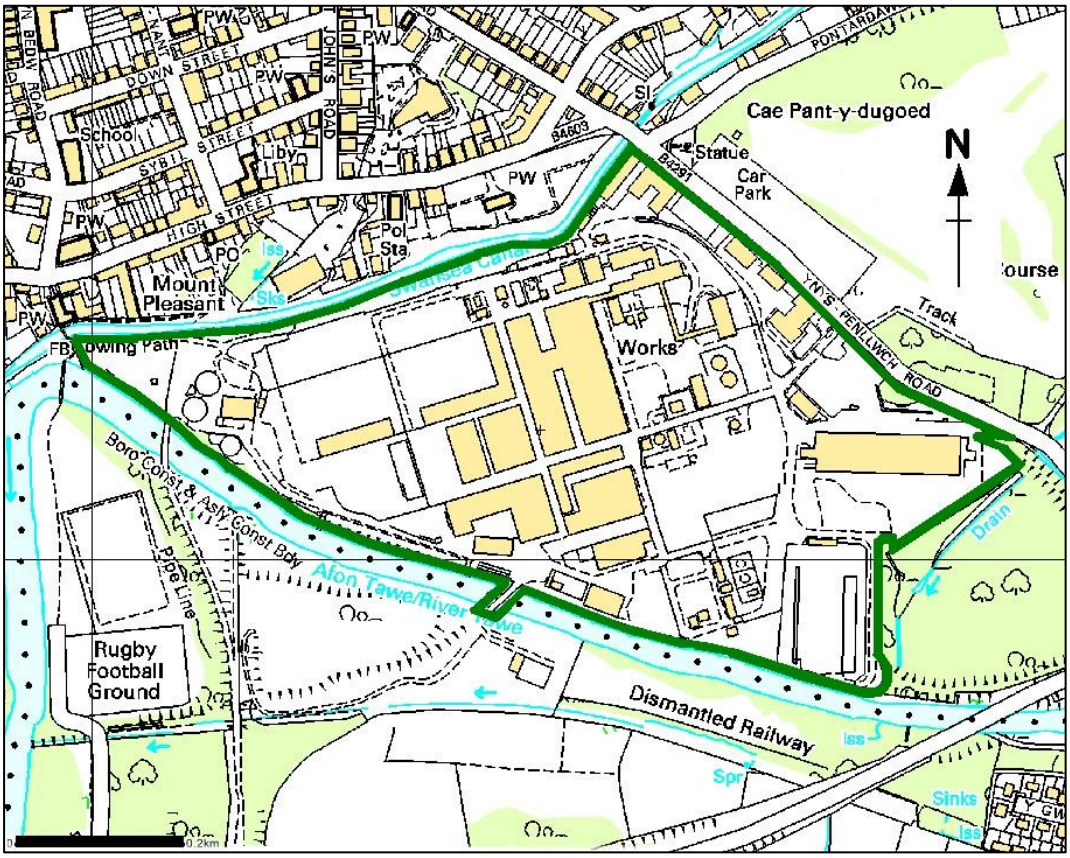
(a) in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or

(b) in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

# Schedule 7 - Site plan

## Installation boundary plan



Site layout plan

## Points of emission to air, water and sewer from the installation
## Western part of the site

Location of installation boundary relative to emission points is shown in green. Coloured, numbered symbols indicate emission points.

## Eastern part of the site

Location of installation boundary relative to emission points is shown in green. Coloured, numbered symbols indicate emission points.


END OF PERMIT