

8. ENVIRONMENTAL MANAGEMENT

8.1 INTRODUCTION

8.1.1 This Chapter of the report presents the general approach to Environmental Management for the Qatalum Project, which will involve the development and implementation of separate Environmental Management Plans (EMPs) will for the construction / commissioning and operational phases of the Project. Preliminary monitoring plans are also discussed and presented.

8.1.2 Waste management, as discussed in Section 6.8, will be incorporated into the EMPs. Management of social impacts has been addressed in Chapter 7 and Appendix G; which present proposed monitoring and evaluation procedures and a Socio-Economic Action Plan (SAP).

8.2 ENVIRONMENTAL MANAGEMENT PLAN

General

8.2.1 The aim of an EMP is to clearly establish a framework for the effective management of significant adverse residual environmental impacts and to ensure the best overall protection of the environment through appropriate management procedures and processes. The implementation of an EMP should ensure that all elements of a Project comply with relevant legislation and license conditions and take account of general good practice.

8.2.2 An EMP is a continuously evolving document, which will develop to meet the needs of the Project during the construction and operational phases. Regular audits against an EMP are undertaken to ensure that all actions / procedures are being carried out effectively. As part of the audit, inspection reports would be recorded and would form part of the review and revision procedure for the EMP.

8.2.3 An EMP would normally address and include the following:

- a summary of the environmental impacts identified in the EIA;
 - a detailed description of mitigation measures to be undertaken for each significant impact;
 - a description of the process in place to ensure environmental compliance;
 - details of control measures;
 - details of monitoring and reporting regimes;
 - emergency response plans and protocols;
 - details of record keeping;
 - a definition of responsibilities for implementation of the elements of the EMP;
 - an implementation schedule for execution of the actions described in the EMP;
- and

- specifications for management procedures and processes for:
 - the control of Contractors,
 - the auditing, checking and implementation of corrective actions,
 - training and awareness,
 - communication on environmental matters, and
 - checking, reviewing and up-dating the EMP document as necessary.

8.2.4 An outline of the proposed contents of the Qatalum EMPs, for both construction / commissioning and operational phases of the Qatalum Project, is presented below. Further details regarding the development of environmental management for operation and construction are presented below.

1 INTERNAL CONTROLS

- 1.1. Validation
- 1.2. Employee Responsibilities
- 1.3. Approval

2. PURPOSE

3. SCOPE

- 3.1. Legal Basis
 - Conventions
 - National Legislation, Standards and Permitting
- 3.2. Relationship to Other Documents

4. ENVIRONMENTAL MANAGEMENT

- 4.1. Qatalum Environmental Policy
- 4.2. Environmental Management System

5. ENVIRONMENTAL MANAGEMENT PLANNING

- 5.1. Identification of Legal and Other Requirements
- 5.2. Environmental Impacts and Control Measures
- 5.3. Establishment of Environmental Objectives and WMP
- 5.4. Establishment of Environmental Management Plans/Procedures

6. ENVIRONMENTAL MANAGEMENT PLAN IMPLEMENTATION

- 6.1. Environmental Management Organisation
- 6.2. Roles and Responsibilities
- 6.3. Training
- 6.4. Communication
 - Internal Communications
 - External Communications
 - Contractor Management

7. EMERGENCY RESPONSE PROCEDURES

8. MEASUREMENT, EVALUATION AND REVIEW

9. MANAGEMENT OF CHANGE

10. DOCUMENT MANAGEMENT SYSTEM

11. APPENDICES

- 11.1. Appendix 1 – Acronyms and Terms
- 11.2. Appendix 2 – Reference Documents
- 11.3. Appendix 3 – Project Impact Summary & Mitigation and Monitoring Commitments.

Operation

- 8.2.5 A HSE programme will be developed specifically for the Qatalum Project, which will take into account relevant Qatari / international legislation and Hydro's / QP's Corporate Policies and requirements. This, in conjunction with this EIA report, will provide the basis for the development of an Environmental Management System (EMS) for the operation of the Qatalum Project. An operational EMP, along the lines of that discussed above will be produced from the EMS. The EMP will incorporate the WMP, as discussed previously in Section 6.8.
- 8.2.6 Based on Hydro's extensive operational experience with smelters in Norway and main land Europe, a preliminary draft operational monitoring plan has been presented in Section 8.3 below. It is proposed that this will form the framework for the monitoring and reporting plan that will ultimately be incorporated into the Consent to Operate.

Construction

- 8.2.7 The Qatalum HSE enterprise will submit a Master HSE Management Plan for construction. On the basis of this, and the findings of this EIA, all Contractors will be required to produce their own EMPs.
- 8.2.8 The EIA has identified that the construction activities with the greatest potential to result in adverse impacts on the environment are dredging to construct the Qatalum Port facilities, shipping access and turning basins and meeting the site fill requirements. The specific issues associated with dredging and fill requirements will depend on the final selection of the Port location / dredging scenario and where the overall fill materials are ultimately sourced from.
- 8.2.9 Nonetheless, whichever Port concept is selected, dredging activities will need to be carefully managed; thus, Qatalum will commit to submitting a separate EMP for dredging activities, prior to commencing works. This will provide the details of the dredging and the specific measures and protocols that will be adopted to ensure environmental protection.
- 8.2.10 Preliminary monitoring plans for the general and dredging related construction activities with potential to result in adverse environmental impacts are presented in Section 8.3 below.

Responsibility

- 8.2.11 As noted above, the EMPs will define the responsibilities of key individuals involved with the Project. These will include personnel from Qatalum, Contractor(s), consultants and other key operatives.
- 8.2.12 All Contractor(s) will be responsible for adhering to the requirements of their individual EMPs, including ensuring compliance with relevant Qatari and international legislation / regulations.
- 8.2.13 Qatalum will have the ultimate responsibility for the management of environmental issues, including:

- regular consultation with statutory and non-statutory consultees and other relevant parties;
- specifying environmental standards and monitoring requirements to prospective contractors;
- monitoring Contractor performance; and
- general monitoring and problem resolution as the project progresses.

8.3 MONITORING PLANS

Operation

8.3.1 An outline of the proposed monitoring plans for the operation of the Qatalum Project is presented below as a series of tables and text.

8.3.2 The following will be agreed with SCENR prior to the initiation of operational monitoring:

- monitoring methodology;
- monitoring frequency and programme; and
- reporting format and frequency.

Atmospheric Emissions

8.3.3 Table 8.1 and Table 8.2 contain the proposed plans for monitoring atmospheric emissions from both the main and minor sources. Figure 8.1 shows the location of the main atmospheric emission sources.

Ambient Air Quality Monitoring

8.3.4 It is envisaged that an air quality monitoring station will be installed, at the same location as the Qatalum baseline monitoring station (see Appendix D), towards the end of the construction phase. This will be operated for at least a year after full production has commenced.

8.3.5 A further monitoring station will be considered for installation to the north of the Aluminium Plant, at a location to be determined between the Main Site and the community area. Furthermore, data from QP's and MIC's existing monitoring stations (see Appendix D) will also be used to determine the effect of the plant's operation on ambient air quality.

8.3.6 After the initial monitoring and subsequent assessment of air quality has been completed, a permanent programme will be designed and implemented.

Vegetation Monitoring

8.3.7 A program for monitoring potential effects of fluorides / SO₂ on vegetation will be developed. This may include identification of suitable fluoride indicator species, condition monitoring for natural and ornamental vegetation and sampling and analysis of vegetation tissue.

Aqueous Effluent Monitoring

- 8.3.8 Table 8.3 contains the proposed plans for monitoring fresh water and seawater aqueous discharges arising from the operation of the Project. The location of the point of discharge to the QASCO channel for the return seawater has been shown in Figure 3.4. Fresh process water will not be discharged directly; it will be used for irrigation purposes at landscaped areas within the site.

Marine Environment Monitoring

- 8.3.9 With the proposed discharge control measures, it is not expected that there will be any regular discharges that will be unique to the Qatalum plant and that should justify a dedicated marine monitoring program. Instead it is proposed that Qatalum will participate in future updates of the SARC studies.

Groundwater

- 8.3.10 The draft MIC Guidelines require industrial facilities to install a sufficient number of groundwater monitoring wells (at least one well at each boundary site) and monitor and report the quality of the groundwater in accordance with a set list of parameters. The use / installation of boreholes for this purpose, and a monitoring programme will be discussed and agreed with MIC prior to the commencement of full production.

Waste

- 8.3.11 Wastes will be sampled and analysed according to the requirements in the Executive By-Law and according to agreements with waste handling contractors.

Noise

- 8.3.12 Initial noise mapping inside plant and along perimeter will be performed after start-up. A programme for operational noise monitoring will be developed on the basis of this.

Performance Indicators

- 8.3.13 The Qatalum EMS will enable performance monitoring to be undertaken on the basis of a range of environmental indicators. This are likely to include at least some of the following:

- annual mass emissions to air (e.g. CO₂, SO₂, NO_x, PM₁₀, HF, total fluorides, PAH and PFC etc);
- annual mass GHG emissions (as CO₂ equivalents);
- energy use and efficiency;
- annual raw materials use;
- water use and efficiency; and
- annualised waste generation, minimisation and recycling.

- 8.3.14 The data for the above parameters may be obtained from measured data, mass balance calculations or through estimation techniques. Since these data would be generated primarily for internal use to assist with continual performance improvements and the setting of performance targets; it is not proposed that these would be formally reported as part of the operating consent.

Table 8.1 – Operational Monitoring Plan for Main Atmospheric Emission Sources

Stack Reference ^a	Source	Activity	Emissions	Flue Gas Treatment	Priority for Monitoring	Type of Monitoring
1-2	Potroom – building ventilation	Aluminium reduction	CO ₂ , CO, HF, particulate fluoride, SO ₂ , PAH and traces of PFCs	-	Fluorides, SO ₂ , dust & PAH	Periodic sampling will be carried out at a number of sampling points according to a schedule to be determined. The use of online monitors for HF will be considered.
3-6	Potroom – fume treatment plant	Aluminium reduction cells	CO ₂ , CO, HF, particulate fluoride, SO ₂ , PAH and traces of PFCs	Dry scrubbing with alumina to remove ~99% of fluorides and some PAH, followed by baghouse to remove dust. Seawater scrubbing to remove SO ₂ and further reduce dust and HF	Fluorides, SO ₂ , dust & PAH	Periodic stack sampling and analysis. The use of online monitors for HF and SO ₂ will be considered PFCs will be calculated and reported based on the frequency and duration of Anode Effects (AE)
7	Carbon Plant – Paste Plant	Mixing / forming / heating	Pitch fume (including PAH), dust	Dust pre-filter, followed by RTO to remove >99% PAH.	PAH, dust	Periodic stack sampling and analysis
8	Carbon Plant – Bake Plant furnace off gas	Anode baking	Tar / pitch fume (including PAH), fluorides (HF and particulate fluoride), SO ₂ and dust	Dry scrubbing with alumina to remove ~99% of fluorides, followed by baghouse.	Fluorides, PAH, dust, SO ₂	Periodic stack sampling and analysis
9 and 13	Casthouse	Fluxing, crucible cleaning	Dust & fluorides	Lime (CaO) primed baghouses to remove dust and fluorides	Dust and fluoride	Periodic stack sampling and analysis
14-17	Power plant – gas turbines	Combustion of natural gas	Combustion gases	No specific treatment is required, emissions are minimised through design.	NOx	Continuous NOx monitoring

Notes:

a The stack reference numbers relate to those in Figure 8.1 below.

Figure 8.1 – Location of Main Atmospheric Emission Sources

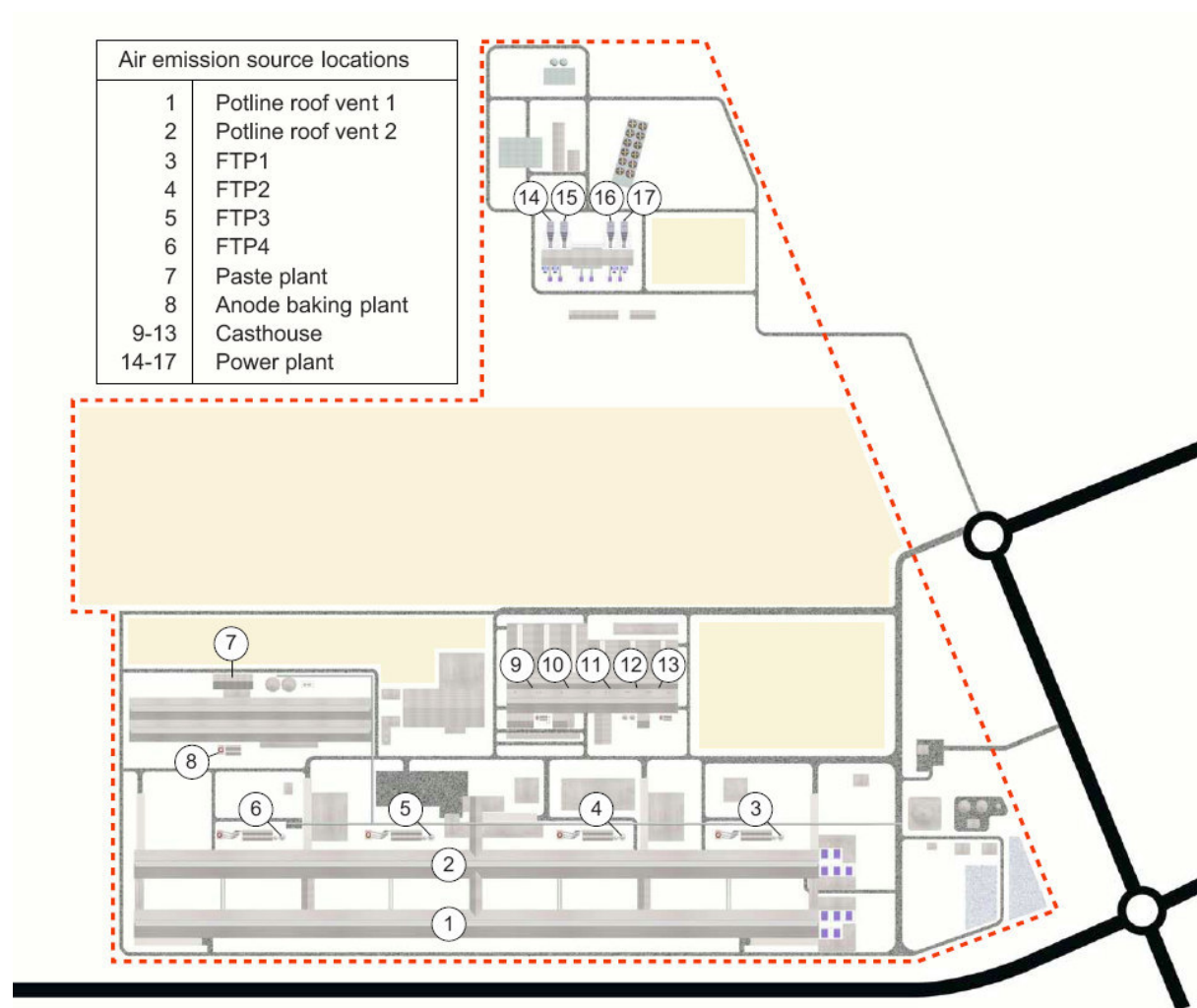


Table 8.2 – Operational Monitoring Plan for Minor Atmospheric Emission Sources

Source	Activity	Emissions	Priority for Monitoring	Type of Monitoring
Casthouse mixing furnaces	Gas fired heating, charging	Combustion gases and dust	NOx, dust	Initial performance test for NOx, periodic dust sampling
Hot-oil (HTM) heaters	Gas fired heating	Combustion gases	NOx	Initial performance test for NOx
Pitch storage	Purging, venting	Pitch vapour	PAH	Initial performance test, periodic visual inspection
Power Plant –cooling towers	Cooling	Salt aerosol	Salt	Initial performance test
Miscellaneous dust control equipment (baghouses)	Material handling	Dust	Dust	Initial performance test, periodic visual inspection

Table 8.3 –Monitoring Plan for Process Effluents

Effluent category	Potential Contaminants	Priority for Monitoring	Type of Monitoring
Aluminium Plant: fresh process effluents for irrigation use	pH, oil & grease, TOC, suspended solids	pH, oil and grease, TOC, flow rate	Continuous for flow rate and pH Periodic sampling for TOC
Power plant: fresh process effluents for irrigation use	Phosphate, dissolved solids, pH	Phosphate, dissolved solids, pH	Continuous for flow rate and pH Periodic sampling for phosphate and dissolved solids
Seawater scrubber effluent	pH, COD, temperature, PAH	pH, COD, temperature, DO	Before entering QASCO channel: continuous monitoring of flow, pH and temperature; periodic sampling for COD; and initial characterisation for PAH. Downstream mixing with QASCO effluent: Continuous monitoring of pH and temperature; and periodic sampling for COD and DO.
Surface water run-off	Suspended solids, dissolved solids, oil and grease, fluoride	Suspended solids, dissolved solids, oil and grease, fluoride	Sampling as needed before use for irrigation
Sanitary effluents	COD, BOD,		To be agreed with MIC

Construction

- 8.3.15 An outline of the proposed monitoring plans for the construction of the Qatalum Project is presented below. As noted previously, the Contractor(s) will be responsible for producing their own EMPs, including monitoring plans. Table 8.4 below presents an indication of what will be considered for inclusion in the construction monitoring programme(s).
- 8.3.16 Given the potential significance of impacts associated with dredging activities, particular focus has been given to the monitoring requirements for this element of construction.
- 8.3.17 Full details of the construction monitoring programme will be submitted to and agreed with SCENR prior to construction activities commencing.

Table 8.4 – Anticipated Construction / Commissioning Monitoring Plan

Source / Aspect ^a	Location	Parameters	Monitoring Frequency	Type of Monitoring
General Construction Activities				
Atmospheric dust emissions	Perimeter fence / edge of construction areas	Dust	Daily	visual
Aqueous discharges	Prior to discharge (if applicable)	To be confirmed by Contractor(s)	To be confirmed by Contractor(s)	To be confirmed by Contractor(s)
Noise generation	Perimeter fence / edge of construction areas	noise	Daily during particularly noisy events	Periodic sampling with noise meter
Sanitary effluents	COD, BOD,	To be agreed with MIC	To be agreed with MIC	To be agreed with MIC
Wastes	Various	Volume / weight and type	weekly	Periodic sampling
Dredging Activities				
Pre-dredge preparation: sediment - Alternative Port concept	Proposed dredge areas	TOC, TPH, metals, pH, nitrogen, phosphorous	One-off survey prior to works commencing	Sediment sampling and analysis
Pre-dredge preparation: seawater - Alternative Port concept	Proposed dredge areas	TSS, salinity TPH, metals, PCBs, pH, nitrogen, phosphorous	One-off survey prior to works commencing	Seawater sampling and analysis
Pre-dredge preparation: marine ecology - Alternative Port concept, dredge scenario 1	Jetty footprint and immediately adjacent areas	General marine ecology	One-off survey prior to works commencing	Video footage
Pre-dredge preparation: marine ecology - Alternative Port concept, dredge scenarios 2 & 3	Proposed dredge areas and surroundings	Detailed marine ecology	One-off survey prior to works commencing	Scuba diving by experienced marine ecologists and video footage
Dredging –Original Port concept	Representative locations to be agreed with SCENR	Currents and sediment drift through measurement of total suspended solids in seawater	Throughout dredging at a frequency to be agreed with SCENR	Current meter Seawater sampling and analysis

Source / Aspect ^a	Location	Parameters	Monitoring Frequency	Type of Monitoring
Dredging – Alternative Port concept	Representative locations to be agreed with SCENR	Currents and sediment drift through measurement of total suspended solids in seawater Seawater (TSS, salinity TPH, metals ^b , PCBs, pH, nitrogen, phosphorous) Sediment (TOC, TPH, metals ^b , pH, nitrogen, phosphorous)	Throughout dredging at a frequency to be agreed with SCENR	Current meter Seawater and sediment sampling and analysis
Post dredging	To be agreed with SCENR	Epibenthic organisms and infauna (focusing on seagrass species, percentage cover and health)	Every two month for the first year following cessation of dredging activities	Scuba diving by experienced marine ecologists and video footage
Dredged material – Alternative Port concept	Storage / dewatering area	TPH, metals ^b	Daily, or as required prior to use as fill / disposal	Representative sampling and analysis
De-watered dredged material – either Port concept	Storage / dewatering area	General suite of parameters to be agreed with SCENR/MIC	Weekly or as required prior to use as fill / disposal	Spot sampling and analysis
Dredged water run-off - either Port concept	Prior to release to sea	Total suspended solids content	daily	continuous sampling

Notes

- a The Contractor(s) will produce monitoring plans as part of their EMPs, the entries in this table present an indication of types of monitoring that are anticipated.
- b The suite of metals to be analysed for will be determined based on the results from the pre-dredge sediment quality survey.