10.0 Ecologically Sustainable Development

This section describes how the proposed TSF addresses the principles of ESD. It also addresses future requirements for adopting sustainability strategies, a number of which relate to climate change.

Australia's national Strategy for Ecologically Sustainable Development (1992) ("NSESD") defines ESD as:

> *"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased."*

10.1 SUSTAINABILITY

10.1.1 Principles of ESD

The EP&A Act encourages ESD in line with four sustainability principles being:

- The precautionary principle;
- The principle of intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation, pricing and incentive mechanisms.

> *The **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

The precautionary principle has been addressed by carrying out detailed EAS of the environmental characteristics of the site and surrounding area. The assessments have been used to determine potential environmental impacts and recommend environmental management practices and mitigation measures to ensure project impacts are minimised.

The potential for environmental impacts of construction and operation of the TSF are well known. While a number of potential threats are outlined in the residual environmental risk analysis in Section 12, none are considered likely to result in serious or irreversible environmental harm.

Measures to prevent environmental degradation during construction and operation include management plans and monitoring programs, and application of existing policies and best practices. This approach is consistent with the precautionary principle.

> *Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

Mitigation measures identified as part of this EA recognise the requirements to achieve, where possible, a neutral or beneficial effect on the environment. Benefits to future generations would be realised by:

- Strict applicant of mitigation measures to protect current and future values;
- Provision of employment positions during construction and operation;
- Direct economic benefits for the regional and State economy; and
- Investment in the Hunter Region and the Newcastle LGA.

Further discussion on the economic and social benefits of the proposed TSD is provided in Section 9.16.2.

> *Conservation of biological diversity and ecological integrity, namely that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

The industrial and agricultural history of the site (and surrounding area) has resulted in a site with limited biological diversity and ecological integrity. The proposed TSF is able to be constructed without any significant impact on the diversity and integrity of the locality. With the proposed environmental offsets, there would be no adverse impact upon threatened species, populations or ecological communities of their habitats as a result of construction or operation.

The proposed project would improve the management of stormwater runoff from the site which would result in benefits to water quality and the environment of the South Arm of the Hunter River and Hunter Estuary Wetlands.

> *Improved valuation, pricing and incentive mechanisms, namely, those environmental factors should be included in the valuation of assets and services.*

This principle is addressed by actions such as polluter pays, full life cycle costing, and utilising incentive structures/ market mechanisms to meet environmental goals.

Offsetting for the loss of wetland areas recognises the environmental values of the site.

QR National is committed to sustainability through their Environmental Management System (EMS). QR National is committed to achieving the following objectives of the Environmental Policy:

- Establishing, monitoring, reviewing and continually improving environmental objectives, targets and action plans;
- Minimising the environmental impacts of operations and developments;
- Developing and maintaining effective Emergency Response Plans to protect the environment;
- Ensuring contractors engaged by QR National meet QR National's environmental standards and requirements and comply with relevant legislation; and
- Communicating the EMS to all employees and communicating the Environmental Policy to the community.

Consistent with QR National's commitment to sustainability, Section 10.1.2 below outlines how sustainability will be pursued for the Project.

10.1.2 Recommended Sustainability Actions

The following ESD considerations will be incorporated in the detailed design phase of the Project:

- The examination, application and adoption of energy efficient appliances and sustainability features into buildings (WELLS rated installations for plumbing and electrical appliances);
- Optimal use off natural light to reduce energy consumption (cost-effective lighting, sensor lights for yard and external buildings, controller on office lighting);
- Use of low environmental impact materials where practical (low emission fireboards, avoid CECs, minimise use of PVCs);
- Possibility for the use of photovoltaic cells and recycle technologies to improve efficiencies and become self-sufficient or feed back into existing water and energy grids;
- Maximise use of renewable material, fuel and energy sources (green energy – solar power, plantation timber and recycled material);
- Examining "state-of-the-art" technologies and how these may be incorporated into designs for new facilities or extensions to existing facilities, including pollution treatment systems (improving capability, capacity and output quality);
- Considerations of UDIA 'EnviroDevelopment' criteria including elements such as ecosystems (flora and fauna), waste (before, during and after construction), energy (GHG production and energy efficiency), materials (non-toxic and environmentally responsible), water (40% reduction in portable water demand and water efficiency) and community (consultation, transport, safety and facilities);
- Recycling/ reuse opportunities from treated wastewater into amenities, energy storage and rebate availability;
- Rainwater harvesting and reuse;
- Minimisation of the ecological footprint;
- Identification of areas to re-vegetate or rehabilitate to offset any removal of vegetation;
- Adopt the "reduce, reuse and recycle" principle wherever possible;
- Implementation of the proposed offset strategy identified in Section 9.2.4;
- Ensure vegetation corridors and buffer zones are established as part of a rehabilitation scheme; and
- Ensure that monitoring programs are in place to evaluate the effectiveness of rehabilitation and re-vegetation works.

10.2 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

The Australian Government has identified climate change as one of its policy priorities. The Government's climate change policy is built on three pillars:

- Reducing Australia's GHG emissions;
- Adapting to climate change that cannot be avoided; and
- Helping to shape a global solution to climate change.

A GHG assessment was prepared as part of the Air Quality Impact Assessment contained within Appendix Q of this EA. The proposed development would generate GHG during construction and operation.

The DGR's for the proposed TSF request that a GHG assessment (including an assessment of the emissions of the disposal/use of extracted coal tailings) be conducted taking into account the *AGO Factors and Methods Workbook (Australian Greenhouse Office*).

The TSF footprint has been revised and will have no impact on the coal tailings on the site and no coal tailings will be extracted/removed from the site as part of the proposed development, as such a GHG assessment has not been undertaken to assess the emissions from this activity.

The purpose of undertaking a GHG assessment is to determine the amount of GHG emissions estimated to be released as a result of the proposed development and to outline mitigation and management methods to be implemented.

GHGs produced via human activities (predominantly energy consumption) has been considered a major contributing factor to the observed changes in climate over the 20th century. Climate change is defined as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climatic variability observed over comparable time periods (IPCC, 2010).

10.2.1 Greenhouse Gas Assessment Methodology

Quantification of potential emissions relating to the proposed TSF has been undertaken in relation to both carbon dioxide (CO_2) and other non-CO_2 GHG emissions.

For comparative purposes, non-CO_2 GHGs are awarded a "CO_2-equivalence" (CO_2-e) based on their contribution to the enhancement of the greenhouse effect. The CO_2-e of a gas is calculated using an index called the Global Warming Potential (GWP). The GWPs for a variety of non-CO_2 GHGs are contained within the Intergovernmental Panel on Climate Change (IPCC), (1996) document "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories".

The GWPs of relevance to this assessment are:

- Methane (CH_4): GWP of 21 (21 times more effective as a GHG than CO_2); and,
- Nitrous oxide (N_2O): GWP of 310 (310 times more effective as a GHG than CO_2).

The short-lived gases such as carbon monoxide (CO), nitrogen dioxide (NO_2), and non-methane volatile organic compounds (NMVOCs) vary spatially and it is consequently difficult to quantify

their global radiative forcing impacts. For this reason, GWP values are generally not attributed to these gases nor have they been considered further as part of this GHG assessment.

The GHG emissions associated with the proposed TSF have been assessed in terms of potential direct emission (Scope 1), potential indirect emission (Scope 2) and significant upstream/downstream (Scope 3) emission potential. A summary of the current and potential Project GHG emission sources is provided in Table 50 below.

Electricity and diesel consumption figures for the current operations at the KCT have been used as a baseline to assess potential GHG emissions.

Table 50: Potential GHG Emissions

Project Component	Direct Emissions	Indirect Emissions	
	Scope 1	Scope 2	Scope 3
Diesel	Emissions from the combustion of diesel at the proposed TSF in both mobile and fixed plant and equipment	Not Applicable	Estimated emissions attributable to the extraction, production and transport of diesel consumed at the site.
Electricity	Not Applicable	Emissions associated with the consumption of purchased electricity at the proposed TSF.	Estimated emissions from the extraction, production and transport of fuel burned for the generation of electricity consumed at the site and the electricity lost in delivery in the transmission and distribution network.

Further detail concerning Scope 1, 2 and 3 potential GHG emissions is contained within the Air Quality Assessment in Appendix Q.

10.2.2 Potential Impacts

The GHG assessment contained within the Air Quality Assessment in Appendix Q considers the impact of the proposed TSF and compares this predicted impact to that currently experienced as a result of the current Kooragang facility operations.

The construction of the TSF is short term in nature and it is anticipated that GHG emissions during the operation of the facility will be higher than those generated during construction. Therefore, the assessment of the construction of the TSF has not been considered in detail within the GHG assessment.

In order to undertake the GHG assessment, activity data for the current activities at the KCT with respect to total electricity consumption and diesel consumption was obtained from QR National for the period 1 September 2011 to 31 August 2012.

Due to expected increases in the coal industry/port operations, train movements are likely to increase. As such, QR National operations will eventually increase from 11 train sets (associated with the current Kooragang facility) to 38 train sets at the Hexham facility. For the purposes of being conservative, approximately 3.4 times more trains will be serviced at the proposed TSF. The proposed TSF will not directly result in an increase of train numbers.

A summary of activity data related to the current (Kooragang) and future operations at Hexham is provided in Table 51 below.

Table 51: Project Related Activity Data Relevant to GHG Emissions

Activity	Quantity for Project Operations	
	Current	Future
Annual Electricity Consumption (kWh)	19,316	65,678
Annual Diesel Consumption, onsite operations (L)	120,833	410,834

Direct (Scope 1) GHG emissions (CO_2-e) resulting from the operation of the proposed Hexham TSF are estimated to be 1,102 tpa, an increase of approximately 778 tpa on current Kooragang operations.

Indirect (Scope 2) GHG emissions (CO_2-e) resulting the operation of the proposed Hexham TSF are estimated to be 57.8 tpa, an increase of approximately 40.8 tpa on current Kooragang operations.

Emissions of GHG in NSW were reported to be 161 Mt in 2009, 27% of the Australian total GHG emissions of 545.8 Mt. Comparison of the emissions attributable to the proposed TSF with NSW and Australia emission totals is presented in Table 52 below.

Table 52: Comparison of proposed TSF GHG Emissions to State & National Totals

Emission Scope	Estimated Emissions (tCO_2-e/annum)	% of NSW 2009 GHG Emission Total	% of Australian 2009 GHG Emission Total
Scope 1	1,108	<0.001	<0.001
TOTAL (1, 2 and 3)	1,254.9	<0.001	<0.001

The GHG Assessment has found that the principal source of GHG emissions during the operational phase of the proposed TSF is the onsite usage of diesel, however the estimated emissions are considered negligible when compared to NSW and Australian emissions totals.

The impact of the proposed TSF on GHG emissions would be mitigated during construction by the reduction of fuel use and improved efficiency of plant machinery, vehicles and generators.

There are no sea level rise issues for the site although there is the likelihood of increased flooding risk and potential increased rainfall intensity that could affect stormwater management. These aspects of climate change have been considered in project design and assessment. Adequate mitigation and adaptation capacity for potential climate change effects has been included in the proposal.