22 Sustainability and climate change

This chapter describes and presents the approach to sustainability and climate change on the Project and how specific objectives, initiatives and considerations are being incorporated into the Project development.

22.1 Introduction

Sustainability is considered a key issue in the SEARS, whereas climate change is listed under 'Other issues' and refers to the Scoping Report (TfNSW, 2019d) for the Project. The climate change risk assessment and response to sustainability in this chapter will serve both to address the SEARs as well as consider the requirements outlined in the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability (IS) Rating Tool.

Table 22-1 sets out the relevant SEARs and Scoping Report requirements relevant to sustainability and climate change and identifies where these requirements have been addressed within this chapter.

Table 22-1 SEARs

SEARs	Where addressed in the EIS
Sustainability	
The Proponent must assess the sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability Rating Tool, or equivalent, and recommend an appropriate target rating for the project.	TfNSW has made a commitment to pursue a formal IS Rating level of Excellent under Version 1.2 of the IS Rating Tool. This is discussed further in **Section 22.2.4**
The Proponent must assess the project against the current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport.	**Section 22.2.2**
Other Issues	
(Address) the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report: *(g) climate change* The Scoping Report (TfNSW, 2019) makes the following commitments: A sustainability assessment will be included in the EIS which would address the following:	-
• an assessment of the Project against the current guidelines including targets and strategies that address sustainability themes e.g. water, energy and transport	**Section 22.2.2**
• an assessment of potential impacts of climate change on the Project, taking into account the climate change scenarios already considered within the design	**Section 22.3**
• a high level assessment of sustainability risks and opportunities for improved sustainability outcomes during design, construction and operation	**Section 22.2.3**
• consideration of how the Project would demonstrate a best practice level of performance using ISCA IS Rating Tool Version 1.2 during design, construction and operation.	**Section 22.2.4**

22.2 Sustainability

22.2.1 Overview

Sustainability for the Project would be guided by a Sustainability Management Plan (SMP), which would address sustainability initiatives for the Project and consider a range of frameworks, goals, objectives and principles. The SMP would weave the principles of ecologically sustainable development (ESD) and other core drivers with TfNSW to help support government policies and legislation. The SMP would provide a detailed description of sustainability risks and opportunities for improved sustainability outcomes during design, construction and operation.

The following sections address the requirements of the SEARS including an assessment of the Project against current sustainability guidelines and the ISCA Rating Tool.

22.2.2 Assessment against current sustainability guidelines

An assessment of the Project against current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport, is provided below including:

- The NSW Government sustainability commitments
- United Nations Sustainable Development Goals
- ISCA – Infrastructure Sustainability (IS) Rating Tool
- TfNSW sustainability commitments, policies, frameworks and guidelines
- Ecologically sustainable development.

NSW Government sustainability commitments

At the state level, there are a range of policies and legislative mechanisms to improve the sustainability and resilience of government including providing for energy efficiency and resource use. The sustainability initiatives and targets developed for this Project as described in **Section 22.2.3** would serve to support a number of key policies including:

- the NSW *Climate Change Policy Framework* – which aims to set out the NSW Government's role in reducing carbon emissions and addressing the risks posed by climate change. Aspirational objectives of this Framework are to achieve net-zero emissions by 2050 and to help NSW become more resilient to a changing climate
- the NSW Government's *Government Resource Efficiency Policy* (GREP) – which aims to reduce operating costs and increase the efficiency of the resources used across government. The Policy addresses key challenges including rising costs of energy, water usage, improving air quality and waste management and driving resource-efficient technology and services through purchasing power
- the *NSW State Infrastructure Strategy 2018-2038* – which sets out the NSW Government's priorities for sustainable growth over the next 20-years including a commitment to improve infrastructure resilience to shocks and stressors including natural hazards such as floods, bushfires, and storms.

United Nations Sustainable Development Goals

At the outset of the Project, a sustainability visioning workshop was held in early 2019 to brainstorm key sustainability strategies and initiatives that could be implemented on the Project to help compliance with ISCA and NSW Government targets. Using the United Nations Sustainable Development Goals (SDG) as a framework, outcomes and strategies were discussed during this workshop which would in turn inform the development of the Project specific SMP. In particular, the SMP would include measures aimed at addressing certain key SDGs such as:

- SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- SDG 7: Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable energy for all

- SDG 8: Decent Work and Economic Growth – Promote sustained, inclusive and sustainable economic growth, full of productive employment and decent work for all
- SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation
- SDG 11: Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient and sustainable
- SDG 12: Responsible Consumption and Production – Ensure sustainable consumption and production patterns
- SDG 13: Climate Action – Take urgent action to combat climate change and its impacts
- SDG 17: Partnerships – Strengthen the means of implementation and revitalise the global partnership for sustainable development.

As TfNSW have committed to adhering to the UN SDGs, incorporating these key measures will further demonstrate this commitment and result in the Project achieving improved sustainability outcomes for the community.

ISCA – Infrastructure Sustainability (IS) Rating Tool

The IS Rating Tool Version 1.2 seeks to embed sustainability into the design, delivery and operations of infrastructure projects. The IS Rating Tool has been designed to help infrastructure meet its full sustainability potential across all project stages, and ISCA offers ratings across the full life cycle of an infrastructure asset.

TfNSW has made a commitment to pursue a formal IS Design and As-Built Rating level of Excellent under Version 1.2 of the IS Rating Tool. This level requires between 50 and 74 verified points to be achieved from a possible 100. The IS Rating Tool awards points towards the overall score against fifteen categories grouped into six themes. This is discussed further in **Section 22.2.4**. Note that at this stage an ISCA IS Operations rating is not currently being pursued for the Project. An Operations rating is based on 12 months of infrastructure operation and can often be sought after the design and as-built ratings, as the final design of the project can influence the operational rating.

TfNSW sustainability commitments and guideline

TfNSW Environment and Sustainability Policy

The TfNSW *Environment and Sustainability Policy* (TfNSW, 2015d) (refer to **Appendix D**) guides projects and services to be delivered in a manner that balances the economic, social and environmental issues to provide a sustainable transport system for NSW. Key objectives from the policy that apply to the Project include:

- minimise impacts on the environment, whether through transport operations, infrastructure delivery, maintenance or corporate activities
- procure, deliver and promote sustainable transport options that promote value for money
- comply with relevant legislations
- develop, expand and manage the transport network in a sustainable and climate change resilient way.

Through the delivery of both the EIS and a formal IS Rating, the Project would address and support the objectives outlined in this policy.

TfNSW Sustainable Design Guidelines

The TfNSW *Sustainability Design Guidelines* version 4 (TfNSW SDGs) (TfNSW, 2017c) seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure projects. The guidelines cover a range of sustainability initiatives and include the following key aims:

- minimising impacts on the environment, whether through transport operations, infrastructure delivery or maintenance

- procuring, delivering and promoting sustainable transport options that achieve value for money and reduced lifecycle costs
- developing, expanding and managing the transport network to be sustainable and climate resilient.

The Project is seeking an ISCA rating under the IS Rating Tool, which is a widely recognised national benchmark, and designed to achieve a similar aim to the TfNSW SDGs of embedding sustainability into projects and assisting projects to reach their full potential in terms of sustainability. As the Project is seeking a rating under ISCA, a rating under the TfNSW SDGs has not been obtained.

Redfern Station Upgrade Project Sustainability Policy

As part of meeting the requirements of achieving an Excellent rating under the ISCA IS Rating Tool, a project-specific Sustainability Policy (Novo Rail, 2019b) has been prepared in conjunction with the SMP. Policy initiatives have been identified across six key categories. These are summarised in **Table 22-2**. Note that the initiatives described below are subject to change during finalisation of the Sustainability Policy. The SMP outlines the roles and responsibilities for how the potential initiatives would be addressed and delivered.

Table 22-2 Sustainability Policy categories and potential initiatives

Category	Potential initiative
Leadership	• visible leadership and drive from all Project personnel involved in the delivery of the asset – we all have a valuable role to play • strive and implement sustainability goals through shared values and beliefs • deliver social outcomes through workforce planning measures in assisting people experiencing barriers or discrimination in the workforce • dedicated resourcing in Project personnel, equipment, innovative technologies and applications in realising sustainability outcomes.
Compliance	• compliance with the requirements of the contractor's agreement with TfNSW, relevant legislation, codes and standards, as applicable to the Project • implementation of robust risk management tools in embracing beneficial sustainability opportunities and proactively mitigating risk in avoiding and minimising pollutants to our local environment, conservation of heritage and the protection and preservation of local biodiversity • implementation of local Project systems in managing local sustainability opportunities and issues in accordance with the Environmental Management System relating to the Project • implementation of the Project's SMP in alignment with the Redfern Station Upgrade Project Sustainability Strategy.
Sustainability performance and reporting	• facilitate and implement sustainability targets under the Project's CEMP and SMP • consistent delivery of works that meets or exceeds defined 'Key Result Areas' for the Project • measure and contribute to NSW carbon emission targets through reducing construction and operation energy use and material use • establishment of open and transparent systems in the proactive reporting of sustainability outcomes including resource savings – material, carbon and water and applicable near-misses and hazards • embedding of sustainability requirements and innovations through all stages of the Project's asset cycle.
Stakeholder engagement, knowledge sharing and transparency	• fostering a knowledge sharing culture through collaboration and engagement of relevant stakeholders • engaging with all our internal and external stakeholders including communicating this Policy to all those working within the Project or affected by the Project.

Category	Potential initiative
Internalisation of project supply chain	• early internalisation of environmental and social procurement requirements and Project expectations through the supply chain • sustainability training realising sustainability knowledge transfer beyond construction contractor • ongoing collaboration within the supply chain in realising sustainability performance outcomes.
Innovative and learning culture	• train our Project team, including suppliers, in sound environmental practice, sustainability requirements and good practice in social procurement • fostering a working environment that encourages and promotes innovation within the sustainability sphere and throughout the Project • implementing a process for achieving continual improvement including the use of lessons learned • identifying good practice and sharing this within the Alliance Normal Operating Procedures and TfNSW.

Ecologically sustainable development

Ecologically sustainable development (ESD) refers to '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' (Commonwealth of Australia, 1992). Four principles have been identified to assist in achieving ESD which are defined in the *Environmental Planning and Assessment Regulation 2000* (NSW) (Part 3 of Schedule 2) and in the *Protection of the Environmental Administration Act 1991*(NSW), these are provided in **Table 22-3**.

Table 22-3 Ecologically sustainable development principles and climate response

ESD Principle	Response
The ***precautionary principle*** – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for not implementing mitigation measures or strategies to avoid potential impacts.	Uncertainty around future changes to the climate have been addressed through the review and selection of future climate scenarios. Mitigation measures and strategies (adaptation actions) to respond to climate change (e.g. increased design temperature ratings) have not been avoided as a result of the existing uncertainty around future changes, but rather provided in response to these changes.
Inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment are equal to or better for the future generations.	By considering future changes in climate within the design, the Project would provide a climate-responsive station for future generations. Furthermore, facilitating access for a broader range of customers (e.g. those with mobility challenges) would encourage non-private vehicle modes of transport – further reducing carbon emissions.
Conservation of biological diversity and ecological integrity – ecosystems, species and genetic diversity within species should be maintained.	The selection of plant species for landscaping has included provision for future changes in the climate (e.g. drought-tolerant). This consideration would help maintain the existing biological diversity and ecological integrity for the areas surrounding the Project into the future.
Improved valuation and pricing of environmental resources – economic values for services provided by the natural environment should be determined, such as the atmosphere's ability to receive gaseous emissions; cultural values; and visual amenity.	Sustainability is considered as part of the full project lifecycle and includes the impacts of the use of materials and resources. Appropriate pricing and economic value of these materials includes reducing demand on fossil fuels and greenhouse gas emissions.

ESD Principle	Response
	The Project is committed to implementing the energy hierarchy principals which include avoidance of energy use, increases in energy efficiency, investigations into the use of renewable energy generation, lower emissions energy sources and offsets, where appropriate.

An assessment of the Project against the principles of ESD for other environmental matters is provided in Section 25.8.5 of **Chapter 25** of this EIS.

22.2.3 Assessment of sustainability risks and opportunities

Table 22-4 provides a summary of sustainability risks and opportunities which would be developed as part the Project SMP to deliver improved sustainability outcomes during the design, construction and operation of the Project. These opportunities have been developed in alignment with the sustainability guidelines and ISCA IS target for the Project as well as in response to the identified sustainability risks.

Table 22-4 Assessment of sustainability risks and opportunities – summary of sustainability initiatives

Category	Sustainability risks	Sustainability initiatives for the Project
Management systems	• adequate management plans/systems are not in place to manage sustainability appropriately, resulting in poor sustainability outcomes.	• an SMP would be developed for the Project, which would identify measures such as knowledge sharing opportunities.
Procurement and purchasing	• the Project uses non-sustainable materials and products, or misses opportunities to deal with suppliers that have sustainability objectives as part of their business plan.	• the Project would integrate sustainability into procurement and purchasing practices such as sustainability supply chain training and identification of sustainability objectives with suppliers.
Climate change adaptation	• the Project is susceptible to climate change risks such as higher temperatures and increased extreme rainfall events.	• development and implementation of climate change adaptation measures (refer also **Section 22.3.6**).
Energy and carbon	• the Project results in excess emissions being released that could have been avoided.	• the SMP would identify energy and carbon reduction targets for the Project.
Water	• the Project uses more water than is required.	• use of non-potable water would be maximised during construction. The SMP would identify water reduction targets for the Project
Materials	• the whole life cycle of materials is not considered in the Project, resulting in unsustainable material/product choices.	• 'whole of life' costing methodologies would inform selection of materials during design and construction of the Project. The SMP would identify material lifecycle impact reduction targets for the Project. Material reuse would be maximised.

Category	Sustainability risks	Sustainability initiatives for the Project
Discharges to air, land and water	• the Project results in environmental impacts (e.g. to air, land and water) that could have been avoided.	• the SMP would identify targets to reduce air, land and water impacts for the Project.
Waste	• the Project produces waste that could have been avoided.	• the SMP would identify waste reduction targets for the Project. Soil reuse would be undertaken.
Ecology	• the Project results in impacts to ecological values associated with the site that could have been avoided.	• the ecological value of the Project site has been assessed (refer **Chapter 16**). Landscaping would consider ecological value and habitat connectivity (note that landscaping is considered in **Chapter 8**, **Chapter 9** and **Chapter 16**)
Community, health, wellbeing and safety	• the Project is detrimental to community welfare.	• the SMP would identify measures to support community health, wellbeing and safety throughout the Project, such as information provided at community events, supporting local enterprise and integration of shading.
Heritage	• opportunities to conserve or facilitate appreciation of heritage values are not released, or heritage values are otherwise diminished (for both Aboriginal and non-Aboriginal heritage).	• the Project would integrate celebration of Aboriginal and European heritage through appropriate design measures (note that Aboriginal heritage and non-Aboriginal heritage are assessed in **Chapter 15** and **Chapter 14** respectively, and that heritage installations are proposed as a part of the Project as described in **Chapter 5**).
Stakeholder participation	• Project stakeholders aren't adequately identified or engaged with.	• the Project would engage with community members during design, including the use of innovative visual aids (note that stakeholder and community engagement for the Project is described in **Chapter 6**).

22.2.4 Infrastructure Sustainability Council of Australia Infrastructure Sustainability Rating Tool

In support of TfNSW's commitment to pursue an IS Design and As-Built Rating level of Excellent under Version 1.2 of the ISCA IS Rating Tool, **Table 22-5** describes the Project alignment to the ISCA IS Rating Tool credit categories. The objectives, targets and initiatives align with credit requirements under ISCA IS v1.2 and aim to balance economic, environment and social issues.

These initiatives and targets would be further refined as part of the design process and committed to in an SMP and included in the contract documents for all detailed design, construction and operations contracts.

Table 22-5 notes where further detail/evidence of how these targets would be integrated into the Project have been addressed in the EIS.

Table 22-5 ISCA credits and potential indicators/targets

Credit category	Indicators/targets	Where addressed in the EIS
Climate Change (Cli-1 and Cli-2)	• identification of key risks and adaptation measures from completed Climate Risk Assessment.	**Chapter 22** (this chapter) - describes climate risks and adaptation measures. **Section 8.4.2** identifies measures developed based on the NSW Government's '*Better Placed*' guidelines and TfNSW's policy document '*Around the Tracks – urban design for heavy and light rail*' which consider climate risks.
Water Use (Wat-1, Wat-2)	• applications for rainwater harvesting are identified • water balance study is undertaken with demonstrated reduction in water usage during construction and operation • identification of potable water replacements.	Rainwater would be harvested for use in toilets, for cleaning and for irrigation as discussed in **Section 8.4.2**.
Water Quality (Dis-1)	• identification of water environmental values • management measures.	**Section 18.3** discusses the water quality in the Project area and applicable catchment areas. **Section 18.5.3** describes performance outcomes and mitigation during construction and operation.
Noise (Dis-2)	• identification of baselines • management measures.	**Section 13.3** identifies sensitive receivers surrounding the Project area and existing background noise levels. **Section 13.5.3** defines measures to mitigate noise and vibration during design, construction and operation.
Vibration (Dis-3)	• identification of baselines/limits • management measures • consideration of human comfort and use of British Standard *BS7385 Evaluation and Measurement of Vibration in Buildings*, and German Standard *DIN4150 Vibration in Buildings - Effects on Structures.*	**Section 13.3** identifies sensitive receivers surrounding the Project area. **Section 13.5.3** defines measures to mitigate noise and vibration during design, construction and operation. **Section 13.2.4** considers human comfort against BS7385, and vibration against DIN4150.
Air Quality (Dis-4)	• identification of baselines • setting of goals and limits (e.g. PM_{10}) • management measures	**Section 19.3** outlines the existing air quality. **Section 19.5** identifies performance outcomes and defines measures to mitigate air quality during construction.

Credit category	Indicators/targets	Where addressed in the EIS
Light Pollution (Dis-5)	• identification of light spill prevention measures • management measures.	**Appendix C** of the EIS describes how light spill has been considered during the design process. **Section 9.5** describes performance outcomes and mitigation in relation to light spill during construction and operation.
Conservation of On-site Resources (Lan-2)	• topsoil to remain productive through management in design and a Soil Management Plan.	**Section 17.5** and **Appendix D** describe soil management and desired performance outcomes for the Project, including erosion measures.
Contamination and Remediation (Lan-3)	• site assessment follows the *National Environment Protection (Assessment of Site Contamination) Measure*, Schedule A: *'Recommended general process for assessment of site contamination'* • remediation options are identified and selected using a sustainability hierarchy.	**Section 17.2** outlines the assessment methodology/guidelines used. **Section 17.5** outlines the approach to management of contamination and a commitment to soil re-use where appropriate.
Flooding (Lan-4)	• flood risk is assessed and measures to mitigate flooding to up and downstream environment during construction and operation are defined • flooding is not worsened as a result of the Project • resilience measures are included (in design).	**Section 18.2.1** identifies the key guidelines and policies used in the assessment of flooding impacts. **Section 18.3** identifies the regional and local drainage and flooding and applicable catchment areas. **Section 18.5.3** describes performance outcomes and mitigation during construction and operation. **Section 18.4.2** shows that the operation of the Project would have a negligible impact on regional flooding and is not expected to have an adverse impact on local flood conditions. Climate change impacts on flood behaviour were also considered.
Waste (Was-1)	• measures to reduce waste during construction and operation are identified • prediction of waste quantities and types • management measures.	**Section 21.4** includes measures to reduce waste during construction and operation **Section 21.4** identifies the waste types likely to be produced during construction and operation, and provides estimated quantities of spoil that would be produced (note that quantities of other waste types would be confirmed during detailed design) **Section 21.5** describes performance outcomes and mitigation in relation to waste reduction during construction and operation.

Credit category	Indicators/targets	Where addressed in the EIS
Ecology (Eco-1 and Eco-2)	• assessment of ecological values and habitat connectivity.	**Section 16.3** identifies the ecological values, including habitat connectivity, present within the locality of the Project. **Section 16.5.3** describes performance outcomes and mitigation to prevent ecological impacts during construction and operation.
Heritage (Her-1, Her-2)	• community heritage values to be identified through consultation and integration into studies • measures to minimise impacts to heritage identified • community and key stakeholders participate in studies.	Section 4 and 5 of **Technical report – Non-Aboriginal heritage**, and **Section 6.4** of the EIS describes heritage values identified by the community and stakeholders and how this feedback is being addressed in the Project and the EIS process. **Section 14.5** describes mitigation measures to minimise impacts to heritage **Chapter 6** describes the community and stakeholder engagement undertaken and proposed for the Project and the EIS process, and how the results of this engagement are being be considered.
Community Health, Wellbeing and Safety (Hea-1, Hea-2)	• measures to positively contribute to community health and wellbeing for one priority issue has been identified and implemented • likelihood of crime has been reduced through implementing appropriate Crime Prevention through Environmental Design guidelines.	**Section 6.4** provides measures incorporated into the design to positively contribute to community health and wellbeing. **Section 8.4.2** and **Appendix C** describes how safety has been improved through the provision of Crime Prevention Through Environmental Design (CPTED) techniques.
Stakeholder Engagement (Sta-1, Sta-2, Sta-3, Sta-4)	• completion of a Stakeholder Engagement Strategy • consultation with and participation from stakeholders • community feedback on effectiveness and satisfaction of communication.	**Chapter 6** describes the engagement strategy, lists stakeholders consulted and details the activities undertaken to solicit feedback. **Section 6.4** provides the results of consultation including feedback from the community and other stakeholders. **Section 6.4.4** describes the specific feedback that has been incorporated into the design as a result of community consultation and engagement.
Urban and Landscape Design (Urb-1, Urb-2)	• an urban and landscape design plan is developed and implemented (for both construction and ongoing management).	**Chapter 8** and **Appendix C** describes how the Project would consist of a well-designed built form and how landscaping would be implemented and managed across the Project.

22.3 Climate change and adaptation

22.3.1 Method of assessment

A climate change risk assessment was undertaken for the Project, which follows the approach detailed within the *Climate Risk Assessment Guidelines* version 3.2 (TfNSW, 2019g). This guideline provides the method of assessment which includes:

- review of the Project definition and local climate context
- identification of risks based on reliable climate data sources and projections, addressing the climate change scenarios already considered within the design phase of the Project
- a climate risk analysis and evaluation of the design
- implementation of adaptation actions to mitigate climate risks
- a review process and gap analysis to further address climate risks.

In addition to the TfNSW *Climate Risk Assessment Guidelines*, the climate change risk assessment has been conducted in line with the following relevant standards and guidelines.

- Australian Standard 5334:2013 *Climate change adaptation for settlements and infrastructure- A risk-based approach*
- TfNSW *Climate Risk Pre-Screening Summary Report Template* DMS-FT-412/1.2 (TfNSW, 2019h)
- AS/NZS ISO 31000:2018 *Risk management – Principles and guidelines*.

These additional documents serve to support the requirements outlined within the ISCA Rating Tool v1.2 (ISCA, 2018) climate change risk assessment (Cli-1) and adaptation options (Cli-2) credits. The tool outlines adaptation measures to address climate change vulnerability and can include both structural and non- structural measures. Structural measures include physical changes to the infrastructure to achieve or facilitate adaptation. Non-structural measures include changes to contracts or implementing an emergency management plan. Credits are applied to provide a specific aspect of sustainability performance within the category such as mitigation measures.

22.3.2 Existing climate trends

The *State of the Climate 2018* report prepared by the CSIRO (CSIRO, 2018) provides an overview of past and current climate trends in Australia. Key points from this report include:

- Australia's climate has warmed by just over one degree Celsius since 1910, causing an increase in the frequency of extreme heat events
- oceans around Australia have warmed by around one degree Celsius since 1910, causing longer and more frequent marine heatwaves
- the oceans around Australia are acidifying (pH is decreasing)
- rainfall during April to October has decreased by 11% since the late 1990s
- extreme fire weather and the length of the fire season have both experienced a long-term increase.

Recent events have highlighted the exposure of Sydney to extreme events and provide an insight to the potential severity of these events to key infrastructure, including the Project. A list of events within the past two years around the Project can be found in **Table 22-6**.

Table 22-6 Recent climate events

Event type	Key impacts
2020	
Bushfire	The 2019 bushfires continued to affect Sydney, NSW and many parts of Australia in January and February 2020. 12.6 million hectares were burnt, with 5.4 million hectares burnt in NSW (ABC, 2020). The conditions that caused these bushfires were 30% more likely to occur due to climate change (Time, 2020).
Storms (East Coast low pressure system)	Approximately 134,000 NSW households suffered power outages in early February 2020, with 50,000 experiencing week-long outages (news.com.au, 2020).
2019	
Bushfire	Some of the worst bushfires in Sydney's history including Australia's highest national annual accumulated Forest Fire Danger Index. These events have resulted in an increase of about 35% of asthma and breathing problems compared to a year earlier (Sydney Morning Herald, 2019a).
Elevated temperatures	Temperatures in Sydney were eight degrees above the average maximum for May, and autumn was significantly warmer than the long-term average, by 1.5 degrees Celsius (The Guardian, 2019a).
Severe storm with hail event	Thunderstorms across most of Sydney with reports of hailstones, severe winds and heavy rain, with 40 flights cancelled due to this weather event (Sydney Morning Herald, 2019b).
Severe winds and dust storm	Severe winds caused more than 17,000 homes and businesses in Sydney's North Shore to lose power SBS News, 2019).
Heat wave	Hottest summer on record for Australia, first season to exceed two degrees Celsius above the long-term average. Rainfall was about 30% below average (ABC News, 2019).
Dust storm	Cool change blew clouds of fine particles in Sydney causing a sharp drop in air quality in the month of February. Air quality warnings were issued for south-west and north-west Sydney. The air quality index was listed as very poor (The Guardian, 2019b).
2018	
Heat wave	Heatwave experienced post-Christmas caused NSW Health to issue an air quality warning for Sydney as ozone levels rose with the extreme heat. Temperatures experienced were 10 degrees Celsius above average (ABC News, 2018).
Severe storm	Storm with significant rainfall, 124 domestic flights cancelled, and 46,000 NSW households had their power supply interrupted in a single weather event dated December 14 (Sydney Morning Herald, 2018a).
Flash flooding	Heaviest November rain in 34 years, flash flooding and close to 100 millimetres of rain in two hours. Widespread transport delays including road closures, cancellation of light rail services, flight delays, train cancellations and delays (Sydney Morning Herald, 2018b).
Severe storm	July wild weather event, with destructive winds of up to 145 kilometres per hour across the Sydney region (news.com.au, 2018).
Severe storm	Thunderstorms in Sydney caused the loss of power to thousands of homes after approximately 22,000 lightning strikes hit the city in a single weather event dated January 9 (The Daily Telegraph, 2018).

22.3.3 Climate variables

A range of climate variables relevant to the Project are listed below in **Table 22-7**.

Table 22-7 Primary and secondary effects from climate variables

Primary climate effect[1]	Secondary climate effect[2]
Mean surface temperature	Extreme temperature and heatwaves
Average annual rainfall	Bushfire weather
Solar radiation	Flood and flash flood events
Extreme rainfall	Drought
-	Storm events and wind speed
-	Evapotranspiration and humidity

Table notes:

[1] Primary effects: are those climate variables that are directly influenced or changed as a result of global warming or climate change. These include air and sea surface temperature, precipitation, wind and solar radiation.

[2] Secondary effects: are those variables that are derived from primary effects which are still influenced by a changing climate. These include matters such as increased risk of bush fire weather and drought.

22.3.4 Climate projections

Climate change risks to the Project have been assessed with reference to current climate science and climate change projections for climate variables relevant to the Project. The climate risk assessment undertaken for the Project has used two data sources for climate projections:

- NSW and ACT Regional Climate Modelling (NARCliM) (NSW Office of Environment and Heritage, 2014) which provides projections at the ten-kilometre resolution for regions across NSW and the ACT
    - based on the location of the Project, the Metropolitan Sydney Region snapshot has been used to obtain projections
- CSIRO and BoM Climate Futures (CSIRO and BoM, 2015) – presented through the Climate Futures tool, which supplements the information available from the NARCliM projections for a number of key climate variables
    - based on the location of the Project, the East Coast – South Cluster Report has been used to inform the assessment.

Modelling based on the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5) provided for a range of scenarios known as Representative Concentration Pathways (RCPs), which were used to define the different projections. The RCPs describe a possible future greenhouse gas emissions trajectory and subsequent radiative forcing. Radiative forcing is a measure of the energy absorbed and retained in the lower atmosphere. Four RCPs are modelled to cover a range of emission scenarios with and without climate mitigation policies. For example, RCP 8.5 is based on minimal effort to reduce emissions; RCP 2.6 requires strong mitigation efforts, with early participation from all emitters followed by active removal of atmospheric carbon dioxide. RCP 2.6 represents a drastic reduction in greenhouse gas emissions and RCP 8.5 represents minimal efforts to reduce global emissions.

For the purposes of this assessment, RCP 8.5 was used to represent the worst-case scenario, and reflects current trends in observed emissions and climate change. Climate projections for RCP 8.5 relevant for the Project can be found in **Table 22-8**.

Understanding the previous events that have impacted the Project area and surrounding, it is likely that future events will become more intense and more frequent. Identified key future climate trends relevant to the Project are likely to influence the risk profile of the Project and include:

- continued increase in temperatures
- more hot days and heatwaves
- increased intensity of extreme rainfall (and ultimately flash flooding)
- harsher fire-weather climate.

Table 22-8 Climate projections –Metropolitan Sydney Region and East Coast – South Cluster

Climate projections	Baseline	Year 2030 Representative Concentration Pathway 8.5	Year 2070 Representative Concentration Pathway 8.5
Mean maximum daily temperature (°C)[1]	22.5 °C	+1 °C (Range of 0.7 °C to 1.3 °C)	+3.1 °C (Range of 2.7 °C to 3.5 °C)
Mean minimum daily temperature (°C)[1]	13.8°C	+1 °C (Range of 0.7 °C to 1.2 °C)	+2.8 °C (Range of 2.1 °C to 3.4 °C)
Mean number of days above 35°C[1]	3.2 days/year	+4 days	+11 days
Frequency of heatwaves (3 consecutive days over 40°C)[2]	2 events/year	+1 to +1.5 additional events per year	+2.5 to +4.5 additional events per year
Drought[3]	3 per decade	+2 to +5 additional events per year	+1 to +9 additional events per year
Soil moisture (%)[2]	Not available	-4.1% (Range of -9.9% to +2.5%)	-8.7% (Range of -15.4% to +2.4%)
Mean annual rainfall (mm)[2]	1,094 mm	-4.5% (Range of -16.1% to +6.5%)	-8.1% (Range of -21% to +11.8%)
Wettest day (24 hour rainfall total)[2]	327.6 mm (from 1986)	+17.9% above baseline	+38.1% above baseline
Hail[4]	89 hail events (between 1990-2007)	No projections available	+6 additional days per year

Notes: Measures are given as an average followed by the predicted range.

[1] CSIRO and BOM – East Coast Cluster Report & Projections

[2] AdaptNSW – Sydney Snapshot and NARCliM Data Projections

[3] CSIRO Marine & Atmospheric Research

[4] NSW Department of Environment, Climate Change and Water

22.3.5 Time scales

To support a comprehensive risk assessment process, the Project's key assets and components were categorised based on their design life. For the purposes of this assessment, the following design lives have been sourced from the Australian Standards and Asset Standards Authority (ASA) Standards and are being applied to the Project:

- signalling – Design life of 20 years
- control, electrical and mechanical infrastructure and systems (e.g. substations), building fixtures (e.g. glazing, cladding, artwork, signage) and landscaping – Design life of less than 30 years
- overhead wiring – Design life of 30 years
- pavement surfaces, buildings and structures (e.g. stairs and concourse), lift shaft, drainage and platform components (e.g. canopy, retaining structures) – Design life of 50 years.

Due to the variance of these design life projections, the projections for the years 2030 and 2070 were selected as the time series to be used to model the Project's climate risk. These years represent short and long-term scenarios, which capture the design life of most of the assets.

22.3.6 Impact assessment

A preliminary risk assessment in accordance with the TfNSW *Climate Risk Assessment Guidelines* was undertaken and subsequently refined and updated based on feedback provided in workshops held on 21 May 2019, 21 June 2019 and 19 February 2020 with multi-disciplinary groups of key stakeholders and Project team members. Risks were rated according to the TfNSW risk matrix in the *Climate Risk Assessment Guidelines*.

There were 34 climate risks identified as part of the risk assessment process for the Project and each risk was assigned a risk rating of low, medium, high or extreme. Risks were grouped by the following climate variables:

- extreme rainfall – 12 risks
- extreme heat – 11 risks
- drought – 7 risks
- severe storms – 4 risks.

Risks were then assigned a rating of low, medium, high or very high, which each have their own tolerance and acceptability in accordance with the *Climate Risk Assessment Guidelines*. This tolerance and response is detailed in **Table 22-9**.

Table 22-9 Risk tolerance and response

Risk rating		Response	Review frequency
A	Extreme - Generally intolerable	Extreme risks are generally intolerable and should be avoided except in extraordinary circumstances. Where the risk has health, safety or environmental consequences the activity must not be undertaken without the explicit approval of the Secretary for TfNSW. An alternative solution must be found and all necessary steps must be taken to reduce the risk below this level without delay.	Monthly
B	High - Undesirable	High risks are undesirable. They can only be tolerated if it is not reasonably practicable to reduce the risk further. Where the risk has health, safety or environmental consequences the activity must not be undertaken without the explicit approval of the relevant Direct Report to the Secretary for TfNSW who is to verify that all reasonably practicable treatments have been implemented. High risks are considered to be on the verge of being unacceptable and must be given immediate priority.	Monthly
C	Medium - Tolerable	Medium risks are tolerable if it is not reasonably practicable to reduce the risk further. Where a risk has health, safety or environmental consequences the activity should be reviewed to determine if the risk can be reduced further and whether all reasonable and practicable controls have been considered and/or applied. Additional treatment measures should be sought if significant benefit can be demonstrated and/or there is an additional treatment measure which is recognized as good practice in other like environments.	Two-monthly
D	Low - Broadly acceptable	Low risks are broadly acceptable. Where the risk has health, safety or environmental consequences control measures should be effective, reliable and subject to appropriate monitoring. If options for further risk reduction exist and costs are proportionate to the benefits, then implementation of such measures should be considered. The risk and its treatments should be subject to appropriate degrees and forms of monitoring to ensure that it remains at this level.	Quarterly

In summary, the risk assessment identified eight Low and 26 Moderate risks (no High or Extreme risks) for the year 2030 projection, and two Low, 26 Moderate and six High (no Extreme) risks for the year 2070 projection.

Table 22-10 presents the medium risks (excluding low risks) identified for the operational phase of the Project for the year 2030 projection. In accordance with the TfNSW *Climate Risk Assessment Guidelines*, low risks have been excluded as they do not require the same level of consideration as the medium, high and very high risks. In addition, in accordance with both the SEARs and ISCA, **Table 22-10** has detailed a number of current and proposed risk treatments (or adaptation actions) that have been identified to help reduce the exposure, likelihood or consequence of the identified medium risks. These treatments may be subject to change (in consultation with external stakeholders) as the Project progresses through detailed design, however risks would be reassessed should any changes be made to the treatments with consideration to the residual risks.

The full risk register is available including all risk ratings and risk treatments for both the years 2030 and 2070 in the *Climate Risk and Adaptation Report: TAP04 Redfern Station Upgrade* (Novo Rail, 2020).

Table 22-10 Climate change risks to Project operation (2030) prior to mitigation and after mitigation

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
003	High heat days may be exacerbated by the 'urban heat island' effects in rail environments, which predominantly comprise of urban pavement and infrastructure and reduced greenery. Extreme heat, prolonged exposure to direct sunlight and high heat days have the potential to cause heat stress in customers and staff, resulting in risks to health. Heat stress in staff members may further lead to deficient performance and consequently, safety concerns. Extreme heat exacerbates dehydration, particularly in the young and elderly.	**C - Tolerable**	The design includes roofing structures in as many locations as possible to increase shading including above the concourse and accessways (stairs/lifts). Glazing of façades on structures and the lifts would be treated to reduce radiation impacts. Glazing would be designed with a low emissivity rating. Programming of active mechanical thermostat for ventilation within lifts would be included in design to achieve thermal comfort. Opportunities to include water stations at Little Eveleigh Street and Marian Street have been identified and would be confirmed during design development. The provision of water stations would minimise risk of dehydration amongst passengers and staff.	**D – Broadly acceptable**
004	Higher temperatures have the potential to elicit heat stress responses from vegetation. This may be expressed as wilting, leaf fall or death of the plant.	**C - Tolerable**	Irrigation systems would not be used in landscaping, however drought resistant and drought tolerant species would be selected for landscaping where appropriate.	**D – Broadly acceptable**
005	Higher temperatures have the potential to compromise the integrity of external façades and buildings fixtures including handrails and roofing material leading to quicker deterioration and cracking. This increases maintenance costs for these assets.	**C - Tolerable**	Perforated aluminium for façade and additional materials selection to be heat resistant. Material specifications and detailed design would account for material movement. Specification of materials would consider environmental conditions. During detailed design, opportunities to include light coloured fixtures and fitting would be explored to reduce wear and tear over time.	**C - Tolerable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
006	Electrical systems at platform level (cabling and wiring, lighting, switchboards, communications, transformers, fire systems) can be affected by increased heat, resulting in failure of installation of the system or degradation of the operation of electronics and reduced running life of equipment.	**C - Tolerable**	Electrical systems would be protected from external elements, located under canopy shading or in temperature-controlled rooms. Design would be in accordance with applicable Asset Standards Authority standards. Transformers to be installed would be designed for outdoor installation.	**D – Broadly acceptable**
007	Increasing and extreme temperatures cause reduced reliability and functionality of forced ventilation/cooling systems in the back of house areas, resulting in reduced thermal comfort for staff and failure to adhere to standards on thermal conditions for plant and equipment which could lead to system failures.	**C - Tolerable**	Mechanical ventilation/cooling would be specified to deal with the predicted extremes within the operational lifespan of the equipment as per applicable Australian Standards. Increased mechanical capacity would accommodate the potential for extreme heat days.	**D – Broadly acceptable**
008	Increasing and extreme temperatures in ambient environment cause sagging of overhead wiring resulting in speed restrictions and operational delays.	**C - Tolerable**	Where impacted, overhead wiring would be designed to ASA Standards T HR EL 08011 ST and EP 08 00 00 01 SP or equivalent which accommodates for the future temperature increases.	**D – Broadly acceptable**
009	Thermal lag from paving and adjacent buildings may cause increased heat at station entrances in semi-enclosed areas (under canopies, lifts and stairways).	**C - Tolerable**	The design would include passive solar measures including inclusion of lighter coloured materials. Where applicable, the concourse and stairways would be naturally ventilated. Soffit insulation for canopy (to be confirmed, subject to design development).	**D – Broadly acceptable**
010	High voltage equipment affected by increased ambient temperature, resulting in degradation of performance and reduced operating life of high voltage equipment.	**C - Tolerable**	Design has considered worst case ambient temperature criteria for high voltage equipment operation according to applicable Australian Standards. The high voltage equipment would be in outdoor pad mounted kiosks designed to Australian Standards.	**D – Broadly acceptable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
011	High voltage cables within cable containment including trenching, cable ladder and enclosed troughing affected by increased ambient temperature, resulting in reduced carrying capacity performance of high voltage cables and reduced operating life.	**C - Tolerable**	For above ground installations, the high voltage cables have been designed to allow for 1000 Watts per square metre constant sun radiant heat at 40 degrees Celsius ambient temperature. For indoor installations, the high voltage cables are within a shaded environment and have been designed to operate at 40 degrees Celsius ambient temperature. For underground installation, the high voltage cables have been designed to operate at 25 degrees Celsius surrounding soil temperature. Design has considered worst case ambient temperature criteria for high voltage equipment operation according to RailCorp's Engineering Standard *EP 00 00 00 13 SP Electrical Power Equipment – Design Ranges of Ambient Conditions*. The cable containment system would allow for a minimum of 30% spare capacity which allows for heat dissipation. When the design life for cable has ended, design assessment and upsizing in cables can be undertaken if climate related design criteria is changed.	**D – Broadly acceptable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
012	Extreme rainfall events have the potential to create flows of water which exceed the capacity of drainage and storm water systems which could become stressed and fail. This may result in localised flash flooding and spills to natural waterways.	**C - Tolerable**	Hydraulic and drainage design would accommodate the additional drainage requirements from new canopy structures and would connect to existing systems. The design would accommodate the 1% Annual Exceedance Probability (AEP) event[1] plus a 10% increase to account for climate change. Hydraulic modelling would be used to influence design control and incorporate water sensitive urban design. An underground rainwater tank would be considered in the design of the Project near the Marian Street entrance adjacent to the services building. The tank would be connected to hydraulics to service the family accessible toilets, hose taps for cleaning the concourse and footbridge surface and any potential landscaping. Design of rainwater tanks would include overflow removal. Rain guards and filters would be included in hydraulic design so that drainage doesn't get clogged during storm events. An Urban Design and Public Domain Plan would be implemented to provide for rainwater harvesting/water storage (e.g. water sensitive urban design) (refer **Appendix C** of this EIS).	**D – Broadly acceptable**
015	Hail event containing fine hail and occurring over a long period of time leads to hail clumps forming into larger blocks of ice, resulting in blockage of drainage channels.	**C - Tolerable**	Gutters would be designed to have overflow allowance and a path of egress to allow water to discharge out. Hail guards would be designed for gutters.	**D – Broadly acceptable**
016	Hail causes damage to platform canopies, glass lifts, facades and (potential) solar PV installations.	**C - Tolerable**	Roof materials would be selected to withstand damage and reduce the likelihood of localised damage and corrosion. Glass would be selected of similar quality to withstand damage for safety reasons.	**D – Broadly acceptable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
017	Increased rainfall and extreme events can affect customer egress and entrances to the station interchange and precincts.	**C - Tolerable**	The proposed drainage infrastructure associated with the station, concourse and station entrances would accommodate the 1% AEP event[1] including a 10% increase to account for climate change.	**D – Broadly acceptable**
018	Inadequate drainage during extreme rainfall events has the potential to cause and increase flooding onto nearby streets damaging roads and infrastructure including houses and commercial buildings, impacting businesses.	**C - Tolerable**	The drainage and hydraulics included in the design would accommodate the 1% AEP event[1] including a 10% increase to account for climate change.	**D – Broadly acceptable**
019	Extreme rainfall events have the potential to cause flooding and restricted access or overcrowding on platforms which increases human health and safety risks.	**C - Tolerable**	The design would incorporate maximum cover where feasible above new infrastructure elements including the concourse and entrance ways including additional canopies.	**D – Broadly acceptable**
020	Extreme rainfall events have the potential to restrict access to the lifts which impacts disabled customers and those carrying prams.	**C - Tolerable**	Lift entrances would be located above flooding levels. Canopy would provide shelter between lift entrances and the proposed concourse.	**D – Broadly acceptable**
023	Extreme rainfall causes water ingress in high voltage cable pit and conduits resulting in high voltage cable operating under water and build-up of water within cable insulation leading to reduced operating life or damage to high voltage cable.	**C - Tolerable**	High voltage cables selected have Polyvinyl Chloride (PVC) sheath which would provide a level of protection from water ingress into cable pits and conduits. High voltage cable pits have been designed with proper drainage to prevent water from over land flow entering cable ingress into pits. The pit lids and conduit joints have been designed with water sealing function to prevent water ingress. High voltage system has been designed to allow for redundancies in the event of feeder failure.	**D – Broadly acceptable**
025	Extended drought conditions can damage or kill vegetation species and can make it difficult to establish new plantings.	**C - Tolerable**	Appropriate native vegetation would be selected for landscaping with consideration to drought tolerant species.	**D – Broadly acceptable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
026	Increased drought conditions have the potential to cause an increase in the severity or occurrence of dust storms which can impact the mechanics in lift systems causing them to shut down and not operate.	**C - Tolerable**	Maintenance activities would be scheduled following events to clean or minimise ongoing build-up of dust on machine parts including filters.	**D – Broadly acceptable**
027	Increased drought conditions have the potential to cause an increase in the severity or occurrence of dust storms which can accumulate on canopies requiring increased maintenance.	**C - Tolerable**	Maintenance and cleaning of canopies would occur following extreme events to minimise impacts from accumulation of dust on canopies.	**D – Broadly acceptable**
028	Dust from storms can accumulate on the overhead wiring which inhibits insulation and can create live wires. Service shutdowns or delays would be required for maintenance.	**C - Tolerable**	Where impacted, overhead wiring would be designed to ASA Standards T HR EL 08011 ST and EP 08 00 00 01 SP or applicable which accommodates for the future temperature increases.	**D – Broadly acceptable**
029	Dust storms, when combined with extreme weather events such as rain or storms can create mud and slurries which result in slipping hazards for pedestrians, customers and staff.	**C - Tolerable**	Maintenance and cleaning of stairs and surfaces would occur following extreme events to minimise impacts from accumulation of dust and slurries causing slipping. Stair treads would be designed to ASA standards for safety during in extreme events.	**D – Broadly acceptable**
030	High voltage cables within cable trenching affected by increased soil thermal resistivity resulting in reduction of the current carrying capacity performance of high voltage cables and reduced operating life.	**C - Tolerable**	For underground installation, the high voltage cables have been de-rated at 1.2K.m/W soil thermal resistivity. Designs for high voltage cables would be in accordance with RailCorp's Engineering Standard *EP 00 00 00 13 SP Electrical Power Equipment – Design Ranges of Ambient Conditions*. Cable containment system would allow for a minimum 30% spare capacity which allows for heat dissipation. When design life for cable is ended, assessment and upsizing in cables can be done if climate related design criteria is changed.	**D – Broadly acceptable**

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
031	Severe wind and storms pose a human health risk to customers and staff who will attempt to seek shelter and be at risk in bottle necks as people seeking shelter on the bridge or platforms could cause congestion and customers may hurt themselves or loose belongings in the process.	**C - Tolerable**	Design would provide shelter on platforms (where impacted), entry and exit points and the new concourse. Shelter from severe storms would include linking canopies to provide undercover space.	**C - Tolerable**
033	Severe storms causing wind, lightning, rail and hail could cause increased deterioration of the concourse.	**C - Tolerable**	Roof materials would be designed to provide endurance from extreme wind.	**D – Broadly acceptable**
034	Rain and hail could cause slip and fall hazards on surfaces such as pathways, walkways, stairs, etc. causing health incidents to customers and staff.	**C - Tolerable**	Maintenance and cleaning of stairs and surfaces would occur following extreme events to minimise impacts from accumulation of water causing slipping. Stair treads would be designed to ASA standards for safety during in extreme events.	**D – Broadly acceptable**

Notes:

[1] The majority of the Project area is not affected by 1% AEP flood event levels – refer **Chapter 18** Flooding hydrology and water quality of this EIS.

22.3.7 Residual risk assessment

A residual risk assessment for the Project was undertaken to apply the relevant risk treatments identified in the above section for all moderate risks (noting that there were no very high or high risks). Risk treatments have been specifically identified and incorporated in the design to address particular climate change risks, which satisfies the SEARs. As a result, the risk treatments have reduced the overall risk ratings from eight low and 26 moderate risks in the year 2030 to a revised rating of 32 low and two moderate risks. It is noted that there are no residual very high or high risk ratings remaining for the year 2070 projection.

The two remaining moderate (i.e. “Tolerable”) risks would be reviewed during detailed design to determine if the risk can be reduced further and whether all reasonable and practicable controls have been considered and/or applied.

22.4 Management and mitigation

22.4.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

The requirement for the contractor to develop an SMP is outlined in Section 3.2 of the CEMF.

The chapter includes a compilation of the performance outcomes as well as mitigation measures to be included in this plan.

22.4.2 Performance outcomes

The performance outcomes for the Project in relation to climate change and sustainability include:

- the Project reduces the NSW Government’s operating costs and ensures the effective and efficient use of resources
- conservation of natural resources is maximised
- the Project is designed, constructed and operated to be resilient to the future impacts of climate change.

The Project would be designed, constructed and operated to achieve these performance outcomes.

22.4.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction and operation of the Project are provided in **Table 22-11**.

The identified sustainability initiatives for the Project would be implemented through the SMP. The sustainability initiatives would align with targeting an IS Rating of Excellent.

Table 22-11 Mitigation measures

Reference	Mitigation measure	Applicable location(s)
Construction		
SCC1	Sustainability initiatives would be incorporated into the detailed design and construction of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.	All
SCC2	A rating level of ‘Excellent’ would be targeted under version 1.2 of the IS Rating Tool.	All
SCC3	A workforce development and industry participation strategy would be developed and implemented during construction.	All

Reference	Mitigation measure	Applicable location(s)
SCC4	Adaptation measures, as outlined in the TfNSW *Climate Risk Assessment Guidelines*, would be further assessed during detailed design and where practicable incorporated into the detailed design and construction of the Project.	All
Operation		
SCC5	Sustainability initiatives would be incorporated into the operation of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.	All
SCC6	Adaptation measures, as outlined in the TfNSW *Climate Risk Assessment Guidelines*, would be further assessed during detailed design and where practicable incorporated into the operation of the Project.	All
SCC7	Periodic review of climate change risks would be undertaken during operations to ensure ongoing resilience to the impacts of climate change.	All