Transport Asset Standards Authority

T MU EN 00008 ST

Standard

Sustainability Assurance Requirements

Version 1.0

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Standard governance

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Document history

Version	Summary of changes
1.0	First issue.

Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the *ASA Charter*, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW's governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW's process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW's Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset's whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

This document provides the sustainability assurance requirements for new assets or upgrade of existing assets and delivery of transport services on the TfNSW Transport Network. It outlines the key sustainability areas on which the sustainability assurance should be based.

This standard is a first issue.

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1. Introduction

Sustainability for Transport for New South Wales (TfNSW) has the same meaning as ecologically sustainable development (ESD).

ESD is defined in the *Protection of the Environment Administration Act 1991* (NSW) as the effective integration of social, economic, and environmental considerations in decision-making processes. This Act also stipulates the following four principles to be used as a guide to decision making and actions for sustainability:

- the precautionary principle
- inter-generational equity
- conservation of biological diversity and ecological integrity
- improved valuation, pricing and incentive mechanisms

For further information on the ESD principles, refer to Part 3, Section 6(2) of the Act.

This document provides a system that enables the integration of TfNSW key sustainability areas in Transport decision-making. These key sustainability areas are identified in the TfNSW *Environment and Sustainability Policy Framework* and support TfNSW *Future Transport Strategy 2056*.

These key sustainability areas are the crucial factors on which the sustainability assurance requirements will be based as part of the Transport Network Assurance Committee (TNAC) assurance process as stipulated in T MU AM 04001 PL *TfNSW Configuration Management Plan*.

Implementation of solutions to address TfNSW key sustainability areas generates credit points under the TfNSW *Sustainable Design Guidelines*, Infrastructure Sustainability Council of Australia (ISCA) rating tool and other sustainability rating tools.

The sustainability assurance requirements also include the Infrastructure New South Wales (INSW) gateway review process. The INSW gateway review is a NSW Treasury requirement for major capital projects with a value of $10 million or more. INSW has prescribed a series of baseline sustainability requirements that need to be implemented and reported on at each stage of the asset life cycle.

2. Purpose

The purpose of this document is to do the following:

- enable the integration of TfNSW key sustainability areas into TfNSW decision-making processes
- facilitate the submission of requirements in TfNSW configuration management gates

- ensure that TfNSW meets its obligation under the *Transport Administration Act 1988*, which requires public transport agencies *"to promote the delivery of transport services in an environmentally sustainable manner"*
- demonstrate how TfNSW contributes to achieving ESD
- support Future Transport's six customer outcomes including sustainability
- support the Greater Sydney Commission's 10 directions for the metropolis of three cities and the Commission's liveability, productivity and sustainability framework (both the directions and the framework are described in the Commission's publication *A Metropolis of Three Cities – connecting people*)
- support the regional growth plans for NSW

2.1. Scope

This document outlines TfNSW sustainability challenges and opportunities presented as key sustainability areas. These key sustainability areas are based on the *Transport Environment and Sustainability Policy Framework* and *Future Transport Strategy 2056* and its supporting plans.

This document provides the key activities and corresponding evidence required as part of the TfNSW assurance gates. The sustainability assurance requirements align with INSW gateway review requirements.

2.2. Application

This standard applies to all transport proposals, projects, and programs involving configuration changes that affect the TfNSW Transport Network. This standard applies to all of TfNSW or its representatives and service providers to TfNSW that are proposing an asset change.

3. Reference documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

International standards

AS ISO 14020 Environmental labels and declarations - General principles

Transport for NSW standards

T HR MD 10001 GU Glossary of Defined Terms - Competency Management

T MU AM 01001 ST Life Cycle Costing

T MU AM 01005 ST Asset Handover Requirements

T MU AM 04001 PL TfNSW Configuration Management Plan

T MU EN 00005 ST Ambient Environmental Conditions

T MU EN 00007 GU Integrating Green Infrastructure

T MU EN 00008 F1 Sustainability Checklist for the Demand / Need Stage

T MU EN 00008 F2 Sustainability Checklist for the Plan Stage

T MU EN 00008 F3 Sustainability Verification and Validation Checklist for the Accept Phase

T MU RS 17002 ST Prohibited and Restricted Materials

T HR SS 80001 ST Infrastructure Lighting

TN 031: 2016 Requirements for photovoltaic installations connected via inverters to the RailCorp low voltage (LV) distribution network

Legislation

Environmental Planning and Assessment Act 1979

Protection of the Environment Administration Act 1991

Transport Administration Act 1988

Work Health and Safety Regulation 2011

Other reference documents

Calkins M 2009, Materials for Sustainable Sites: A Complete Guide to the Evaluation, Selection, and Use of Sustainable Construction Materials, Wiley

Carbon Market Institute 2018, Policy Landscape, marketplace.carbonmarketinstitute.org/policy-landscape

Department of the Environment and Energy 2018, Carbon Offsetting, http://www.environment.gov.au/climate-change/government/carbon-neutral/ncos-eligible-offsets

Department of Planning and Environment, Planning for the future of regions across NSW, http://www.planning.nsw.gov.au/plans-for-your-area/regional-plans

Greater Sydney Commission 2018, A Metropolis of Three Cities – connecting people

Note: A Metropolis of Three Cities – connecting people is supported by five district plans: Western City District Plan, Central City District Plan, Eastern City District Plan, North District Plan, and South District Plan.

Infrastructure NSW 2017, Project Assurance, http://infrastructure.nsw.gov.au/project-assurance

Infrastructure NSW 2018, State Infrastructure Strategy 2018-2038

Infrastructure Sustainability Council Australia 2017, IS Rating Tool

Office of Environment and Heritage 2014, NSW Government Resource Efficiency Policy

Productivity Commission 2006, Waste Management, Report No. 38, Canberra

Transport for NSW 2013, Environment and Sustainability Policy Framework

Transport for NSW 2016a, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives

Transport for NSW 2016b, Transport Sustainable Procurement Policy

Transport for NSW 2017, Sustainable Design Guidelines

Transport for NSW 2018a, Asset Management Policy (document number CP14005.2)

Transport for NSW 2018b, Future Transport Strategy 2056

Transport for NSW 2018c, Regional NSW Services and Infrastructure Plan

United Nations 2005, Millennium Ecosystem Assessment, technical volumes and reports

Wuppertal Institute 2018, Calculating Resources, wupperinst.org

4. Terms and definitions

The following terms and definitions apply in this document:

ASA Asset Standards Authority

CCHP combined cooling, heating and power (also known as trigeneration)

CM configuration management

competent person a person who has competence in line with T HR MD 10001 GU *Glossary of Defined Terms - Competency Management*

configuration the interrelated functional and physical characteristics of assets that form part of TfNSW Transport Network

configuration management coordinated activities to direct and control configuration changes of transport assets

DfD design for disassembly

ecosystem services processes by which the environment produces resources utilised by humans such as clean air, water, food and materials (*Millennium Ecosystem Assessment*)

EIA environmental impact assessment

embodied energy total energy consumed in raw material acquisition, manufacture, transport, and disposal of a material/product (Calkins M 2009)

ESD ecologically sustainable development; the effective integration of social, economic and environmental considerations in decision-making processes (section 6(2) of the *Protection of the Environment Administration Act 1991*)

Forest Stewardship Council internationally recognised not-for-profit organisation established in 1993 to develop standards to promote responsible management of the world's forests

GHG greenhouse gas

heatwave three or more days of high maximum and minimum temperatures that are unusual for that location (Bureau of Meteorology)

Intergovernmental Agreement on the Environment (IGAE) an agreement between the Commonwealth, the States and the Territories reached in May 1992 which articulates the principles the parties agree should guide the development and implementation of environmental policy and programs, including adoption of sound practices and procedures as a basis for ESD

MIPS material input per unit service; a measure for the overall natural resource use of products and services. The material intensity analysis is used to calculate the material footprint of any economic activities in production and consumption (Wuppertal Institute 2018)

operational energy energy use during the operation stage of the TfNSW asset

passive design design approach that uses natural elements, often sunlight, to heat, cool, or light a structure

SMP sustainability management plan

TfNSW Transport for NSW

TfNSW Transport Network the transport system (transport services and transport infrastructure) owned and operated by TfNSW, its operating agencies or private entities upon which TfNSW has power to exercise its functions as conferred by the Transport Administration Act or any other Act

5. Sustainability assurance requirements

TfNSW sustainability assurance requirements are linked to the TfNSW configuration management (CM) gates at each asset life cycle stage, as shown in Figure 1.

Figure 1 shows seven defined CM gates that have been established for the management of configuration changes to TfNSW networks. The gates are identified sequentially from CM gate 0 to CM gate 6. All stages of an asset life cycle are covered by the defined gates. Responsibility for gates may vary during the life of an asset.

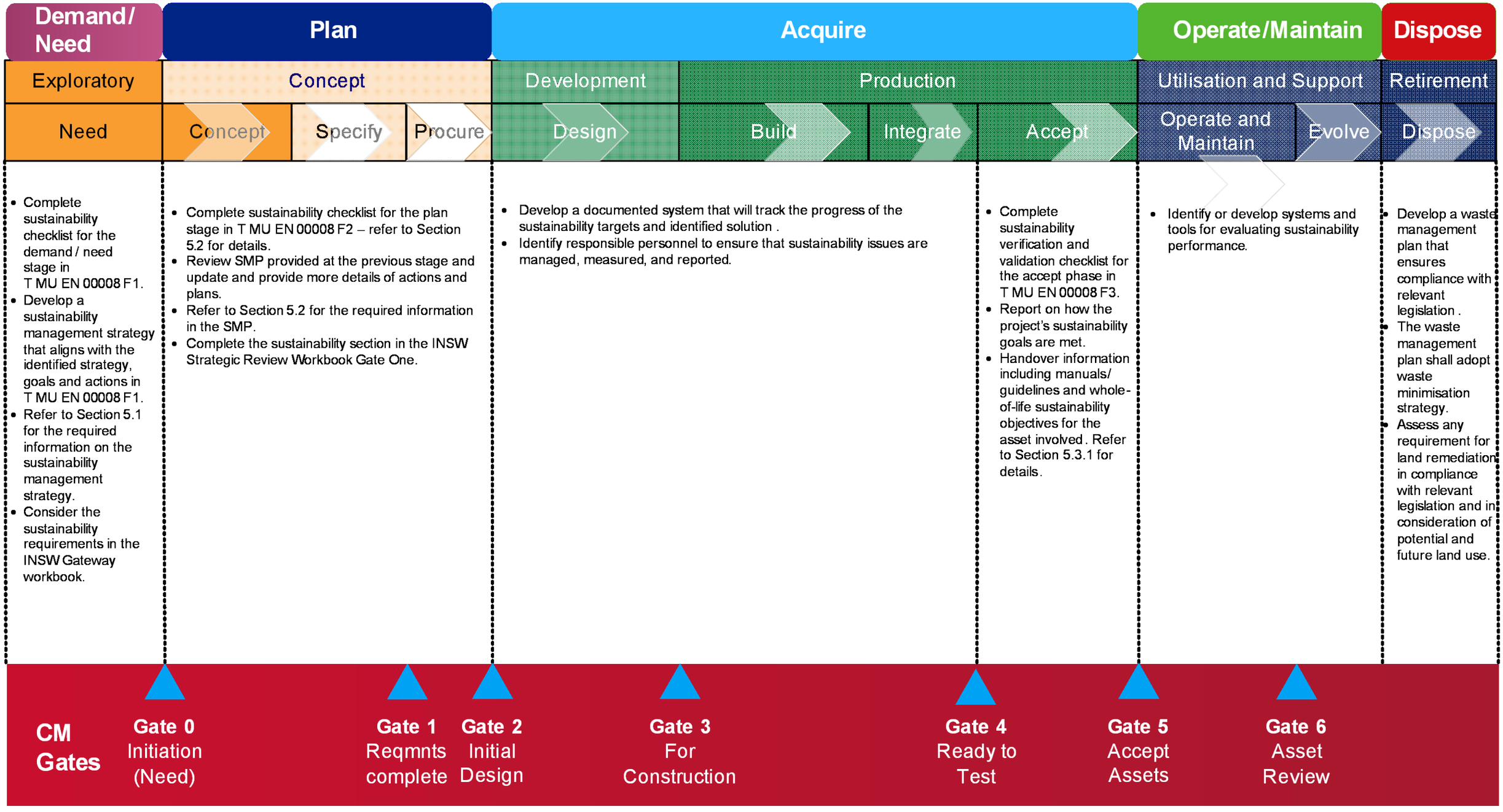

Figure 1 - Asset life cycle and configuration management gates

The key sustainability areas (discussed in Section 6) shall be embedded within each stage of the TfNSW asset life cycle and evidence shall be submitted at the TfNSW configuration management gates.

As indicated in Figure 1, sustainability considerations shall be embedded at the beginning of the demand / need stage. To facilitate this, projects without an in-house environment or sustainability specialist or both, shall commence engagement and collaboration with the Planning, Environment, and Sustainability section in Infrastructure and Services division at TfNSW at the beginning of the demand / need stage. This is to ensure that sustainability risks and opportunities are identified early to maximise benefits and avoid additional costs.

5.1. Demand / need stage

The following sustainability assurance activities shall be carried out at the demand / need stage and evidence shall be made available at the CM gate 0:

- Complete the sustainability checklist in T MU EN 00008 F1 *Sustainability Checklist for the Demand / Need Stage* to inform sustainability strategy, goals, and intended actions. The completed checklist shall be made available at the CM gate 0 review.
- Develop a sustainability management strategy that aligns with the identified strategy, goals and actions in the checklist in T MU EN 00008 F1. The sustainability management strategy shall be completed by a competent person (that is, an environment or sustainability specialist or both) and approved by the project director (preferably) or the project manager or similar position and shall be made available at the CM gate 0 review.
- A competent person may be an in-house resource from the Planning, Environment, and Sustainability section in Infrastructure and Services division at TfNSW or an external service provider.
- The sustainability management strategy shall include information on how the established sustainability objectives will be incorporated as the proposal progresses to the plan and acquire stages.
- Include explanation in the sustainability management strategy on how the proposed transport solution fits in the integrated transport and land use planning for the district or precinct. Refer to Section 7 for more information on integrated transport and land use planning.
- The sustainability management strategy shall include discussion on the whole-of-life considerations and benefits. Refer to Section 8 for more information on whole-of-life approach.
- Using the completed checklist in T MU EN 00008 F1 as a guide, incorporate the goal/strategy for each of the key sustainability areas into the proposed project/program's governance framework. For example, system requirements, assurance governance plan,

project governance plan, business case, and business requirements. Refer to Section 9 for more information on project governance.

- For projects costing more than $10M, complete the sustainability section in the appropriate INSW gate. For guidance, refer to the 'Resources' tab on the Project Assurance page on the INSW website at http://infrastructure.nsw.gov.au/project-assurance.

5.2. Plan stage

The following sustainability assurance activities shall be carried out at the plan stage and evidence shall be provided at CM gate 1:

- Review and clarify the sustainability strategies, goals and intended actions identified at CM gate 0 by completing the checklist in T MU EN 00008 F2 *Sustainability Checklist for the Plan Stage*. The completed checklist shall be made available at CM gate1.
- Develop a sustainability management plan (SMP) based on the strategies, goals and intended actions identified at CM gate 0 and revised in the sustainability checklist for the plan stage. The SMP shall have options and alternatives identified to meet the proposal's sustainability management strategy. Consider benchmarking (locally or internationally) to compare what similar projects have achieved in terms of sustainability. Include any specific actions or mitigations identified in the environmental impact assessment (EIA).
- The SMP shall be completed by a competent person (that is, an environment or sustainability specialist or both) and approved by the project director (preferably) or project manager or similar position and shall be made available at CM gate 1.
- A competent person may be an in-house resource from the Planning, Environment, and Sustainability section in Infrastructure and Services division at TfNSW or an external service provider.
- In the SMP, include discussion on how the proposal will incorporate the established sustainability objectives in the design, build, and integrate phases of the acquire stage.
- The SMP shall include discussion on the whole-of-life considerations and benefits. Refer to Section 8 for more information on whole-of-life approach.
- Sustainability solutions shall consider the whole-of-life cost compared to its benefits (including environmental and social externalities). Future costs shall include the operating and maintenance costs and disposal costs as well as likely cost impact to other parts of the TfNSW Transport Network. Refer to Section 8.2 for more information.
- Incorporate the sustainability strategies and goals into the project governance framework (for example, system requirements, assurance governance plan, business case, and business requirements) for the proposal and include this framework in the CM gate submission. Refer to Section 9 for more information on project governance.

- Include in the SMP discussion on how the planning stage of the proposed transport solution has considered the integrated transport and land use planning for the district or precinct. Refer to Section 7 for more information on integrated transport and land use planning.
- Where required (for projects costing more than $10M), complete the sustainability section in the appropriate INSW gate. For guidance, refer to the 'Resources' tab on the Project Assurance page on the INSW website at http://infrastructure.nsw.gov.au/project-assurance.
- Include the identified sustainability goals in the procurement contracts for the proposal.

5.3. Acquire stage

The following sustainability assurance activities shall be carried out in the acquire stage and evidence shall be made available at the CM gate 2, CM gate 3, and CM gate 4:

- Identified sustainability goals and associated actions shall be followed through and revisited.
- There shall be documented evidence that tracking processes and competent persons are in place to ensure that sustainability outcomes are managed, measured and reported in a transparent way.
- Sustainability shall be integrated into risk management.
- Identified responsible personnel shall be in place to ensure that sustainability issues are managed, measured and reported in a transparent way.

5.3.1. Accept phase

The following sustainability assurance activities shall be carried out in the accept phase of the acquire stage and evidence shall be made available at the CM gate 5:

- Complete the sustainability verification and validation checklist for the accept phase in T MU EN 00008 F3 *Sustainability Verification and Validation Checklist for the Accept Phase* to validate and verify that outcomes of the sustainability goals identified in the SMP are met.
- Review the SMP and report on how the project has met its sustainability objectives as stated in the SMP. This report shall be completed by a competent person (that is, an environment or sustainability specialist or both) and approved by the project director (preferably) or project manager or similar position and shall be made available at CM gate 5.

- Manuals and guidelines relating to the operations and maintenance of any sustainability features of the asset involved shall be handed over in accordance with T MU AM 01005 ST *Asset Handover Requirements*.
- Information relating to the asset's whole-of-life sustainability objectives shall also be handed over in accordance with T MU AM 01005 ST.

5.4. Operate / maintain stage

Operators and maintainers shall support and maintain the sustainable intent of the TfNSW asset design by implementing the required maintenance for the asset.

Operators and maintainers shall identify or develop systems or tools for evaluating sustainability performance such as the following:

- integration of sustainability in an asset's risk management
- having sustainability objectives, processes and people in place to ensure that sustainability issues are managed, measured and reported in a transparent way

5.5. Dispose stage

At the asset disposal stage the following activities shall be carried out and evidence shall be made available at the CM gate reviews:

- develop a waste management plan that ensures compliance with relevant legislation and shall adopt a waste minimisation strategy by reusing or recycling materials where it is cost effective
- assess any requirement for land remediation in compliance with relevant legislation and in consideration of potential and future land use

6. Key sustainability areas

Section 6.1 to Section 6.7 lists the key sustainability areas for TfNSW and these sustainability areas are based on the sustainability themes in the Transport *Environment and Sustainability Policy Framework*. These key sustainability areas shall be incorporated into the transport planning and design solution and evidence shall be submitted as part of the assurance requirements.

Most of the sustainability areas affect environmental, social, and economic aspects of sustainability. For example, while greenhouse gas emissions only directly impact the environment, the high greenhouse gas concentration in the atmosphere is highly attributed to global warming that is causing significant changes in the climatic conditions around the world. This in turn affects human health (social concern) and increases the cost risk associated with physical damage to assets and service reliability (an economic concern).

Most solutions to manage sustainability challenges will bring about benefits for the economy, society, and environment. An example is the solution to integrate 'green infrastructure' into the TfNSW Transport Network (for an explanation of green infrastructure, refer to T MU EN 00007 GU *Integrating Green Infrastructure*). While direct environmental benefits are apparent with this sustainable solution, it also provides very important social and economic benefits for the community by way of health improvement and resilience to extremely hot days (a social benefit) and financial savings from avoided health costs and increased property values (an economic benefit).

When deliberating solutions to TfNSW's key sustainability areas, decision makers shall:

- investigate alternatives and compare the strengths and weaknesses of each
- make decision in a larger context of the asset's whole-of-life (see Section 8)
- balance cost, risk and sustainable performance (see Section 8)
- align with TfNSW's *Asset Management Policy*

6.1. Climate change resilience

Transport assets in NSW are sensitive to the following climate variables with the level of impact varying depending on the location and the asset life expectancy:

- extreme heat or heatwaves
- extreme precipitation and flooding
- storm surge
- sea level rise
- damaging storms (wind, lightning)
- bushfire

These climate variables have the potential to significantly affect:

- transport assets' functionality, reliability and integrity
- transport assets' whole-of-life costs
- transport demand
- ability to meet customers' needs and expectations

To support NSW Government aspirational long-term objectives (that is to achieve net-zero emissions by 2050 and to make NSW more resilient to a changing climate) and TfNSW *Future Transport Strategy 2056* objective (that is, all investment across the transport cluster will improve the resilience of the network in a changing climate) proposals for new assets and proposals to modify existing assets shall include an assessment of climate change risks and the

proposals shall be planned and designed with appropriate mitigation and adaptation measures commensurate to the level of the climate risk.

Authoritative projections of future climate may be found in the websites of the NSW Office of Environment and Heritage (OEH) Adapt NSW, NSW and ACT Regional Climate Modelling (NARCliM), Commonwealth Scientific and Industrial Research Organisation (CSIRO), National Climate Change Adaptation Research Facility (NCARF), and Australian Government Geoscience Australia.

One of the solutions that will contribute to climate change resilience is the integration of green infrastructure in the transport network. Refer to T MU EN 00007 GU *Integrating Green Infrastructure* for guidance.

For information on the ambient environmental conditions in which TfNSW assets will operate, and for which they need to be designed, refer to T MU EN 00005 ST *Ambient Environmental Conditions*.

6.2. Energy management

Energy management is applicable for all assets that consume operational energy.

Proposals for new assets or asset modification that consumes operational energy shall have an energy strategy that contributes to reduce energy demand particularly during peak energy usage periods.

When prioritising options, the following energy hierarchy shall be adopted:

a. avoiding or reducing energy usage

b. improving energy efficiency

c. sourcing low carbon energy onsite

d. sourcing low carbon energy offsite

e. using carbon offsets

Reducing energy usage results in significant cost savings over the whole of the asset life. Solutions to manage energy issues including using low carbon sources shall consider the long-term benefits of reduced consumption and overall whole-of-life cost not just the construction cost.

6.2.1. Avoiding or reducing demand through design (passive design)

Options that minimise energy demand over whole of the asset life shall be taken into account when designing assets. A number of passive design strategies can be adopted depending on the site. For example, when designing a building or facility make use of natural light, external air flows and consider thermal properties of materials.

6.2.2. Energy efficiency

After passive design strategies are optimised, systems and appliances that maximise energy efficiency shall be taken into account. Consider energy efficient system solutions such as regenerative braking technology on rolling stock and high efficiency distribution systems (such as high efficiency transformers, active controls for voltage and reactive power management). Appliances and equipment shall be at least the market average star rating. Refer to the NSW *Government Resource Efficiency Policy* published by the Office of Environment and Heritage for minimum requirements relating to offices, electrical equipment and appliances.

Furthermore, the energy efficiency requirements specified in T HR SS 80001 ST *Infrastructure Lighting* shall be implemented.

6.2.3. Sourcing low carbon energy onsite

After the energy demand is minimised, the next option is to consider a mechanism to enable the use of renewable generation onsite to minimise attributable greenhouse gas emissions. Examples include use of combined cooling, heating and power (CCHP) or onsite renewable energy sources such as photovoltaic systems, waste to energy, and so on.

Onsite photovoltaic installations on Sydney Trains Network shall comply with specifications in TN 031: 2016 *Requirements for photovoltaic installations connected via inverters to the RailCorp low voltage (LV) distribution network*.

6.2.4. Sourcing low carbon energy offsite

When the options explained in Section 6.2.1 to Section 6.2.3 are exhausted or are not practicable, the next option is to consider offsite renewable energy for the remaining energy demand. The proportion of renewable energy could be from 6 percent (NSW Government policy minimum for government agencies) to 100 percent. The purchase of GreenPower (accredited program that enables the purchase of renewable energy) is an easy way to do this; however other methods include solar farms, wind farms, and harnessing geothermal energy.

6.2.5. Carbon offsets

The last option in energy management is to consider abatement of any remaining energy emissions that cannot be avoided where practicable and feasible, through the purchase of a recognised offset mechanism. To better understand the carbon offset mechanisms at the federal and state levels, refer to Australia's Carbon Marketplace website (http://marketplace.carbonmarketinstitute.org/policy-landscape/).

6.3. Liveability

The *Future Transport Strategy 2056* recognises the role of transport to improve the liveability of communities across the state. The term 'liveability' has the same meaning as defined in the *Future Transport Strategy 2056*, where it is defined within the context of land use planning as focusing on quality of life within a given area considering social, economic and environmental factors. It encompasses the impact of the built environment on human health and community well-being.

6.3.1. Walkability and cyclability

One of the key outcomes specified in *Future Transport Strategy 2056* is to encourage active modes of transport such as walking and cycling. The active transport mode offers environmental benefits (reduces overall car travel thus reduces greenhouse gas (GHG) emissions), social benefits (improves general health and well-being), and economic benefits (reduces traffic congestion and provides health savings).

The degree of walkability and cyclability of an area is greatly influenced by the distance to destinations, street attractiveness, sun shading, safety, and ambient environment quality.

6.3.2. Heritage

When changes are proposed to items that have heritage significance, transport design shall comply with the relevant statutory heritage legislation and its requirements.

The transport design shall respect and protect elements of heritage significance. The design shall aim for the continued use of heritage items, or sensitive adaptation to new uses of heritage places and items so as to avoid unnecessary demolition and the introduction of new construction activities and materials. Key sustainability aspects of heritage items include the following:

- the savings derived from using and re-using existing heritage fabric, including the embodied energy within the structure and materials
- taking the opportunity to improve heritage assets by increasing efficiency, particularly in relation to thermal performance or energy consumption

Adaptive re-use of heritage items to a new use shall be guided by the identified heritage significance of the heritage item, and shall also include the long-term economic sustainability of the new use.

6.3.3. Green infrastructure

One solution that will contribute to liveability is the integration of green infrastructure into the TfNSW Transport Network. Refer to T MU EN 00007 GU *Integrating Green Infrastructure* for

more details. Green infrastructure encourages active transport, provides visual amenity, and contributes to place making.

6.3.4. Place making

A multi-faceted approach which capitalises on a local community's physical and human resources is needed in order to create public spaces that promote health and well-being.

Future Transport Strategy 2056 refers to place making as the development and management of the built environment to influence the character or experience of places. It entails the preservation or enhancement of public spaces, by making such areas more accessible, attractive, comfortable and safe. To help achieve this, refer to the Movement and Place framework specified in *Future Transport Strategy 2056*.

6.4. Resource management

Resource management for the purposes of this document include minimisation of resource use by adoption of reduce, re-use, and recycle or repurpose hierarchy when dealing with waste, materials management, and water resource use.

6.4.1. Materials

The following principles are provided as a guide to material selection, noting that the selection of material is considered fit for purpose:

- design for disassembly and retrofit

  Design for disassembly (DfD) and retrofit means designing transport assets to facilitate future change and the eventual dismantlement (in part or whole) for recovery of systems, components and materials. To accomplish this, the design process should include developing the assemblies, components, materials, construction techniques and information and management systems.

- design for the whole-of-life

  Designers and contractors should ensure that the design components and parts are easy to replace and suppliers of those components and parts are available for the long term, to avoid replacing a whole structure which will result in undue waste.

- minimise use of resources

  During design, options that reduce the use of resources without compromising the asset functionality, safety and reliability should be chosen. Options to consider include the following:

  - reducing the size of a structure
  - retrofitting or repurposing an existing asset

- re-using materials or using waste as feedstock for new products
- pre-fabrication off-site

- low ecological impact

  Consideration should be given to the use of materials and products as follows:

  - sustainably manufactured (for example consider eco-labelled products – refer to AS ISO 14020 *Environmental labels and declarations - General principles*)
  - using timber certified by the Forest Stewardship Council or by the Programme for the Endorsement of Forest Certification (both internationally recognised not-for-profit organisations established to develop standards to promote responsible management of the world's forests)
  - low embodied energy
  - materials produced with energy from renewable sources
  - use of local materials
  - low material intensity such as material input per unit of service (MIPS), which is a measure of the overall natural resource use of products and services

- minimal environment and human health risk

  Use of materials or products that have toxic chemicals or by-products should be avoided if possible. If the use of such materials or products is unavoidable, then their use should be minimised so far as is reasonably practicable (SFAIRP) and the risks to human health should be controlled SFAIRP. Refer to product material safety data sheets (MSDS) and T MU RS 17002 ST *Prohibited and Restricted Materials* for more information.

  Design should also consider the low volatile organic carbon (VOC) requirement under the NSW *Government Resource Efficiency Policy*.

- material inventory

  Appropriate management and operational procedures that improve inventory management to eliminate the accumulation of unused or expired chemicals, and material handling (for example, leftover construction materials on a site are collected for use at another site) should be implemented.

6.4.2. Waste

All transport asset designs and management shall aim primarily to prevent the generation of waste and to reduce its harmfulness. Once options for reducing waste are optimised, redundant materials shall be considered for re-use, repurposing and recycling. Use of materials or products from manufacturers with product take-back programs should be considered where practicable.

6.4.3. Water (resource) and hydrology

This section is applicable for all assets that utilise water for non-drinking purposes and for all assets that are likely to impact on water run-off quality and quantity.

Hydrology

Proposals should aim to avoid impacts on all surface and subsurface water systems within a site or region by avoiding any physical disturbance whenever possible. If these impacts cannot be avoided, then proposals should aim to minimise the impacts.

To minimise the impact on the natural water cycle and to improve water quality, transport corridor design shall consider the integration of green infrastructure like water sensitive urban design (WSUD) and landscaping measures where there is space and where transport operational safety and reliability is not compromised. This will avoid or minimise increase in peak stormwater flows for rainfall events and decrease the amount of pollutants in stormwater run-off. These considerations shall be investigated as early as possible in the design stage.

Reduce demand and conserve water

When prioritising options, the following water resource hierarchy shall be adopted:

a. reducing water usage

b. water efficient design

c. rainwater re-use for non-potable purposes

The design of stations, bus depots, maintenance depots, and other transport facilities shall assess opportunities for using rainwater for sanitary flushing, vehicle and equipment washing, and vegetation irrigation. Regulations to ensure rainwater tanks are safe and suitable are available from the Sydney Water website.

6.5. Biodiversity

Degraded ecosystems can threaten the sustainability and resilience of human communities. The natural environment shall be conserved and restored.

6.5.1. Minimised landscape fragmentation

Paths with no or minimal fragmentation impact shall be pursued whenever feasible. To achieve this, an ecological or environmental survey should be carried out during the planning stage and measures to minimise fragmentation be considered.

Note: Assessment of impact to natural ecosystems is part of the environmental impact assessment for any project as required by legislation.

6.5.2. Enhancing biodiversity

Restoration of surrounding parklands, riparian zone and inclusion of diverse plant species should be considered by designers and asset managers.

6.6. Pollution control

All TfNSW transport facilities and infrastructure design shall integrate pollution prevention measures to minimise emissions (including noise) and discharges of pollutants to air, water, and land during operations and maintenance and shall comply with all relevant federal, state, and local government regulations.

Operators and maintainers of NSW transport facilities and infrastructures shall ensure that measures are put in place to minimise emissions and discharges of pollutants and shall ensure that they comply with all relevant federal, state and local government regulations.

6.7. Economic and social sustainability

Economic and social sustainability refers to the anticipated economic and social benefits of the proposed transport asset change at a micro (local) level. This may include opportunities for local industry participation in terms of workforce deployment, Indigenous participation, capacity and skills development, and engagement of local small to medium enterprises.

Other social sustainability issues include fair and ethical procurement of goods and services, including the supply chain. Procurement of goods and services shall align with the TfNSW *Transport Sustainable Procurement Policy*.

7. Integrated transport and land use planning

A fundamental planning approach to achieving environmental, social and economic sustainability goals is the integration of transport and land use plans.

Demand / need analysis and planning of transport solutions shall be in line with the regional, district, city, town, and precinct level.

Integrated land use and transport planning underpins the *Future Transport Strategy 2056*. It is based on the collaboration with the Greater Sydney Commission, Infrastructure NSW's State Infrastructure Strategy, and the Department of Planning and Environment's Regional Plans for the creation of the strategy.

For areas outside the Greater Sydney region, refer to the Department of Planning and Environment's *Planning for the future of regions across NSW* for NSW regional plan (http://www.planning.nsw.gov.au/plans-for-your-area/regional-plans).

These plans shall be consulted and sustainability goals and objectives identified in the plans shall be considered where they fit in with the TfNSW key sustainability areas.

8. Whole-of-life approach

Decisions during the early stages of the asset life cycle (that is, the demand / need, plan, and acquire stages) shall take into consideration complexities involved during the operation and maintenance of the asset involved. The operate / maintain stage takes up the largest portion of the cost of asset ownership. It is therefore important that the operator and maintainer of the asset is involved in the early stages of the asset life cycle.

The operator and maintainer shall be included in the stakeholder consultation including its in-house environment or sustainability specialist or both.

8.1. TfNSW asset management policy

Sustainable solutions shall take into account the principles and practices set out in TfNSW's *Asset Management Policy*.

8.2. Whole-of-life cost and benefit analysis

An analysis of the whole-of-life cost of the proposed solution compared to its benefits including environmental externalities shall be completed to assess the viability for implementation. Include discussion on when and how the benefits will be realised.

Future costs shall include the operating and maintenance costs and disposal costs in accordance with T MU AM 01001 ST *Life Cycle Costing* and likely cost impact to other parts of the TfNSW Transport Network. Analysis of future costs shall also include discussion on when and how the benefits will be realised and any cost impact until they are realised.

> *Note: Externalities occur where an activity or transaction has positive (benefits) or negative (costs) effects on the welfare of others who are not direct parties to the transaction. An example of a positive externality is disease immunisation, which protects the individual, but also lowers the general risk of disease for everyone. Examples of negative externalities include pollution and large buildings that block sunlight to their neighbours.*
>
> *These market failures (or the lack of a solution) arise from problems with property rights. For example, if the right to clean air was adequately defined and defended, polluters and those affected by pollution could negotiate efficient outcomes, provided the costs of negotiation (or 'transaction costs') were low.*
>
> *(Adapted from Productivity Commission 2006).*

9. Project governance

At the project strategic level, project governance shall incorporate sustainability criteria into the decision making framework. The framework should also identify multidisciplinary stakeholders to

create better support and buy in, while at the same time meeting the asset functional requirements.