

Central Station Main Works Project
Construction Carbon & Energy Plan

LAING O'ROURKE

Central Station Main Works Project

Construction Carbon & Energy Management Plan

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Project name	Central Station Main Works
Client	Sydney Metro City & South West – Sydney Metro
Client contract number	SMC
Laing O'Rourke contract number	K51

Revision history

Rev	Date	Description	Reviewed	INT/Date	Authorised
0	18.04.2018	For Review			
1	08/06/2018	For Review			
2	20/07/2018	Final			
3	26/03/2019	Annual update			
4	2/5/2019	Incorporating Metro comments			
5	30/4/2020	Minor amendments to sections 3.1 and 4.1	Nick Clarke		
6	05/05/2021	Formatting changes, minor amendments to Sections 4.1, 5.1, 5.3 and Appendix A, Updates to emission factors to align with Sydney Metro direction	Jannaya Ashelford		Nick Clarke
7	30/05/2022	section numbers updated. Section 4.1, 5.1 table 5 and Appendix A Emissions factors updated	Theo Snyman		Alyssa Slaney

Central Station Main Works Project

Construction Carbon & Energy Plan



Management reviews

Review Date	Reviewed By	Details	Initial	Date
18.04.18	Jeremy Matterson		JWM	
30/04/2020	Greg Cook			
05/05/2021	Jannaya Ashelford		NC	
30/05/2022			AS	

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Table of Contents

Revision history	2
Management reviews	3
1. Introduction	5
1.1 Purpose and Application	5
1.2 Sydney Metro City & South West – CSM	5
1.3 Sydney Metro City & Southwest Sustainability Strategy	5
1.4 Update and Ongoing Development	6
2. Planning	7
2.1 Sustainability Policy	7
2.2 Objectives & Targets	7
2.3 Legal & Other Obligations	8
2.4 Relevant guidelines	8
2.5 Project Roles, Responsibilities and Authorities	9
3. Emission & Consumption Estimates	10
3.1 Project Greenhouse Gas (GHG) Emissions by Emission Scope	10
4. Carbon and Energy Strategy and Initiatives for Delivery Phase Activities	11
4.1 Green Travel Plan	11
4.2 Avoidance Initiatives	13
4.3 Initiatives to Improve Efficiency	15
4.4 Initiatives to Source 'Low Carbon'	16
4.5 Offset Initiatives	16
4.6 Carbon and Energy Opportunities for Delivery Activities	17
5. Monitoring & Review	18
5.1 Monitoring	18
5.2 Analysis	18
5.3 Reporting	18
5.4 Audit	19
5.5 Non-Conformity and Corrective Actions	20
5.6 Continual Improvement & Management Review	20

Central Station Main Works Project

Construction Carbon & Energy Plan



1. Introduction

1.1 Purpose and Application

This Construction Carbon & Energy Plan (CCEP) specifies the sustainability requirements that the Project must meet in order to enhance its construction energy and carbon performance. A description of operational carbon and energy initiatives achieved through design is contained in the Sustainability Management Plan.

Consistent with the Projects Sustainability Policy, the intended outcomes of the CCEP concerning sustainability include:

- enhancement of sustainability performance in relation to energy and carbon emissions;
- fulfilment of compliance obligations in relation to energy and carbon emissions, and;
- achievement of sustainability objectives in relation to energy and carbon emissions.

The CCEP enables the Sydney Metro City & South West - Central Station Main Works Project (CSM) to manage its Construction Phase Energy and Carbon (emissions) in a systematic manner. It is applicable to the Project, and all of the Project's activities, products and services that the Project determines it can control or influence considering a life cycle perspective.

This CCEP is a sub plan of the Sustainability Management Plan SMCSWSMC-LOR-SMC-SU-PLN-000001 (SMP) and shall be read in conjunction with it.

1.2 Sydney Metro City & South West – CSM

The Sydney Metro City & Southwest project is the second stage of the Sydney Metro program, extending from Chatswood, under Sydney Harbour, through the central business district (CBD) and beyond to Bankstown. It includes seven new metro stations and the upgrade of all eleven existing stations between Sydenham and Bankstown. The Sydney Metro City & South West project is due to open in 2024 with the capacity to run a metro train every two minutes each way through the centre of Sydney.

The CSM project is a core component of the Sydney Metro City & Southwest, the CSM works will enhance and support Central Station as a gateway to the city and the NSW transport network delivering a multi-modal interchange with links between Sydney Metro, the existing suburban and intercity rail network, and light Rail.

The CSM Works comprise Metro Station Works, the Central Station Works, and the Central Walk Works the full scope of which are described in the Scope of Works and Technical Criteria (SWTC).

1.3 Sydney Metro City & Southwest Sustainability Strategy

Sydney Metro is Australia's largest public transport project. Sydney Metro will deliver 31 metro stations and more than 66 kilometres of new metro rail, that intends to increase the capacity of Sydney's passenger rail system by 60% by 2024.

The Sydney Metro City & Southwest Sustainability Strategy 2017-2024 seeks to define sustainability, and as such defines that:

Central Station Main Works Project

Construction Carbon & Energy Plan



“For Sydney Metro ‘sustainability’ means optimising environmental and social outcomes, transport service quality, and cost effectiveness.”

Within the context of CSM, this Plan provides the governance framework to assist the delivery of the Sydney Metro Sustainability Strategy as it applies to energy efficiency and associated CO2 emissions.

The related Sydney Metro Sustainability Strategy objectives are outlined in Table 1 below.

Strategic Theme	Strategy Objectives
Governance;	<p>Demonstrate leadership by embedding sustainability objectives into decision-making.</p> <p>Be accountable and report publicly on performance</p> <p>Demonstrate a high level of performance against objectives and appropriate benchmarks.</p>
Carbon and Energy Management;	<p>Improve the shift toward lower carbon transport.</p> <p>Reduce energy use and carbon emissions during operations.</p> <p>Reduce energy use and carbon emissions during construction.</p> <p>Support innovative and cost effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement.</p>

Table 1. Sydney Metro Sustainability Strategy: Objectives related to CCEP

1.4 Update and Ongoing Development

The CCEP will be updated with the SMP in accordance with the requirements of the contract, (Management Requirements – Project Administration – Central Station Main Works (MR-PA) Clause 2.4) i.e. as a minimum every 6 months.

Updates and development of the CCEP will ensure it remains consistent with Project priorities, risk management, client requirements, and Project objectives, taking into account:

- The status and progress of activities
- Changes in the design, delivery and operations processes and conditions
- Lessons learnt during delivery and operations
- Changes in other related Project Plans
- Requirements and matters not covered by the existing Project Plans
- Changes to Plans resulting from any comments from the Principals Representative

Central Station Main Works Project

Construction Carbon & Energy Plan



2. Planning

2.1 Sustainability Policy

Achieving sustainability is an integral part of Laing O'Rourke's corporate vision. The Project Sustainability Policy is found in Appendix A of the Sustainability Management Plan.

2.2 Objectives & Targets

Strategic Theme	CSM Targets With construction phase component
Governance	<p>IS Rating:</p> <ul style="list-style-type: none"> • achieve a Leading “Design” rating (score of at least 75, with a target of 79) • achieve a Leading “As Built” rating (score of at least 75, with a target of 79) <p>Green Star</p> <ul style="list-style-type: none"> • achieve a GSDABRT ‘Design Review’ rating of at least 5 stars for the design of the Works • achieve a GSDABRT ‘As Built’ rating of at least 5 stars for the delivery of the Works
Carbon and Energy Management	<ul style="list-style-type: none"> • For those activities where ISCA IS Ratings are required achieve or exceed the following ISCA IS Rating Scheme Version 1.2 credit requirements: <ul style="list-style-type: none"> • Level 2 for credit Ene-1 ‘Energy and carbon monitoring and reduction target’ demonstrating a greenhouse gas emissions reduction of 20% below a base case footprint; and • Level 1 credit Ene-2 ‘Use of renewable energy’ to fully investigate opportunities for use of renewable energy. • Achieve at least a 20% reduction in greenhouse gas emissions associated with the Contractors Activities, measured against the CERT Base Case. • Use a minimum 5% biodiesel mix for all diesel powered plant and equipment and a minimum 10% blended ethanol mix for all petrol powered plant and equipment wherever possible. • As a minimum, 25% of the total electricity being used is being offset through either one or a combination of the following: <ul style="list-style-type: none"> • purchase of Australian Carbon Offset Credits; and • purchase of renewable energy from an Accredited Renewable Energy Supplier. • Ensure that refrigerants and fire suppression systems within temporary site facilities and permanent infrastructure have zero ozone depletion potential and a low or zero global warming potential. • Ensure that all vehicles, plant and equipment, are: <ul style="list-style-type: none"> • Selected and operated for optimum energy efficiency; • Not left idling when not in use; • Fitted with catalytic converters, diesel particulate filters or equivalent devices where reasonable and feasible; and • Well maintained and serviced in accordance with relevant equipment maintenance documentation to reduce emissions due to poor engine performance. • Ensure that, the energy efficiency of all new plug-in electrical equipment within any site facilities meets the minimum standards outlined in the NSW Government Resource Efficiency Policy 2014 requirement E3 “Minimum standards for new electrical appliances and equipment”. • Identify and implement opportunities for using onsite sources of renewable energy during the CSM Contractor’s Activities.

Central Station Main Works Project

Construction Carbon & Energy Plan



	<ul style="list-style-type: none"> • Develop and Implement a green travel plan to promote cultural shift for commuting to encourage car-pooling, use of public transport and cycling. The travel plan will be developed through a committee by employing the following actions; <ul style="list-style-type: none"> ○ Develop a committee and work to define the purpose, scope and key actions & outcomes of the plan; ○ Reviewing workplace accessibility; ○ Surveying employees (and visitors/ clients if appropriate) about how they travel to and from the project office and site; ○ Consulting internal stakeholders about the plan and potential actions; ○ Reviewing good practice in managing work-related travel, including travel plans prepared by other workplaces; ○ Production of a green travel plan; ○ It is expected the green travel will be ready for implementation within 6 months of contract execution.
--	--

Table 2. CSM Sustainability Targets for Carbon and Energy Management

2.3 Legal & Other Obligations

This CCEP has been informed by current policy frameworks at both Federal and State level. The Australian Government has committed to reducing Australia's Greenhouse Gas (GHG) emissions by 60% on 2000 levels by 2050, with the intervening short-term targets and trajectory to be determined based upon international agreements during upcoming climate change negotiations. Central to the Australian Government's climate change policy is the Clean Energy Act. The NSW State Government has prepared a Greenhouse Action Plan to meet its commitments outlined above.

Legislation that is directly applicable to the Project includes:

- National Greenhouse and Energy Reporting Act 2007 (NGER Act)
- Renewable Energy (Electricity) RE Act 2000
- National Construction Code - Section J (Energy Efficiency)

2.4 Relevant guidelines

The following guidelines are relevant to this CCEP:

- AS ISO 14064-2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements (Australian Modification)
- National Greenhouse and Energy Reporting (Measurement) Technical Guidelines - Department of Climate Change and Energy Efficiency- 2012
- Energy Efficiency Opportunities Industry Guidelines – Department of Resources, Energy and Tourism – 2011
- Energy Savings Measurement Guide – Department of Resources, Energy and Tourism – 2011
- National Carbon Offset Standard (NCOS) - Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education
- IS Rating Tool – Infrastructure Sustainability Council of Australia
- World Resources Institute/World Business Council for Sustainable Development's Greenhouse Gas Protocol Corporate Accounting and Reporting standard.

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

2.5 Project Roles, Responsibilities and Authorities

All personnel have a role in ensuring the strategies and procedures set out in this plan are implemented. The key roles and their responsibilities critical to the management of CCEP are outlined in Table 3 below.

Role	Responsibilities For Carbon and Energy Management
Project Director	Ensure adequate resources to fulfil sustainability commitments. Managing the delivery of the CSM Works including overseeing implementation of Carbon & Energy Management processes, initiatives, and procedures.
Sustainability Manager	Overall responsibility and authority for; Ensuring that the carbon and energy management conforms to the requirements of this CCEP. Reporting on the performance of the project with regards to energy and carbon to top management and interested parties.
Sustainability Engineer	Monitor and report on carbon and energy performance construction Development of tools for the estimation and onward tracking of scope 1, 2, and 3 carbon emissions resulting from CSM activities.
Design Manager	For construction delivery: Smart design and consideration of efficient construction methodology which facilitates a lean construction methodology and early 'off hire' or deletion of construction plant and equipment – all of which supports energy efficiency.
ESD Consultant	Facilitate innovation leading to carbon and energy efficiency outcomes in design and delivery strategies. Ensure relevant energy efficiency initiatives are addressed in design development.
DJV Sustainability Coordinator	Facilitate innovation of energy efficiency and carbon management in design and delivery strategies. Ensure relevant energy and carbon requirements are addressed in design development.
Commercial /Procurement Managers	Procure efficient temporary electric design for construction and consider introduction of renewable technology into temporary site accommodation and construction equipment, lighting, efficient use of transformers and timing switches for charging stations.
Construction Managers & Project Engineer	Facilitation in the development of construction plant and equipment inventory. Consider impact on energy and fuel usage resulting from construction methodology – identify how methodology or program acceleration opportunities and work with sustainability team to capture any associated energy usage savings.
Superintendent	Drive site based behavioural aspects of energy saving e.g. non idling etc.

Table 3 Roles & Responsibilities for Carbon & Energy Management.

Central Station Main Works Project

Construction Carbon & Energy Plan

The logo for Laing O'Rourke, featuring the company name in white capital letters on a black rectangular background, with a yellow horizontal line above and a red horizontal line below the text.

3. Emission & Consumption Estimates

3.1 Project Greenhouse Gas (GHG) Emissions by Emission Scope

In support of meeting the CSM greenhouse gas reduction targets estimates for energy use (in Contractors Activities i.e. permanent and temporary works) and GHG emissions will be determined for the Project. The estimated footprint will be based on the reference design across the infrastructure lifecycle using a carbon footprint assessment undertaken in accordance with ISO 14064-1, ISO14064-2, and ISO14064-3 that incorporates direct and indirect emissions.

Greenhouse gas assessments will also be undertaken using TfNSW's Carbon Estimate and Reporting Tool (CERT).

To help track against the CERT through construction, a carbon footprint assessment was developed which includes Scope 1, 2 and 3 emissions for most material aspects of project footprint. This footprint is indicative (as a proxy for the whole of project) and will help track general performance, without needing to continuously track all aspects of the footprint extensively. The footprint was developed in accordance with ISO 14064-1, ISO14064-2, and ISO14064-3 to incorporate direct and indirect emissions associated with:

- On site electricity and fuel consumption;
- Transport of materials (deliveries of concrete & steel);
- Transport of waste/excavation materials;
- Embodied carbon emissions of concrete & steel

The GHG assessment is included in Appendix A.

Central Station Main Works Project

Construction Carbon & Energy Plan

LAING O'ROURKE

4. Carbon and Energy Strategy and Initiatives for Delivery Phase Activities

The CSM Works carbon and energy management strategy has been developed in accordance with carbon management principles.

The main components of this strategy framework are summarised below and described in further detail in subsequent sections of the plan.

Measurement: Understanding the carbon and energy profile will help identify significant energy use and carbon emissions for management and reduction over the project life. The carbon profile estimates presented in Section 3 above have been used to identify savings opportunities. This profile will be improved during delivery.

Set targets/objectives: Once the carbon and energy profiles are understood, ongoing targets are set to manage carbon emissions and energy usage. Objectives have been developed by assessing the carbon and energy risks to the project.

Carbon and energy reduction strategy: The carbon reduction strategy outlines a clear pathway to managing and reducing carbon emissions and energy use throughout delivery. It follows the management hierarchy outlined in the Sydney Metro City & Southwest Sustainability Strategy.

Monitoring and review: Progress against the objectives and targets, as well as the effectiveness of strategies and initiatives to meet those objectives and targets, will be reviewed and reported through monthly dashboards and during the annual sustainability management review.

4.1 Green Travel Plan

The Green Travel Plan SMCSWCSM-LOR-SMC-SU-PLN-000008 has been implemented since 2019 to promote cultural shift for commuting to encourage car-pooling, use of public transport and cycling. The Green Travel Plan was developed by employing the following actions:

- Define the purpose, scope and key actions & outcomes of the plan;
- Reviewing workplace accessibility;
- Surveying employees (and visitors/ clients if appropriate) about how they travel to and from the project office and site (fig. 1);
- Consulting internal stakeholders about the plan and potential actions;
- Reviewing good practice in managing work-related travel, including travel plans prepared by other workplaces;
- Production of a green travel plan to be circulated throughout the project team.

The results shown in Figure 1 below indicate that 'greener' travel options were the dominant choice amongst the Laing O'Rourke team.

Central Station Main Works Project Construction Carbon & Energy Plan

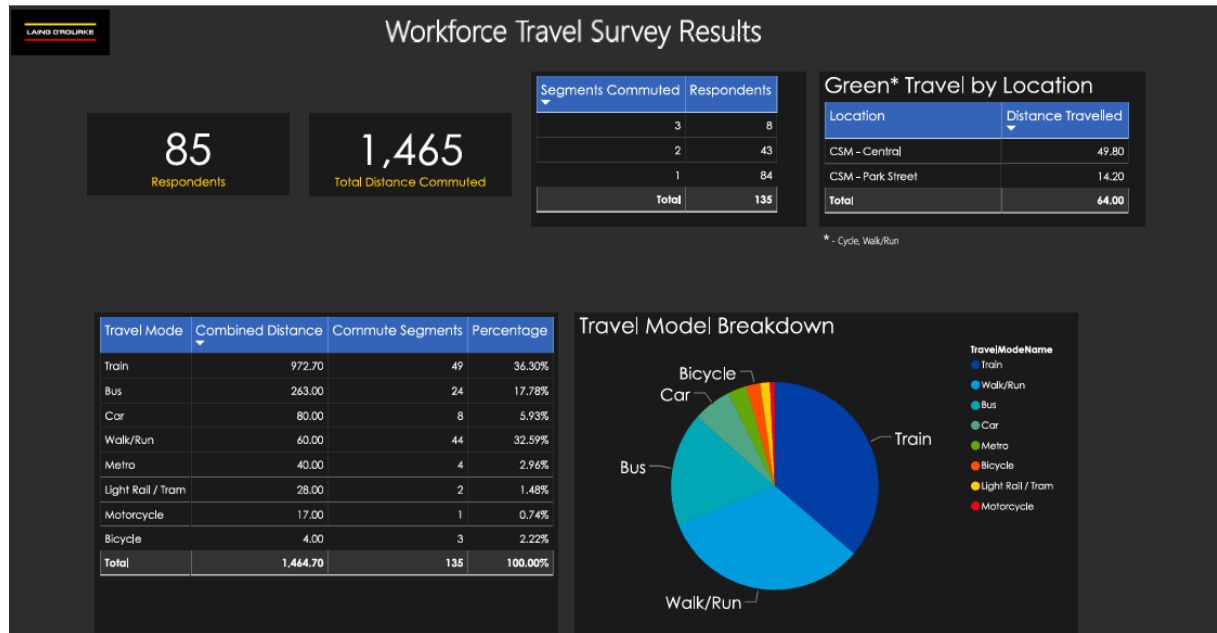


Figure 1 Results of project green travel survey

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

4.2 Avoidance Initiatives

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Minimise the absolute quantities of steel and concrete used on the project through design refinements and optimisation	Materials	High	Low	High	Lead engineer / design manager
Optimise concrete mix for low embodied energy/carbon emissions	Materials	High	Low	High	Lead engineer / design manager
Develop and implement a sustainable procurement strategy to drive purchase of low impact materials	Materials	High	Medium	Medium	Procurement manager
For significant proposed changes of material type at a system wide level an LCA will be carried out between the concept and proposed detailed design material types and quantities to ensure that the material is low impact and consistent with meeting the carbon and energy objectives and targets	Materials	High	Medium	High	Design manager
Training and awareness to turn off equipment and reduce idling of plant and equipment in construction	Construction fuel use	Medium	Low	Medium	Site supervisor
Review and optimise site processes to reduce energy consumption in construction activities, including any water treatment plant, lighting, and vehicle and plant movement	Construction fuel/energy use	Medium	Low	Medium	Sustainability manager
Recruit contractors and staff who live close to the site to reduce transport related costs (local industry and workforce participation)	Transport	Unknown	Low	Medium	Human resources manager

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Identify local recycling facilities, landfills, and construction materials suppliers to reduce emissions associated with materials transport	Transport	Unknown	Low	Medium	Procurement manager
Prioritise suppliers/contractors who provide energy efficient and low emissions services through contractual incentives: including site vehicles which are well maintained and serviced in accordance with relevant equipment maintenance	Construction fuel use/transport/materials	High	Medium	Medium	Procurement manager
Documentation to reduce emissions due to poor engine performance	Construction fuel use	Medium	Low	Medium	Site supervisor
Identify landfills with gas capture and compost facilities for managing waste	Waste	High	Medium	Medium	Procurement manager
Daylight and motion sensors on temporary lighting	Electricity use	Medium	Medium	Medium	Site supervisor
High performance thermal insulation in all walls, glazing, ceilings and floors to optimise thermal performance	Electricity use	Medium	Medium	Medium	Lead engineer / design manager

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Induction to include carbon and energy protocols and awareness training to highlight the requirements and actions outlined in this plan.	All	Unknown	Low	High	Sustainability manager

4.3 Initiatives to Improve Efficiency

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Identify and maximise efficiencies in construction equipment	Construction fuel use	High	Medium	Medium	Construction manager
Purchase fuel efficient fleet for light vehicles	Construction fuel use/transport	High	Low	High	Procurement manager
Use energy efficient lighting in temporary facilities, site lighting and on cranes. This includes the use of low voltage LEDs (i.e. Smart safety light).	Electricity use	High	Low	High	Construction manager
Variable speed drive, high efficiency fans and pumps	Electricity use	Medium	Medium	Medium	Design/ Procurement manager
HVAC equipment to use air conditioning refrigerants with low or zero global warming potential	Materials	Low	Medium	Low	Design/ Procurement manager

Central Station Main Works Project

Construction Carbon & Energy Plan



4.4 Initiatives to Source 'Low Carbon'

Initiatives	Focus Area	Reduction Potential	Potential Cost	Priority	Responsibility
Identify Opportunities For Implementation Of Photovoltaic Systems During Delivery	Electricity Use	Low	Medium	Medium	Procurement / Construction Manager

4.5 Offset Initiatives

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Investigate the feasibility of procuring local carbon credits to offset carbon emissions from energy consumption	All	High	High	Low	Commercial manager

Central Station Main Works Project

Construction Carbon & Energy Plan



4.6 Carbon and Energy Opportunities for Delivery Activities

In line with project requirements and the Project Sustainability Management Plan Section 4.10, the Project will maintain a register of initiative opportunities, which will be identified for further investigation and refinement during the project development phase. This will include all delivery stage carbon and energy opportunities.

The Opportunities Register will be developed such that initiatives can be added to over the course of the project but in particular those significant issues that have the potential to benefit the project. A decision making process will be in place to determine and provide evidence of which opportunities were taken forward to implementation and which were abandoned.

The Project will ensure that decision making in relation to significant issues will be characterised by:

- A consideration of options including business-as-usual and other proven approaches taken in comparable situations;
- An evaluation of options that considers environmental, social and economic aspects through multi-criteria analysis or other scored means;
- An evaluation of options based on the useful forecast life of the infrastructure asset (i.e. 100-year design life);
- The opportunity is consistent with the tender offer.

Generally, when determining what opportunities to include, the following question applies:

- Will undertaking the opportunity reduce capital expenditure and comply with applicable requirements?

Where the answer is 'yes', the opportunity will typically be included automatically. Other opportunities that may require additional expenditure or modification/relaxation of applicable requirements are considered for inclusion based on the following questions.

- Will undertaking the opportunity reduce whole-of-life cost or impacts?
- Will undertaking the opportunity attend to a material risk or opportunity for the Project, the client or other stakeholders?

Once decision making in relation to opportunities has occurred, the opportunities' status will be updated in the Opportunity Register as either 'Included' or 'Abandoned'. If the answers to the relevant questions are unclear, the opportunity status will remain 'Under consideration' and further information will be sought.

Central Station Main Works Project

Construction Carbon & Energy Plan



5. Monitoring & Review

5.1 Monitoring

The Project team shall monitor, measure, analyse, and evaluate its energy and carbon performance and prepare carbon footprint assessments (inclusive of Scope 1, 2 and 3 emissions) at various stages of construction. The Project shall undertake weekly sustainability inspections during construction.

Appropriate records will be retained to assist with monthly reporting and the preparation of carbon footprint (greenhouse gas) assessments.

Table 5 Indicates records which will be used to generate project Greenhouse Gas Assessments (but not limited to):

Data Source	Data Type	Emission scope
Fuel consumption (onsite fuel use for plant, equipment & generators)	Invoices and subcontractor fuel reports (inventory also used in energy modelling where fuel use not available)	Scope 1
Energy consumption (onsite electricity use)	Site meters and electricity bills	Scope 2
Reinforcement steel bars and mesh, ready mix concrete, structural steel, GRC	Materials tracking registers, supplier and subcontract reports	Scope 3
Deliveries and waste removal	Use of Voyager system (Site Logistics Plan SMCSWSMC-LOR-SMC-CM-PLN-000002) to generate CO2 emissions for all domestic deliveries and offsite movements.	Scope 3

Table 5. Records which will be used to generate project Greenhouse Gas Assessments

5.2 Analysis

Analysis of data to identify trends and further opportunities for reduction will be undertaken through formal reviews as part of ongoing governance. Reviews will include the following:

- Assessment of progress against targets;
- Review of induction and training requirements;
- Effectiveness of action implementation;
- Consideration of monitoring data to identify any significant changes to carbon/ energy profile;
- Compliance with legal and other requirements; and
- Identification of new carbon and energy reduction opportunities.

5.3 Reporting

The Project shall evaluate its energy and carbon management performance within the scope of the Green House Gas assessment of the Works Temporary Works and the CSM Contractors Activities. The Project shall communicate relevant energy and carbon performance information both internally and externally, as identified in its communication processes and as required by its

Central Station Main Works Project

Construction Carbon & Energy Plan

The logo for Laing O'Rourke, featuring the company name in white capital letters on a black rectangular background with yellow and red horizontal lines above and below the text.

compliance obligations. The Project shall evaluate and document compliance through the following reports and take action if needed;

- Inventory of non-road diesel powered vehicles using TfNSW's Air Emission Data Collection Workbook 9TP-FT-439
- Greenhouse gas inventory report using the TfNSW's Carbon Estimate and Reporting Tool (CERT)
- Monthly Project Reports and Sustainability Dashboard
- Monthly Sustainability Data Report (MSDR)
- Quarterly Sustainability Report (QSR)
- Annual Sustainability Report (ASR)

5.3.1 [CERT Reporting](#)

The CERT will be used to monitor the Project's progress towards achieving the target of at least a 20% reduction in greenhouse gas emissions. The project's greenhouse gas emissions will be measured against a Base Case at Design Stage 1 (SDR), Design Stage 3 (CDR), annually thereafter and again prior to Construction Completion. CERT reports will be provided to the Principal's Representative for review.

5.3.2 [National Greenhouse and Energy Reporting Scheme \(NGERS\)](#)

The operational control will be determined by NGER legislation. Notwithstanding this, Laing O'Rourke will collect Emissions and Energy data in the same manner as required by the NGER legislation and this will be available to Transport for New South Wales on request.

Emissions and energy data will be provided to the TfNSW representative at such times as may be agreed.

5.4 **Audit**

The Project shall be audited at planned intervals to provide information on whether the Project:

- is meeting its compliance obligations;
- conforms to the CCEP; and,
- determine if the CCEP is effectively implemented and maintained

The Project shall establish, implement, and maintain an audit programme for the Project, including the frequency, methods, responsibilities, planning requirements and reporting of its audits. Sustainability audits will be conducted at least quarterly with at least one per year being 'independent'.

The scope of the audits may vary but it is important that the most material issues are audited regularly during the rating period. Sustainability audits should cover the most material environmental, social, and economic issues. 'Regularly' needs to be described and justified for each project. The audit reports must demonstrate that these requirements have been fulfilled.

If required under the IS Rating Ene-1 the Sustainability Manager shall arrange for the final design CSM energy model (including estimates for construction delivery) to be audited by a suitably qualified person. A suitably qualified person for the purposes of the Ene1 credit is someone who has a formal qualification and a minimum of five years' experience in energy or GHG management. Being registered on the NGERS Register of GHG and Energy Auditors meets this requirement (without needing to supply evidence of experience).

Central Station Main Works Project

Construction Carbon & Energy Plan

The logo for Laing O'Rourke, featuring the company name in white capital letters on a black rectangular background, with a yellow horizontal line above and a red horizontal line below the text.

5.5 Non-Conformity and Corrective Actions

When a nonconformity occurs, including in relation to materials, the Project shall:

- react to the nonconformity and, as applicable:
 - I. take action to control and correct it;
 - II. deal with the consequences, including mitigating adverse sustainability impacts;
- evaluate the need for action to eliminate the causes of the nonconformity, in order that it does not recur or occur elsewhere, by:
 - I. reviewing the nonconformity;
 - II. determining the causes of the nonconformity;
 - III. determining if similar nonconformities exist, or could potentially occur;
- implement any action needed;
- review the effectiveness of any corrective action taken; and, make changes to the ECMP, if necessary.

Corrective actions shall be appropriate to the significance of the effects of the nonconformities encountered, including the sustainability outcomes(s).

The Project shall retain documented information as evidence of:

- the nature of the nonconformities and any subsequent actions taken; and,
- the results of any corrective action

5.6 Continual Improvement & Management Review

The review and improvement process for the sustainability management system will be based on those set out in Section 10 of the CSM Quality Management Plan.

The Project Management Team will check the status and adequacy of this plan and its sub plans to ensure that it meets current Sydney Metro, Laing O'Rourke and project requirements (such as those established in the compliance matrix in Appendix F

The Plan will be reviewed during the course of the contract when the following situations arise:

- Client recommendations for changes (particularly following initial review);
- Changes to the Company's standard system; and
- Opportunities for improvement or deficiencies in the project system are identified.

Project Management shall review the implementation of the SMP at Project level, at planned intervals (at least annually), to ensure its continuing suitability, adequacy and effectiveness. Reviews will be performed by the Sustainability Team. Where practicable the management reviews shall incorporate community participation (e.g. record of minutes from community meetings being input to management review).

The Project shall retain documented information as evidence of the results of management reviews.

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Appendix A

Construction Stage Carbon Footprint Estimate				
Contractors Activities - Plant and Machinery (Scope 1)	Estimated Quantity	Unit	Tonnes CO2e	Assumptions
Diesel - Stationary plant & equipment	1,777	kL		1. All emissions calculated using emissions factors (EF) provided by Sydney Metro in Sustainability Monthly Reporting Guide (Feb 2021); 2. Fuel consumption based on 57 month overall program (248wks); 3. Heavy civil equipment i.e. road headers, canopy tube drilling, central walk mining/tunnelling and associated ventilation will be powered by on-board diesel generators; 4. Assumes construction site runs 100% diesel generators until August 2020.
	68,577	GJ	4814.67	
Diesel - Mobile plant and equipment	2,390	kL		
	92,254	GJ	6500.8	
Petrol	0.35	kL		
	11.59	GJ	0.8	
Total Diesel	4,167	kL	11,315.47	
Total Petrol	0.35	kL	0.8	
Estimated Scope 1 Emissions			11,316.27	

Central Station Main Works Project

Construction Carbon & Energy Plan



Contractors Activities - Electricity Consumption Site Wide Plant + Offices (Scope 2)	Estimated Quantity	Unit	Tonnes CO2e	Assumptions
Site wide plant & amenities	7,068,225	kWh	5,725	1. All emissions calculated using emissions factors (EF) provided by Sydney Metro in Sustainability Monthly Reporting Guide (Feb 2021); 2. Electricity consumption based on 57 month overall program (248wks); 3. Connection to mains electricity from August 2020; Mains power supply for lighting, compound power, small power, medium plant and large plant (tower cranes & hoists); 4. Design office electricity consumption based on 24 month design program (104wks); 5. Assumes construction site runs 100% diesel generators until August 2020.
Design Office	1,005,742	kWh	814.6	
Estimated Scope 2 Emissions	8,073,967	kWh	6539.86	

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Contractors Activities - Embodied (Scope 3)	Estimated Quantity	Unit	Tonnes CO2e	Assumptions
In-Situ Concrete				1. Quantities taken from Stage 1 BoQ; 2. Concrete emissions calculated using emissions factors (EF) in CERT v2, Steel emissions calculated using emissions factors (EF) provided by Sydney Metro in Sustainability Monthly Reporting Guide (Feb 2021). 3. Concrete EF based on average cement replacement of 40% across all insitu mixes (against CERT reference case); 4. Precast concrete based on cement replacement of 30%.
20MPa or less	7,378	m ³	1,269	
25MPa	133	m ³	25	
32MPa	270	m ³	59	
40MPa	9,649	m ³	2,586	
50MPa	22,998	m ³	6,163	
60+MPa	405	m ³	120	
Total Insitu Concrete	40,833	m ³	10,222	
Precast Concrete				
40MPa	16,860	m ³	3,794	
Total Precast Concrete	16,860	m ³	3,794	
Total Concrete				
Total Concrete	57,693		14,016	

Central Station Main Works Project

Construction Carbon & Energy Plan



Structural & Reinforcing Steel

Bars	2,178	tonnes	3920
Mesh	50	tonnes	130
Beams & Columns	9,077	tonnes	29,046
Strand & Wire	667	tonnes	2134
Total Structural & Reinforcing Steel	11,973	tonnes	35,230

Estimated Embodied Emissions (Concrete & Steel)

49,246

Contractors Activities - Transport (Scope 3)	Estimated Quantity	Unit	Tonnes CO2e	
Spoil Disposal	469,620	tonnes	3,029	1. All emissions calculated using emissions factors (EF) provided by Sydney Metro in Sustainability Monthly Reporting Guide (Feb 2021); 2. Transport to landfill assumes 50km round trip; 3. Transport of materials assumes local sourcing - 50km round trip; 4. Transport to recycling facility assumes 22km round trip. 5. Density of concrete 1.5t/m3 taken from CERT v2
Waste Disposal	26,784	tonnes	76	
Concrete Delivery	57,693	m ³	558	
Steel Delivery	11,973	tonnes	77.2	
Estimated Transport Emissions			3,740	
Estimated Scope 3 Emissions			52,986	
Contractors Activities - Totals			Tonnes CO2e	

Central Station Main Works Project

Construction Carbon & Energy Plan

LAING O'ROURKE

Estimated Total for delivery	71,024.1
------------------------------	----------

Notes:

1. This footprint estimate will be refined along with design construction methodology,;
2. An updated footprint using CERT will be provided during Design Stage 3 and again prior to the Date of Construction Completion of the final Portion to reach Construction Completion;
3. Data will be collected during delivery to improve accuracy further. The 'Monitoring & Review' – section in this plan will help to facilitate continual improvement throughout delivery in relation to this baseline calculation;
4. The initial delivery phase footprint estimate incorporates:
 - a. Scope 1 – Fuel used in plant, machinery, vehicles & for onsite electricity generation;
 - b. Scope 2 – Purchased electricity;
 - c. Scope 3 – Embodied emissions of concrete & steel;
 - d. Scope 3 – Transport emissions associated with waste disposal & delivery of materials.
5. The following hierarchy will be employed when calculating material quantities/impacts in future footprints:
 - a. Quantity (mass) directly from BoQ;
 - b. Quantity (mass) calculated from dimensional data within BoQ;
 - c. Quantity (mass) calculated from design documentation, based on BoQ description; and
 - d. Quantity (mass) calculated from manufacturers data, based on BoQ description.

Central Station Main Works Project

Construction Carbon & Energy Plan



Emissions Factors:

Item	Unit	National Greenhouse Accounts Factors (2020)		CERT		SWTC Appendix B01
		EF Scope 1	EF Scope 3	EF Scope 3	Cement Content (kg/m3)	Maximum Cement Content (kg/m3)
Materials						
RMC 20MPa or less	kgCo2/m3			257	250	280
RMC 25MPa	kgCo2/m3			285	280	310
RMC 32MPa	kgCo2/m3			332	330	360
RMC 40MPa	kgCo2/m3			398	400	450
RMC 50MPa	kgCo2/m3			445	450	450
RMC 60/65MPa	kgCo2/m3			445	450	500
PCC 40MPa	kgCo2/m3			398	400	450
Reinforcement bars - AUS	tCo2/t		1.8			
Reinforcement mesh - AUS	tCo2/t		2.6			
Reinforcement strand & wire - AUS	tCo2/t		3.2			
Structural beams & columns - AUS	tCo2/t		3.6			
Transport						
Waste to landfill	kgCo2/t	6.45				
Waste to recycling	kgCo2/t	2.838				

Central Station Main Works Project

Construction Carbon & Energy Plan


 LAING O'ROURKE

Rigid Truck	kgCo2/tkm	0.129				
Artic Truck	kgCo2/tkm	0.0726				
Rail	kgCo2/tkm	0.0255				
Shipping	kgCo2/tkm	0.00893				
Waste						
C&D waste to landfill - inert	tCO2/t		0			
C&D waste to landfill - mixed	tCO2/t		0.2			
Green waste to landfill	tCO2/t		0.47			
Office waste to landfill	tCO2/t		1.6			
Fuel						
Diesel (Transport)	tCO2/kL	2.72	0.14			
Diesel (Stationary)	tCO2/kL	2.71	0.14			
Petrol (Transport)	tCO2/kL	2.38	0.12			
Petrol (Stationary)	tCO2/kL	2.32	0.12			
Biodiesel	tCo2/kL	0.01	NE			
Electricity						
Elec - NSW Grid	kgCo2/kWh	0.81	0.09			

- Emissions factors have been updated to align with the Sustainability Monthly Reporting Guide issued by Sydney Metro to contractors in February 2021. The exception being the use of IS Materials Calculator v2.0 for concrete emissions factors.
- CERT emissions factors will be used for the CERT
- CERT emissions factors will be used for concrete in the sustainability reports (quarterly, biannual, annual) determined on a mix by mix basis
- National Greenhouse Accounts Factors (2020), except for concrete, will be used in the sustainability reports (quarterly, biannual, annual)
- IS Materials Calculator v2.0 emissions factors are not used for concrete (requested in February 2021) as individual emissions factors have already being calculated throughout delivery phase Portland cement content of each individual mix using the CERT tool.

Central Station Main Works Project

Construction Carbon & Energy Plan

The logo for Laing O'Rourke, featuring the company name in white capital letters on a black rectangular background. The text is centered between two horizontal lines: a yellow line above and a red line below.

- NE = Not Estimated, Note: Scope 3 factors for biofuels such as biodiesels and ethanol are highly dependent on individual plant and project characteristics, and therefore have not been estimated (sourced from National Greenhouse Accounts Factors (2020))