Great Eastern Highway Bypass Interchanges Project: Annual Sustainability Report 2022

Prepared by Greater Connect Alliance
GEHBI-GCA-RPT-A000-SY-00021

This annual report covers the period from 1/07/2021 to 30/06/2022. This is the second annual report to be prepared for the project. Previous annual sustainability reports include Financial Year 2020/2021.

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Approval for Publication

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Disclaimer

All information was true and accurate at date of publication. Data is subject to change pending audits, verifications, and reviews.

Abbreviations and Acronyms Table

Abbreviation	Full Form
AMT	Alliance Management Team
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
BAU	Business as Usual
CTSL	Coal Tar Stabilised Limestone
CRC	Crushed Recycled Concrete
DBCA	Department of Biodiversity, Conservation and Attractions
DMP	Dewatering Management Plan
DOA	Delegation of Authority
DSI	Detailed Site Investigation
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority of Western Australia
FSR	Fatal Severe Risks
FOGO	Food Organics Garden Organics
GCA	Greater Connect Alliance
GEHBI	Great Eastern Highway Bypass Interchange
GHG	Green House Gas
GRI	Global Reporting Initiative
ha	Hectare(s)
IS	Infrastructure Sustainability
ISC	Infrastructure Sustainability Council
kL	Kilolitre
km	Kilometre(s)
KPI	Key Performance Indicator
LTIFR	Lost Time Injury Frequency Rate
m	Metre(s)
MCA	Multi-Criteria Analysis
MRWA	Main Roads Western Australia
MJ;GJ	Megajoule; Gigajoule: unit of energy which is equivalent to 1 billion Joules
MNES	Matters of National Environmental Significance
NGA	National Greenhouse Accounts
PAPN	Perth Airport Precinct Northern Access
PEC	Priority Ecological Community
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
PSP	Principal Shared Path
RAP	Reclaimed Asphalt Pavement
REAP	Resource Efficiency Action Plan
RES	Resource Efficiency Strategy
SER	Severe Environmental Risks
STEM	Science, Technology, Engineering and Math
SWTC	Scope of Work & Technical Criteria

Abbreviation	Full Form
tCO_2e	Tonnes of carbon dioxide equivalent
TEC	Threatened Ecological Community
WAIPS	Western Australian Industry Participation Strategy
WP	Work Package

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1 About this Report

1.1 Purpose

This report was compiled by the Greater Connect Alliance (GCA) project team (a consortium comprising Laing O'Rourke, AECOM and Arcadis), on behalf of Main Roads Western Australia, to record the combined annual sustainability progress for the Great Eastern Highway Bypass Interchanges (GEHBI) Project and the eastern extent of the Perth Airport Precinct Northern Access Project (collectively referred to in this report as "the Project"). These projects are in close proximity and are, in part, being delivered on a comparable timeframe. Thus, to best integrate and capture overall sustainability outcomes, GCA has prepared this report for all project components included in the Design and As-Built Infrastructure Sustainability (IS) Rating boundary (**Figure 1**)

This report will accompany the Main Roads Annual Sustainability Reporting and will ultimately be integrated into the Main Roads Annual Report. The report content is prepared in accordance with Global Reporting Initiatives (GRI) principles. This report summarises the sustainability initiatives and potential environmental, social, and economic impacts of the Project. Material topics reported have been determined through a materiality assessment that aligns with GRI and the Infrastructure Sustainability Council (ISC). The ISC Rating system is described in greater detail in **Section 3.1** Approach to Sustainability.

To assist in the preparation and improve the transparency and accuracy of this report, GCA has compiled information from several internal and external reporting frameworks. This includes information gathered from monthly progress reports sent to Main Roads detailing a breakdown of GCA's material usage, water usage, clearing, Aboriginal Participation, and updates for quality, environment, and sustainability. Information for this report has also been drawn from publicly available documents including Newsletters, Fact Sheets, Media Statements, and Project Updates, available on the Project page on Main Roads' Website.

1.2 Sustainability Statement

The WA State Sustainability Strategy (2003) defines sustainability as a commitment to 'creating lasting benefits through an integrated consideration of social, environmental and economic aspects in all that we do'. In essence, to meet the needs of today without compromising the needs of future generations.

Road network development is a major infrastructure industry for Western Australia, it is therefore important to consider the sustainability aspect enveloping road projects. The Project will provide an upgrade in the road network to help with congestion within the surrounding areas. The Greater Connect Alliance is committed to developing a transport network that meets social, economic, and environmental needs and implementing a strategy which aims to create sustainable growth by meeting the economic, social, and environmental challenges of our rapidly changing world. The Project aims to improve connectivity for the local community and industries through sustainable design and construction.

"The Greater Connect Alliance is committed to developing a transport network that meets social, economic, and environmental needs and implementing a strategy which aims to create sustainable growth by meeting the economic, social, and environmental challenges of our rapidly changing world."
Ewan Gee, GCA Project Director

1.3 Highlights

The Project is currently in the 85% Design Phase, progressing towards 100% Design completion with some early works having already commenced. Sustainability highlights include the actions taken to progress the achievement of GCA's Sustainability Topics and associated SMART Targets established as part of our ISC Design Rating Submission (**Table 1**).

Table 1 Sustainability Topics and Highlights

Sustainability Topic	Highlight
Enhanced Urban Design and Placemaking	• 85% design incorporates enhanced water quality function of existing Perth Airport Detention Basin • 85% design incorporates water quality and vegetated infiltration basins along Roe Highway to treat highway runoff prior to discharge into surrounding water bodies
Energy	• Incorporation of 2 x Hybrid RAV4 vehicles into project fleet to date • Design to incorporate LED operational street lighting to be used in place of High-Pressure Sodium (HPS) Street Light Bulbs. Estimated Emission savings to be at approximately 7% over a 25 year period.
Consultation and Engagement	• In response to stakeholder feedback, design is now incorporating a shared path along Adelaide Street • Sustainability Objectives, Targets, and Responsibilities have been circulated to external stakeholders via newsletters and publication of the information on Main Roads' website Project page • GCA are working with Traditional Owners to identify Aboriginal Heritage interpretation, public art opportunities, as well as consideration of an alternative alignment for the Lloyd Street Bridge
Industry Engagement and Prosperity	• A Diversity and Inclusion Policy has been written and forms part of GCA's management processes • 10 Aboriginal Businesses have been engaged to-date • 1026 Hours of training delivered as part of the Project
Efficient Resource Use and Sourcing	• Investigation to use Recycled Asphalt Pavement (RAP) in pavements to reduce the use of virgin materials • Investigation into EME2 asphalt to increase durability and resistance to early failure of asphalt
Management and treatment of impacts on waterborne and airborne contamination	• Acid Sulfate Soil Management Plans (ASSMP) and Dewatering Management Plans (DMP) have been drafted for all at-risk areas to avoid contamination and provide mitigation strategies • Other Contamination Management Plans provide actions to address the risk of Coal Tar Stabilised Limestone (CTSL), Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), and Heavy Metals.

2 Project Overview

The current intersections of Great Eastern Highway Bypass (GEHB) with Roe Highway, Stirling Crescent and Abernethy Road have become increasingly congested with road users experiencing significant wait times during peak periods. This increased congestion is due to the presence of heavy vehicles moving in a north-south direction between the Forrestfield/High Wycombe and Hazelmere industrial areas. Perth hills residents and heavy vehicles seeking to avoid heavy traffic through Midland and Guildford further contribute to congestion. In addition to traffic congestion issues, future expansion of the southern part of Midland around the former railway workshops precinct is constrained by the lack of direct access to and from the south.

By upgrading two major interchanges on Great Eastern Highway Bypass at Roe Highway and Abernethy Road, the Great Eastern Highway Bypass Interchanges Project will enhance connectivity, relieve congestion, and improve safety in Perth's Eastern Metropolitan Region, bringing immediate benefits for over 60,000 road users per day. The Project is also anticipated to improve the amenity of the area, bring hundreds of jobs to the region, and create opportunities for local suppliers.

The GEHBI Project is a fast-tracked, road infrastructure upgrade project in Perth, Western Australia. The decision to fast-track this Project was made in response to local economic challenges associated with COVID-19 impacts on employment and availability of work. Part of the goal set for the Project is to provide opportunities for local business and employment to support those left in vulnerable positions due to the health restrictions imposed across Australia and in particular the Perth and Peel region.

The Perth Airport Precinct Northern Access Project (PAPN) aims to create free flowing access to the Perth Airport North precinct and ensure ongoing efficiency for other road users. This will be achieved by replacing Kalamunda Road bridge over the Arc Infrastructure freight line with two lanes in each direction, adding a grade separated interchange at Great Eastern Highway Bypass and Kalamunda Road, and considering opportunities to improve the shared path connectivity along Great Eastern Highway Bypass.

Over the past year, GCA has reached its 85% design milestone and is progressing to 100% design completion. Following the ground-breaking ceremony in mid-November, various site investigation works, and non-native vegetation clearing have been completed along the Great Eastern Highway Bypass.

A site compound has been established on Vale Road, Hazelmere to support the construction team. Earthworks have been completed and accommodation, pavement, and service relocation works are currently ongoing for the construction of the new Arum Lily Place and tie-in to Vale Road.

Clearing along Adelaide Street was commenced and completed in July 2022, and engagement with businesses concerning accommodation works along with site investigations has commenced at this location.

Seed collecting through future clearing areas was undertaken in late 2021 to facilitate the revegetation program.

Environmental investigations have been ongoing throughout various locations of the Project.

2.1 Locality and Scope

The IS boundary includes the GEHBI Project primarily located within Hazelmere, comprising Work Packages (WP) 1, 2, 3a, 4 and additionally, Work Pack 6 from the Perth Airport Northern Access

Project. The overall Scope for the Design and As-Built IS Rating being pursued as part of sustainability is illustrated in **Figure 1.**

While the Project is mostly encapsulated within Hazelmere, it also extends to parts of Bellevue, High Wycombe, South Guildford, and Midland. The Project includes local government involvement from the City of Swan, City of Kalamunda, and Shire of Mundaring.

The overall Project Scope includes:

- Construction of a Single Point Urban Interchange (SPUI) at GEHB / Lloyd Street and a new freeway-freeway style interchange between GEHB and Roe Highway, removing the last signalised intersections on Roe Highway and providing free-flowing access between both roads
- Elevation of Abernethy Road to pass over Great Eastern Highway Bypass, with connectivity retained via a new grade separated interchange
- A completion of Lloyd Street between GEHB and Lakes Road and between Stirling Crescent and Lloyd Street (north), including a new bridge over the Helena River
- Upgrades to the GEHB, including removal of the existing intersection with Stirling Crescent
- Upgrades to parts of Abernethy Road. There will be a new heavy vehicle standard (RAV 7) connection at Adelaide Street
- Upgrade of Roe Highway between Talbot Road and Clayton Street, including a bridge duplication over the Helena River
- Completion of the missing link in the 30 km Principal Shared Path (PSP) network on Roe Highway between Great Eastern Highway and Kwinana Freeway
- Replacement of Kalamunda Road bridge over the Arc Infrastructure freight line, with two lanes in each direction.

An illustration of the Project location, scope, and extent of works is provided in **Figure 1** below.

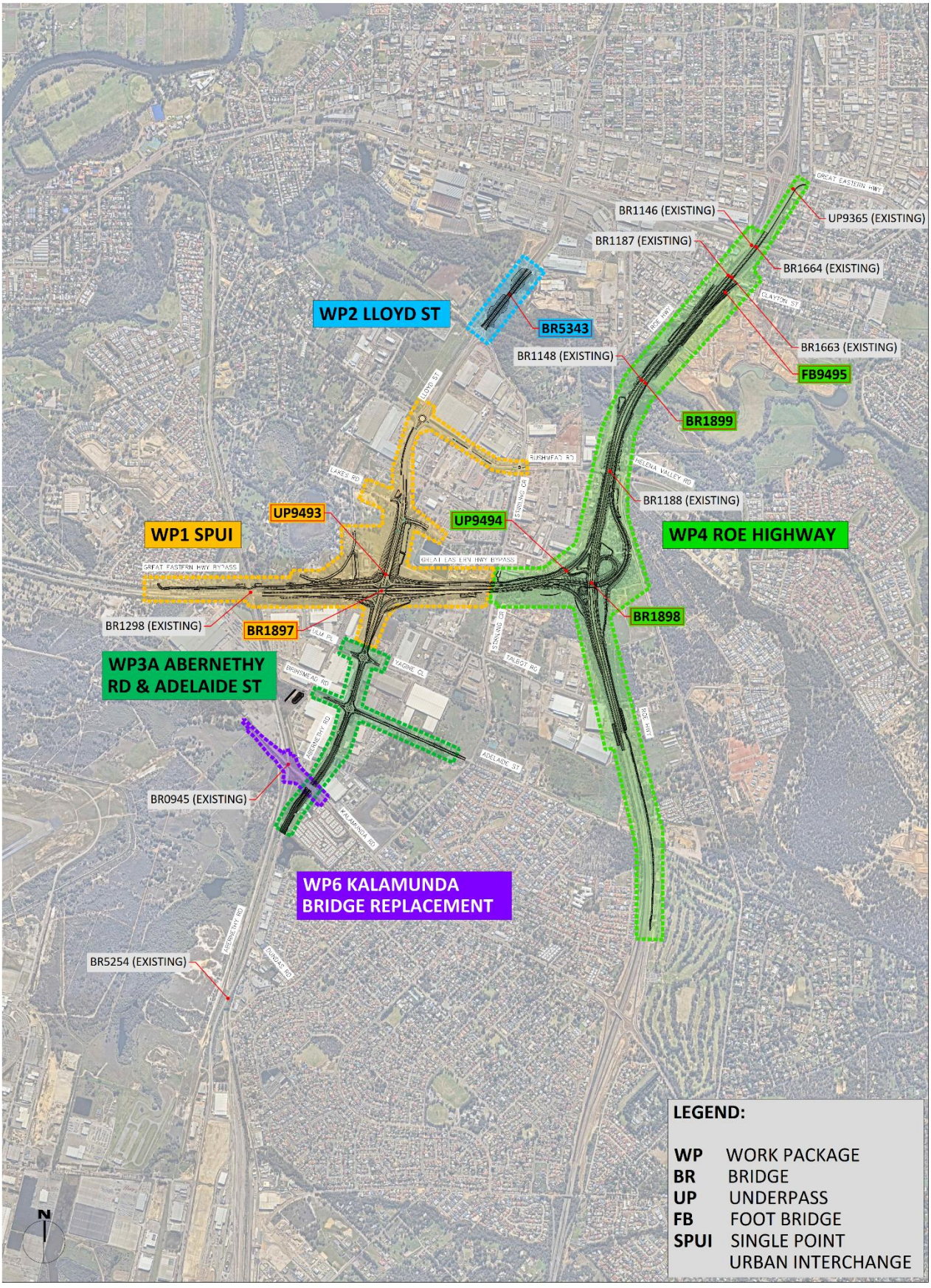


Figure 1 Map of Project Boundary (based on IS rating) and Work Packs

2.2 Value and Funding

The GEHBI extent of the Project is jointly funded by the Federal ($247.25 million) and State and Local Governments ($139.25 million). Work Pack 6 is being funded as part of the PAPN Project which has a total funding split of $85 million for Federal and $85 million for State and Local Governments. Involvement with key stakeholders including local governments, businesses and industry, utility providers, local residents, road users, and Traditional Owners is required for the successful delivery of the Project (**Appendix 1**).

2.3 Delivery Agents/Partners/Contractors

The Project is being delivered by the Greater Connect Alliance, a consortium comprised of Laing O'Rourke, AECOM, and Arcadis, in partnership with Main Roads WA. GCA has engaged many contractors and suppliers throughout the Project to date, prioritising opportunities for local suppliers and contractors to engage in works where possible.

2.4 Project Timeline

GCA was awarded the contract in early 2021, with all works to be finalised and operational by 2025. **Figure 2** provides a summary of key project dates and milestones for the Project and **Figure 3** provides Key Sustainability Milestones to date.

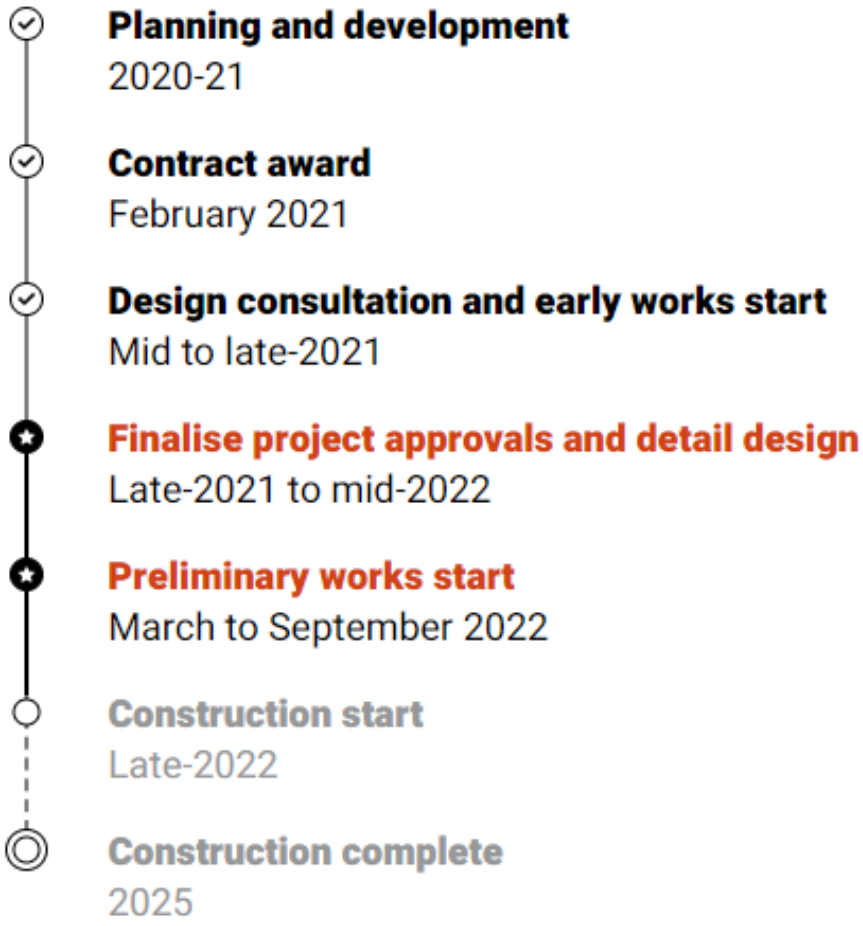


Figure 2 Timeline for project progression across planning, design, and construction phases

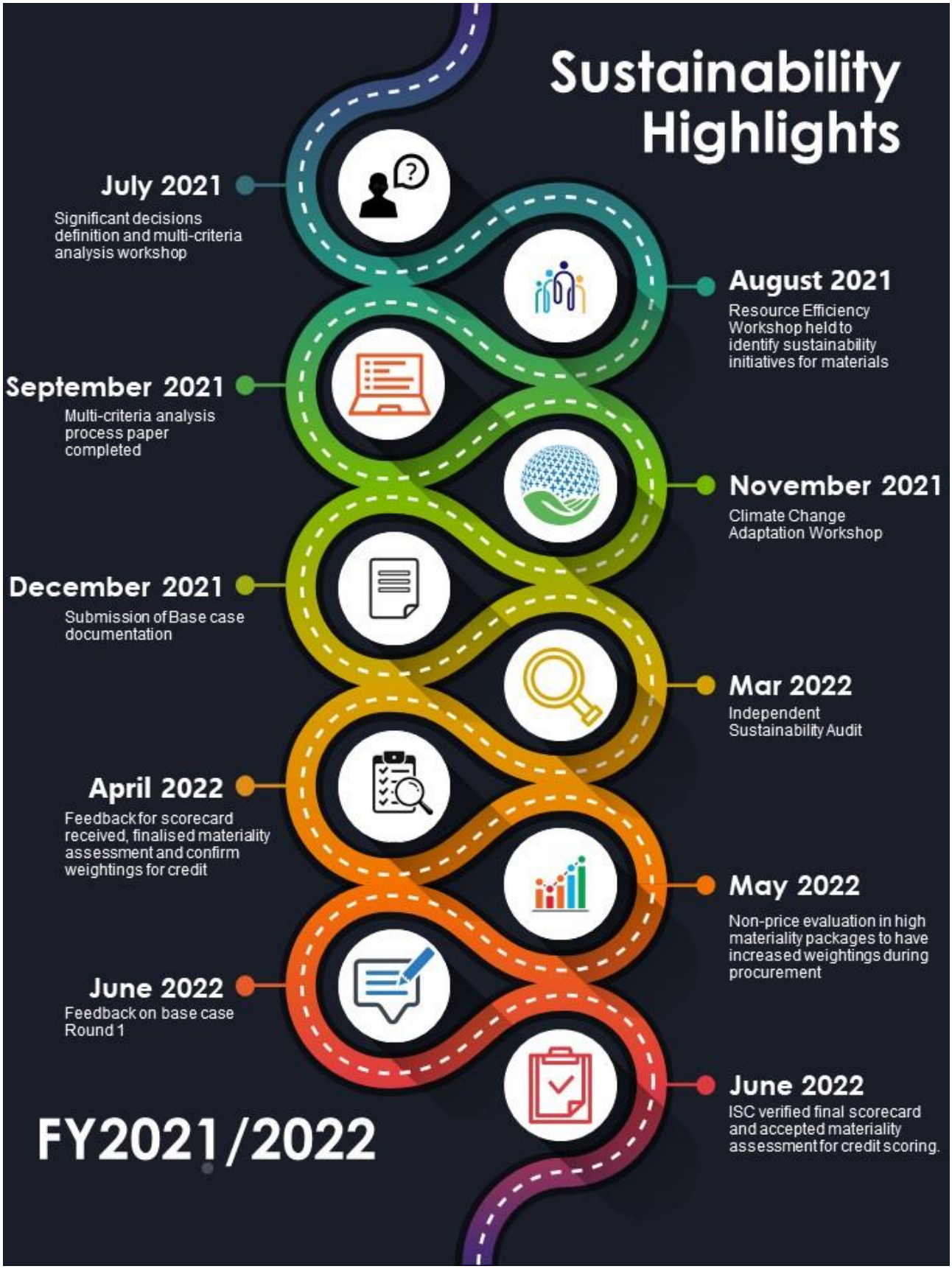


Figure 3 FY2021/2022 Greater Connect Alliance sustainability milestones

3 Governance

3.1 Approach to Sustainability

GCA is committed to designing and building the Project in a way that optimises environmental, social, and economic outcomes for current and future generations. To achieve this commitment, GCA has a dedicated sustainability team which drives sustainable practices across all aspects of the Project and implement appropriate strategies and management plans to achieve sustainability goals. Documents created to assist in the management of sustainability include, but are not limited to: Sustainability Management Plan, Resource Efficiency Strategy, Resource Efficiency Action Plan, Waste Management Plan, Climate Adaptation Action Plan, and Sustainable Procurement Strategy. GCA's commitments to sustainability can be read in the GEHBI Sustainability Policy (**Appendix 2**).

GCA's core sustainability strategy for the Project revolves around ISC's Infrastructure Sustainability rating tools, specifically version 2.0 for Planning, Design and As-built, and version 2.1 for Design and As-built for selected credits. These rating tools provide a list of credits, that represent specific sustainability topics and can be targeted to achieve points that determine the Project's sustainability performance throughout the Planning, Design, and As-built phases of the Project. For this project, the targeted rating for Design and As Built is 40 points, with the achievement of this score resulting in the attainment of a silver rating. To ensure an optimal rating is achieved, the ISC rating tool has been utilised to evaluate and prioritise sustainability initiatives for both Design and As Built phases.

Early project planning identified nine issues for the Project that have been refined into five focus topics. These provide a base for 18 specific objectives which in turn support multiple SMART targets for the Project that will maximise sustainability opportunities across the Project to increase the likelihood of achieving the target IS rating. Our focus topics are:

- Enhanced Urban Design and Placemaking
- Inclusive Community Consultation and Engagement
- In-depth Industry Engagement and Prosperity
- Efficient Resource Use and Sourcing
- Improved Management and Treatment of Impacts on Waterborne and Airborne Contamination.

The focus topics, objectives and targets are outlined in GCA's Sustainability Management Plan and are publicly available on Main Roads' website.

3.2 Material Sustainability Credits

To identify the most important sustainability credits to the Project, a Materiality Assessment was conducted with the GCA Management Team and key discipline leads in May 2021. The team rated the materiality (importance) of sustainability issues to the Project from the perspective of the Project team and from the viewpoint of our stakeholders. Each of the 39 credits within the ISC framework represent a focus topic for sustainability and are assigned a default score – the purpose of the materiality assessment process was to increase or reduce these default credit scores based on the values held by key internal and external stakeholders. Overall, the credits assigned the highest materiality scores (given a score of 3 or 4) are outlined below.

Governance

- Pla-2 Urban and Landscape Design

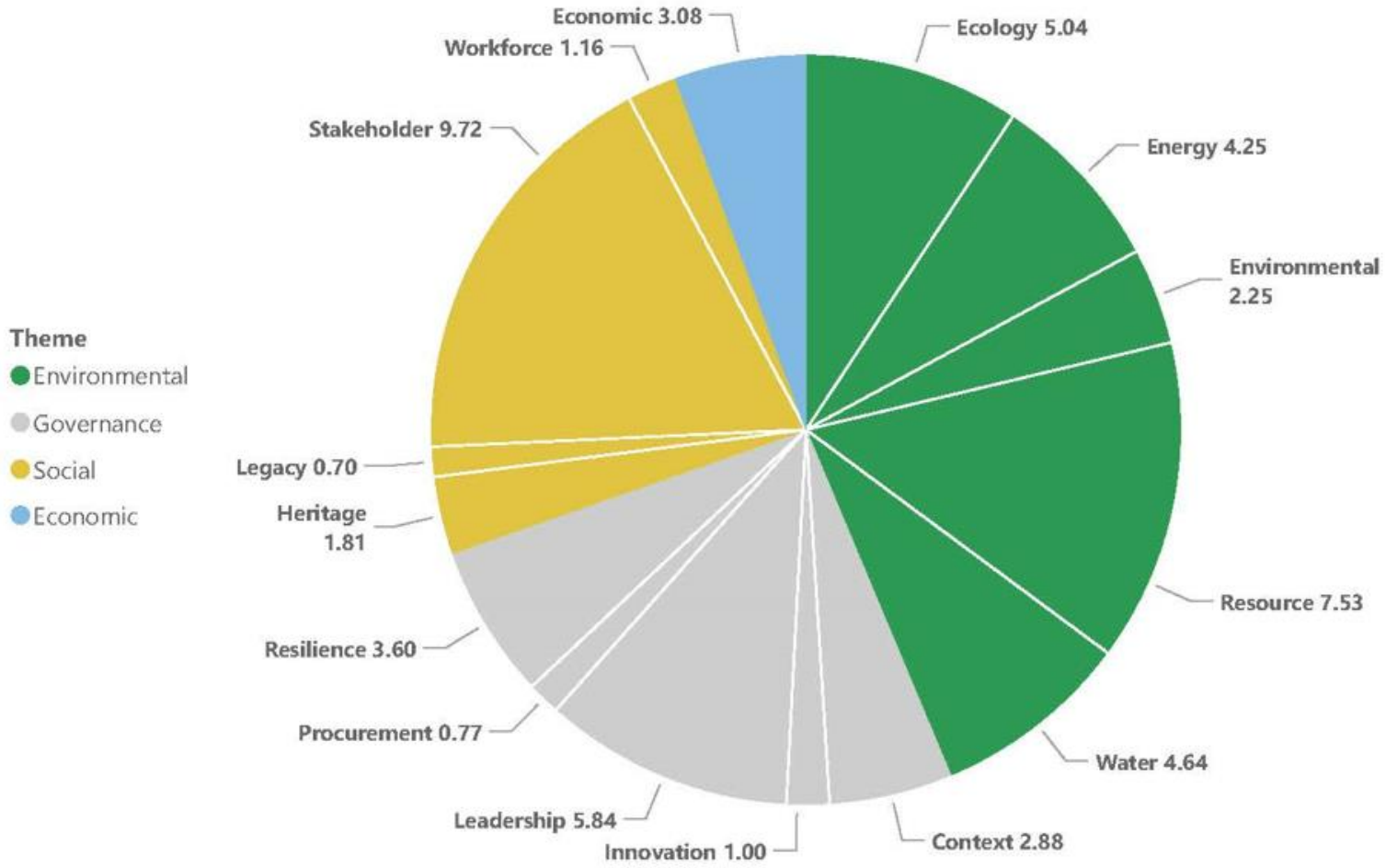
Environment

- Ene-1 Energy Efficiency
- Ene-2 Renewable Energy
- Ene-3 Offsetting
- Env-1 Receiving Water Quality
- Env-2 Noise
- Env-3 Vibration
- Env-4 Air Quality
- Env-5 Light Pollution
- Rso-2 Contamination Remediation Material
- Wat-1 Water Use
- Wat-2 Appropriate Use of Water Sources
- Wat-1 Water use
- Wat-2 Appropriate Use of Water Sources

Social

- Sta-1 Stakeholder Engagement Strategy Development
- Sta-2 Stakeholder Engagement Strategy Implementation
- Wfs-1 Strategic Workforce Planning
- Wfs-2 Jobs and Skills

An illustration of GCA's target credit scores, grouped by category, has been provided below in **Figure 4**. The figure accounts for the changes in the credit scores based on the outcomes of the materiality assessment.



Theme	Target Score
Economic	3.08
Environmental	23.71
Governance	14.09
Social	13.39

Category	Target Score
Context	2.88
Ecology	5.04
Economic	3.08
Energy	4.25
Environmental	2.25
Green Infrastructure	0.00
Heritage	1.81
Innovation	1.00
Leadership	5.84
Legacy	0.70
Procurement	0.77
Resilience	3.60
Resource	7.53
Stakeholder	9.72
Water	4.64
Workforce	1.16
Total	**54.26**

Figure 4 Materiality breakdown for ISCA credit categories

Based on the materiality assessment, credit scores, and likelihood of attainment, GCA is currently focusing on the below credits in alignment with our five key focus topics, noting we are also addressing specific topics that obtained a materiality score between 2-3. (**Table 2**).

Table 2 Alignment of Focus Credits against the five key Focus Topics

Focus Topic	Focus Credits
Enhanced Urban Design and Placemaking	Pla-2, Eco-1, Her-1
Consultation and Engagement	Sta-1, Sta-2, Wfs-1, Wfs-2
Industry Engagement and Prosperity	Spr-1, Spr-2, Leg-1
Efficient Resource use and sourcing	Rso-1, Rso-4, Rso-6, Wat-1, Wat-2, Ene-1, Ene-2
Management and treatment of impacts on waterborne and airborne contamination	Env-1, Rso-2, Rso-3

3.3 Sustainability Targets

Once key material issues to the Project were identified, the sustainability team continued to work one-on-one with the credit leaders to develop revised sustainability focus topics, objectives, and SMART sustainability targets. **Table 3** outlines the focus topics, objectives, and design targets that have been agreed upon and provides current progress against the design targets. A full list of SMART targets across the design, construction, and operational phases of the Project can be viewed on the Project Webpage on Main Roads Website. GCA is currently on track to achieve more than 80% of the targets set for the Project.

Table 3 Sustainability Objectives and Design Targets and Progress Towards Targets

Focus Topic	Objectives	Design Targets	Progress Update
Enhanced Urban Design and Placemaking	• Maximise opportunities for vegetation rehabilitation around Helena River • Enhance the Helena River Crossing and surrounding area • Maximise safe connectivity and permeability for non-motorised or micro modes • Minimise impact on TEC and associated Black Cockatoo Habitat (breeding and foraging areas) at trumpet interchange • Preserve and enhance aboriginal heritage values	• Investigate at least two opportunities to improve environmental outcomes by providing WSUD solutions, revegetation of adjacent degraded areas or other Green infrastructure initiatives • Design Prepare and implement a landscape plan to maximise the vegetation density, species diversity, and survival rate for the Lloyd Street rehabilitation area • Investigate at least 2 opportunities to enhance the Helena River precinct in consultation with key external stakeholders • Investigate the current and future needs of non-motorised and micro mobility transport users in consultation with external stakeholders, and investigate at least 4 opportunities to improve safe connectivity and permeability for these users, and adopt at least 1 connectivity and 1 permeability opportunity. • Investigate at least two opportunities to improve wayfinding opportunities at Roe Hwy / Great Eastern Highway Bypass Interchange. • Define the minimum area required to be cleared within the permit area and implement a behavioural process that restricts clearing to the minimum area required. • Identify drainage basin options that utilise areas of poorer quality vegetation, reducing the need for further clearing. • Investigate at least four opportunities to enhance the sites social and aboriginal heritage aspects through Urban Design, public and community art and interpretation.	**On-track** ✓ • The current Lloyd Street Bridge design allows for gentle batter slopes to improve revegetation efforts • Design of Roe Highway works amended to entirely avoid the Shrublands and Woodlands of the Eastern Swan Coastal Plain (SCP 20c)
Consultation and Engagement	• Maximise opportunities for stakeholder and community input and feedback on the Project design and implementation	• Stakeholder input influences more than one (1) priority project negotiable (as defined in the Community and Stakeholder Engagement Plan (CSEP)). • Communicate to external stakeholders the proposed sustainability objectives, targets and responsibilities for the project	**On-track** ✓ • Examples of channels used to engage stakeholders and encourage feedback include: - Links to CONNECT (customer relationship manager) database

		• Engage with key stakeholder to identify priority risks and opportunities • Engage with key stakeholders to identify social legacy priorities of the local community • Engage with key stakeholders to identify and manage aboriginal heritage value • Engage with key stakeholders to review and comment upon resilience planning for the project • Engage with key stakeholders to identify and treat risks associated with climate and natural hazards	- Invitation to register details on website to populate database - Direct mail within surrounding catchment area - Publications on MRWA website - Ministerial Media Statements • GCA has gathered feedback from all channels to produce a 'Community Feedback Report' which outlines common feedback themes and outlines key design changes resulting from feedback received. This report is publicly available on the Project webpage.
Industry Engagement and Prosperity	• Maximise workforce diversity and wellbeing • Develop capability and capacity in SMEs • Maximise capacity for Aboriginal participation • Maximise capacity for entry level workers	• Create a diversity and Inclusion policy and plan to attract and retain diversity within the project team • Identify key risks and opportunities for SME on the project including smaller design consultancies • Investigate and establish business baseline for engaging Aboriginal businesses during construction • Explore at least 4 Aboriginal heritage opportunities and Aboriginal engagement opportunities through design (e.g. Elder engagement to determine design and placemaking themes, public art opportunities) • Investigate and establish workforce plan and baseline for engaging entry level workers during design and construction	**Needs Attention (!)** • Workforce diversity and wellbeing management plan behind schedule (potential impact to achieving target around establishing workforce plan) **On-track ✓** • 10 Aboriginal Businesses engaged to-date

Efficient Resource use and sourcing	• Reduce carbon footprint from materials requirements • Reduce whole of life energy use for the Project • Reduce whole of life water use for the Project • Reduce waste and maximise onsite reuse and recycling • Integration of off-site recycled products and materials	• Investigate opportunities to reduce the use of material and adopt at least two (2) with a stretch target of 4 opportunities for material reduction/use of recycled products • Investigate energy efficiency opportunities and implement at least 3 • investigate opportunities to improve water efficiency and adopt at least 3 • investigate opportunities to minimise waste and maximise recycling and adopt at least 3 initiatives • Investigate opportunities to replace the use of virgin materials with off-site recycled products and adopt at least 2 with a stretch target of 3 opportunities • Identify and adopt at least 3 key adaptation actions identified through climate change and resilience risk assessments and REAP adaptation plan	**On-track** ✓ • GCA is pursuing a number of potential initiatives for the Project such as use of Recycled Asphalt Pavement • GCA is engaging with local waste services to minimise waste going to landfill and maximise the recycling and re-use of materials
Management and treatment of impacts on waterborne and airborne contamination	• Optimise the design and groundwater interface • Minimise the impacts of groundwater contamination, air quality contamination and ASS • Minimise impact and improve discharge quality to surface water	• optimise the design to minimise disturbance to ASS • optimise the design to minimise disturbance of Coal Tar with a stretch target of not disposing offsite • prepare ASS management plan with the aim to meet the treatment and management of soil and water in DWER guidelines • prepare contamination management plan to outline the requirements to minimise health risk and where possible, contain and encapsulate Coal Tar onsite • Develop appropriate sediment control and hazardous materials management procedures, to ensure avoidance of impacts to surface water quality within Helena River.	**On-track** ✓ • On-site investigations undertaken to assess the risk of Acid Sulfate Soils and other contaminants • Acid Sulfate Soil Management Plans and Dewatering Management Plans currently being drafted

3.4 Climate Change Assessments

GCA has committed to investigating risks posed by climate change and developing adaptation actions to improve resilience against climate change impacts. In alignment with this commitment, GCA has produced a Climate Change Risks and Adaptation Report which describes the climate change projections for the area, risks identified, treatment options, and other opportunities to reduce climate change risks.

3.4.1 Climate Change Projections, Risks, and Treatment Methods

The Climate Change Risks and Adaptation Report modelled future climate projections across two Representative Concentration Pathways (RCP 4.5 & RCP 8.5) using data developed by the Bureau of Meteorology and CSIRO. RCP 4.5 was chosen to reflect a moderate-conservative future increase in the concentration of global GHG emissions, while RCP 8.5 represents a 'worse-case scenario' outcome, predicting much greater future concentrations of global GHG emissions. Two future timeframes were chosen to calculate climate projections – 2030 was used to measure impacts against assets with a short-term life (25-50 years), while impacts to assets with a long-term life (100+ years) were measured against projections for 2090. Outcomes of the modelled projections are shown in **Table 4** below.

Table 4 Future climate projections for project site (Source: Bureau of Meteorology and CSIRO)

Climate Change in Australia Region		**Southern and South Western Flatlands (West)**				
		RCP	**RCP4.5**		**RCP8.5**	
Time period		**Baseline (1981-2010)**	**2030**	**2090**	**2030**	**2090**
Climate Variables	Change in annual mean temperature (^{0}C)	24.6	0.8 (0.6 to 1)	1.7 (1.1 to 2.1)	0.8 (0.5 to 1.4)	3.5 (2.6 to 4.2)
	Number of days over 35^{0}C (annually)	28	36 (33 to 39)	43 (37 to 52)	-	63 (50 to 72)
	Number of days over 40^{0}C (annually)	4	6.7 (5.4 to 7.5)	9.7 (6.9 to 13)	-	20 (12 to 25)
	Relative humidity (%)	-	-0.6 (-1.5 to 0.1)	-1.2 (-2.3 to 0)	-0.6 (-1.4 to 0.5)	-2.2 (-3.8 to -1.4)
	Change in annual rainfall (%)	784mm	-6 (-15 to -1)	-12 (-22 to -1)	-5 (-15 to 1)	-18 (-37 to -5)
	Extreme rainfall and flooding	The total rainfall from heavy rainfall events is projected to increase. Models show an increase in the 1-day annual maximum value and the 20-year return value.				
	Severe fire weather days (days with FFDI greater than 50)	2.5	3.1	3	2.93	5.93
	Drought factor	6.5	6.7	6.77	6.63	7.33
	Drought severity and duration	For all emission levels and time periods, time spent in drought is projected to increase, as is the duration and frequency of extreme droughts.				
	Severe weather events (including extreme wind, severe storms)	Projections show a slight decrease in both mean and extreme wind, although models for this variable are limited. Projections show a reduction in storminess, although global climate models agree that the intensity of storms will increase.				
	Cyclones and tropical lows	Tropical cyclones are expected to become less frequent, although the intensity of cyclones is projected to increase. Tropical lows will continue to impact the region, although cut-off lows are projected to decrease in frequency.				

Based on projections within the report, GCA identified several potential climate change risks to the Project:

- Bushfire – damage to infrastructure and electricity supplies lead to power outages and communications network failure
- Extreme rainfall and flooding – increased road incidents from dangerous driving conditions, and potential for bitumen to degrade at a faster than anticipated rate
- Drought – reduced annual rainfall may reduce the success of landscaping and revegetation efforts

- Extreme heat – increased number of vehicle breakdowns, accelerated deterioration of asphalt, and potential warping of steel elements in infrastructure.

Adaptation controls and treatment methods identified to combat high-rated risks include:

- Implementing planned burns and Traditional Aboriginal burning practices to reduce the risk of bushfires
- Integrating upstream flow restriction/reduction into design to reduce flooding
- Using more durable asphalt and pavement materials (e.g., EME2 asphalt)
- Planting deep-rooted native trees that are more resilient to drought and developing a mulching and watering strategy that will support the establishment of plants
- Increase quantity and accessibility of emergency parking bays and respite zones for road users.

3.5 Technology and Innovation

Innovation has been integrated and is being pursued across various disciplines within GCA. The engineering team within GCA have developed an innovation and value for money monthly workshop that encourages new ideas to be brought forward that will improve the efficiency of the Project and help meet sustainability targets. Additionally, GCA's sustainability team also attends monthly meetings with design, construction, and procurement teams to discuss progress and challenges facing sustainability initiatives and propose innovative ideas for the Project. GCA will continue to challenge business-as-usual approaches and search for innovative methods of improving energy and water savings, materials reduction, and waste reduction.

4 Economic

4.1 Key Economic Context

The Project provides a crucial connection between Great Eastern Highway, Tonkin Highway, and the Perth Metropolitan Road networks, bypassing Guildford and Midland town centres. Within this precinct, the GEHB supports key economic zones including freight distribution centres, Perth Airport, and many businesses within the Hazelmere and Forrestfield industrial areas and adjacent regions. The network also provides access and transport routes for emergency services, schools, St. John of God Midland Hospital, and other services (see **Appendix 1** for the full list).

Given the high reliance on GEHB and Abernethy Road by various stakeholders, construction works in the area are expected to have temporary economic impacts resulting from:

- The temporary closure of roads delaying traffic and increasing work related travel times
- Noise pollution and the restriction of vehicle access to nearby businesses
- Delayed travel times for trucks and freight services impacting deliveries.

Upon completion of the Project in 2025 the improved GEHB and Abernethy Road interchanges will ease congestion and reduce travel times for more than 60,000 road users per day. An improvement in the efficiency of freight services is also expected to result from reduced congestion, with trucks benefiting from a free-flowing road network design.

The Project aims to prioritise opportunities for supply chain procurement from local businesses proximate to the Project. Additionally, GCA has targets for the employment and retention of new starter employees, aboriginal employees, and aboriginal businesses which can be viewed in **Table 3** under the Industry Engagement and Prosperity Focus Topic.

A summary of economic performance and aspects for the Project are detailed in **Table 5**.

Table 5 Summary of Economic Aspects

ECONOMIC ASPECT	UNIT	TOTAL THIS PERIOD	TOTAL FOR PROJECT
Funding Received	$	386.5M (GEHBI), & a proportion of $170M (PAPN)	386.5M (GEHBI) & a proportion of $170M (PAPN)
Indigenous Enterprises	#	6	10
Disability Enterprises	#	0	0
People Employed by Supply Chain[1]	#	261	
Suppliers Engaged	#	111	111
Buy Local Spend Target[2]	$	12,705,839.90	

1. People employed by supply chain defined as employees and subcontractors with on-site presence. Given GCA is currently still in the design phase, suppliers engaged off-site (e.g., for materials) are not significant for this reporting period.
2. Buy local spend target is defined as targeted spending for procurement within WA, excluding spending within GCA (AECOM, Arcadis, and Laing O'Rourke).

4.2 Key Economic Outcomes

The Project aims to deliver the following economic benefits:

Economic Development of the Area

- Improved road safety and reduced congestion for all users of the GEHB and adjoining roads
- Improved freight efficiency, connectivity, and travel times

- Improved access to the Hazelmere and Forrestfield industrial areas and former railway workshops precinct in Midland
- Improved safety conditions, accessibility, and travel times for local and regional cycling, and local pedestrian access and connectivity

Upskilling and Employment Opportunities

- Design and Construction of the Project will bring hundreds of jobs to the area and present opportunities for local suppliers
- Legacy economic benefits by means of upskilling the local labour force through employment, training and participation
- Focused opportunities for Aboriginal business creation and participation
- Strategic assessment of significant project decisions using a bespoke MCA tool developed specifically by GCA for the Project

Greater Economic Development of Area

The PAPN Project includes the upgrade of the intersection between Abernethy Road and Kalamunda Road, and development of a new grade separated interchange of Great Eastern Highway Bypass and Kalamunda Road for the Perth Airport Northern Precinct. The overall development of the area and construction of new roads and interchanges will further stimulate economic growth in the area through the provision of jobs, greater opportunities for local suppliers, and improved accessibility for freight services and people commuting to the airport.

Figure 5 Early Works undertaken at Work Pack 1, May 2022

4.3 Sustainable Procurement and Buy Local

GCA is committed to ensuring the Project delivers full, fair, and reasonable opportunity to local industry during design, procurement, and construction in accordance with the requirements of the *Western Australian Jobs Act 2017* (WA) and the Western Australian Industry Participation Strategy (WAIPS). To document and guide GCA's commitment to sustainable procurement and buy local, a Procurement Management Plan has been developed, which provides a procurement strategy that is specific to the Project and prioritizes local and aboriginal participation. The procurement strategy details the following common principles:

- Use competitive formal tendering procedures with enough qualified tenderers in line with procurement framework and DOA wherever feasible
- To use best endeavours to procure all services, equipment, and materials within budget where feasible and always based on a balanced assessment of the best value for money
- To procure technically conforming goods and services which (where feasible) meet program requirements, or otherwise (if sufficient time is not available) are available in a reasonably timely manner
- To procure goods and services which meet quality, safety, and environmental requirements
- To reduce project procurement risk using appropriate controls and contract documentation
- Use standardised methodology, systems, procedures, together with customized documentation, for consistency
- To identify the critical procurement elements and develop a procurement schedule
- To maximise local content and Aboriginal participation
- To include sustainability requirements that reflect GCA's targets (detailed in a sub-strategy)
- Maximise the use of risk and opportunity management strategies and implement a process of identifying risks and opportunities upfront to allow time to mitigate adverse effects or capitalise on opportunities
- Ensure that all manufacturers' data reports/records dossiers are received, registered, approved and provided to MRWA prior to releasing securities as part of the Handover Plan.

GCA has developed a Sustainable Procurement Strategy which details how GCA will respond to risks and opportunities relating to sustainable procurement and the supplier assessment process that will be used to align GCA's supply chain with sustainability objectives and targets. The Sustainable Procurement Strategy ensures that approximately 25 high priority procurement packages such as asphalt and concrete are given greater weightings to allow sustainability an increased influence over the decision-making process.

Invitations to tender (ITT) sent out to suppliers each include a sustainability section that is adjusted accordingly depending on the level of priority the procurement package is given. Key areas that suppliers are assessed against for sustainability include:

- Energy and greenhouse gas emissions reduction measures
- Measures to utilise appropriate water sources and maximise water use efficiency
- Measures to minimise waste production and waste disposal to landfill
- Measures to minimise the use of virgin materials and maximise the use of recycled or alternative materials that deliver circular economy outcomes and reduce total embodied carbon
- Commitment to using products with approved environmental labels

- Policy on Aboriginal Participation and Engagement within the workplace and wider industry, with an intent to support and enable recruitment, training, and retention of more Aboriginal people in the workforce
- Strategy towards new-starter and trainee development within the workforce, with an intent to support and enable recruitment, training, and retention of more trainees and new starters in the workforce
- Anti-bribery and Corruption Policy and Procedures
- Implementation of sustainability initiatives and innovations

GCA also assesses suppliers with a much higher preference towards buy local (within the Perth Metropolitan region) and procuring materials and services as close to the Project as possible while taking into consideration value for money. For example, GCA has engaged with Gambara, a local environmental consultant service, for the delivery of weed and dieback mapping for the Project. GCA is also engaged with a number of local waste services within close proximity to the Project area.

4.3.1 Targets

Targets used to track GCA's performance towards sustainable procurement are outlined in the sustainable procurement strategy and summarised in **Table 6**. KPI's for these targets have been intentionally excluded from the table as they are currently under revision by GCA's Alliance Management Team.

Table 6 Performance targets for sustainable procurement

Area	Target	ISC Credit	Responsibility
Workforce Skills and Training	$30M spend on lower-level prequalified road and bridge contractors	Spr-2, Wfs-1	Procurement Manager & Human Capital Lead
Workforce Diversity and Inclusion	10% of the total work hours during the construction phase are undertaken by Aboriginal persons	Wfs-1, Wfs-2, Wfs-4	Indigenous Affairs and Social Inclusion Advisor
Workforce Diversity and Inclusion	Works and/or services to a value of at least $10 million are undertaken by Aboriginal Businesses	Spr-2, Wfs-1, Wfs-2, Wfs-4	Indigenous Affairs and Social Inclusion Advisor
Workforce Diversity and Inclusion	At least 5% of the sub-contracts above $20,000 are awarded to Aboriginal Businesses.	Spr-2, Wfs-1, Wfs-2, Wfs-4	Indigenous Affairs and Social Inclusion Advisor
Sustainably Labelled Products	Up to 5% spend on materials or products with sustainable labelling used on permanent infrastructure (for material impact packages)	Rso-7	Procurement Manager & Sustainability Manager
Monitoring and Reporting	Supply chain reporting platform to collect, track and report on analysis of sustainability performance data (waste, materials, energy, water)	Rso-6, Wat-2, Ene-1, Rso-4, Wfs-1	Procurement Manager & Sustainability Manager
Energy Efficiency and Reduction	Achieve at least a 5% reduction in energy used or emissions (scope 1 and 2) created during Project lifetime	Ene-1, Ene-2, Ene-3, Rso-6, Spr-2	Project Manager
Materials use Minimisation	5% reduction in materials lifecycle impacts compared to a Base Case footprint	Rso-1, Rso-6, Spr-2	Project Manager

To ensure local and aboriginal participation is prioritised, GCA have created the position of Local Industry Participation Officer embedded in the Aboriginal and Industry Engagement Team. Their role is to identify and pursue opportunities for local professionals across design, construction, and commercial settings, including opportunities for Aboriginal businesses.

4.4 Sustainable Transport

The Project has a significant focus around improving the extent of Principal Shared Paths in the area to encourage the use of sustainable transport methods including cycling and the use of other small manned electric vehicles. In accordance with this aim, the Project includes new Principal Shared Paths along Roe Highway and Great Eastern Highway Bypass as described:

- The new Principal Shared Path (PSP) along Roe Highway will extend from the Roe Highway and Great Eastern Highway interchange to join the section of PSP north of Kalamunda Road which has been constructed as part of the Roe Highway and Kalamunda Road Interchange project. This extension will complete the missing link in the 30km PSP between Great Eastern Highway in Midland and Kwinana Freeway in Jandakot.
- A new PSP will also be built along the northern side of the Great Eastern Highway Bypass from Roe Highway to just west of the existing railway bridge where it will join the local footpath network on Waterhall Road.

The Project also includes:

- A shared path on the western side of Abernethy Road between Great Eastern Highway Bypass and Kalamunda Road. This shared path will connect to the new PSP on the Bypass via an underpass.
- A shared path along the western side of Lloyd Street between Great Eastern Highway Bypass and the roundabout adjacent to Bunnings in Midland.

The Project is expected to improve the efficiency of everyday travel for regular road users by reducing traffic congestion in the area.

4.5 Case Study - Multi Criteria Analysis Process

GCA has developed a Multi-Criteria Analysis (MCA) tool to assist in the project's decision-making process and optioneering assessment. The MCA tool was developed as part of the IS v2.0 Design & As-Built Ecn-1 Options Assessment credit. The tool includes five main themes: Environmental, Social, Economic (non-financial), Technical and Cost. Each theme was given an individual weighting that was set and agreed upon by the Alliance Management Team (AMT). The individual themes were further divided into individual criteria and provided a percentage weighting, **Table 7** provides a summary for the MCA's themes and criteria.

Table 7 Multi Criteria Analysis theme and criterion weighting

Theme Weighting	Theme	Criterion	Criteria Weighting
13%	Environmental	Water Use	15%
		Resources materials	25%
		Ecological Impacts	10%
		Energy Use	15%
		Resilience to Climate Change	5%
		Contamination	10%
		Resources - waste	20%
13%	Social	Noise	5%
		Aesthetics	15%
		Access and permeability	20%
		Safety (Public)	20%
		Stakeholder Perceptions	20%
		Heritage	15%
		Legacy	5%
13%	Economic (not financial)	Aboriginal Participation	60%
		Tier three contractors	40%
20%	Technical	Constructability	25%
		Operational life	10%
		Maintainability	15%
		Adaptability	10%
		Quality	25%
		Safety in Design	15%
40%	Cost	CAPEX	50%
		OPEX	50%

The theme weightings are standard and set in place, however the assessment allows for the individual criterion weightings to be adjusted depending on their importance for each independent assessment. Additionally, if during an assessment a criterion is found to have a neutral score (zero score, no negative/positive impact) for each option, the assessment will automatically distribute the percentage equally across the remaining relevant criteria.

Prior to starting the MCA process, the option is assessed at a higher level to ensure that the option identified is feasible. This initial assessment is considered as "gates" and if a block is identified, possible solutions are discussed, if none are found the option is considered unfeasible and is excluded from the MCA process. The gates that must be passed by an option are Cost, Time, Community, Supply Chain Capability and Sustainability.

Figure 6 below illustrates an example result of an MCA assessment after scoring is completed for an assessment with three possible options.

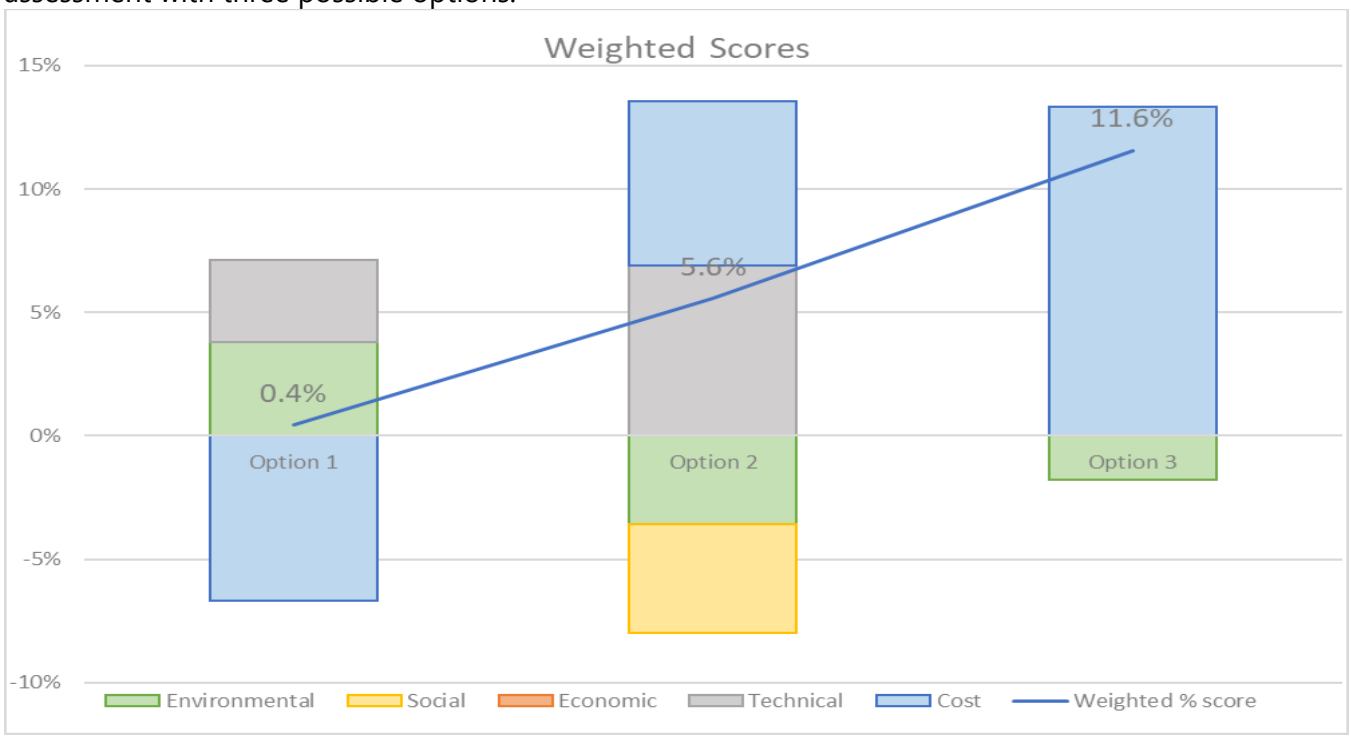


Figure 6 Example of a standard MCA result after an assessment

5 Environmental

A summary of environmental performance and aspects and resource inputs and wastes for the Project are detailed in **Table 8** and **Table 9** respectively below.

Table 8 Summary of Environmental Aspects

ENVIRONMENTAL ASPECTS	UNIT	TOTAL THIS PERIOD	TOTAL FOR PROJECT
Native Vegetation Cleared	ha	0	0
Native Vegetation Retained (due to design)	ha	0	0
Revegetation/rehabilitation Undertaken	ha	0	0
Number of Significant Trees Cleared (Potential suitable Black Cockatoo Breeding Tree)	#	0	0
Number of Trees Retained (due to design)	#	0	0
Total Water Consumption	kL	7,674	7,674
Total Non-Potable Water Consumption	kL	7,120	7,120
Total Potable Water Consumption	kL	554	554
Non-Potable Water Replacement	%	100	100
Total Green House Gas emissions^	t CO_2-e	292.18	296.08
Total Energy Consumption	GJ	3,126.67	3,182.05
Renewable Energy Mix	%	0	0

^ Inclusive of Scope 1, 2 & 3 emissions

Table 9 Resource and Waste Summary

RESOURCE INPUTS AND GENERATED WASTE	UNIT	TOTAL THIS PERIOD	TOTAL FOR THE PROJECT
Resource Inputs (Materials)			
Total Quantity of Virgin Materials Used	t	7,403.20	7,403.20
Total Quantity of Recycled Materials Used	t	7,588.45	7,588.45
Total Quantity of Reused Materials Used Onsite	t	0	0
Percentage of Recycled Material Used	%	50.62%	50.62%
Resource Outputs (Wastes)			
Waste Sent to Landfill	t	68.26	68.26
Waste Diverted from Landfill	t	0	0
Total Waste Generated by Project	t	68.26	68.26
Waste Diversion Rate	%	0%	0%

5.1 Environmental Context

The Project will include various upgrades and road works within the Cities of Swan and Kalamunda, approximately 14 km east of Perth. Construction of the Project will impact conservation significant flora and fauna, Threatened and Priority Ecological Communities, conservation significant wetlands, contaminated sites, and Aboriginal heritage sites. Where possible, the Project is being designed to minimise the impact to environmental values. This includes present and future amendments

undertaken to minimise potential impacts to Banksia woodlands and other Threatened Ecological Communities (TEC).

Key environmental legislation associated with the Project includes the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), which focuses on the protection of matters of national environmental significance (MNES), the *Biodiversity Conservation Act 2016* (BC Act), the *Environmental Protection Act 1986* (EP Act), the *Rights in Water and Irrigation Act 1914* (RIWI Act), the *Swan and Canning Rivers Management Act 2006*, and the *Aboriginal Heritage Act 1972*.

The Project design will likely impact the following:

- Registered Aboriginal Heritage Sites (**Appendix 3**)
- Threatened and Priority flora species and habitat (**Appendix 4**)
- Threatened and Priority fauna species and habitat (**Appendix 4**) inclusive of Black Cockatoo Foraging and potential Breeding Habitat
- Conservation Category Wetland (UFI 15440) located within the scope of the Project and associated with the Helena River
- Bush Forever Site 481 and 122 (Clearing of Bush Forever Site 122 has been avoided through proposal re-design)
- Commonwealth listed Threatened Ecological Communities (**Appendix 3**):
  - Banksia woodlands of the Swan Coastal Plain (Listed as Endangered under the EPBC Act)
  - Shrublands and Woodlands of the eastern Swan Coastal Plain (Listed as Endangered under the EPBC Act, however clearing has now been avoided through proposal re-design).
- State listed Threatened and Priority Ecological Communities (**Appendix 3**):
  - *Banksia attenuata* woodlands over species rich dense shrublands (FCT 20a) (Listed as Endangered under the BC Act)
  - Shrublands and Woodlands of the Eastern side of the Swan Coastal Plain (FCT 20c) (Listed as Critically Endangered under the BC Act, however clearing has now been avoided through proposal re-design)
  - Low lying *Banksia attenuata* woodlands or shrublands (FCT 21c) (Listed as Priority 3 under the BC Act)
  - Central *Banksia attenuata – Banksia menziesii* woodlands (FCT 23a) (Listed as Priority 3 under the BC Act
  - Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands (FCT 28) (Listed as Priority 3 under the BC Act

The Project design has taken into account the environmental values of the Project and the potential environmental impacts. As such, GCA has adjusted design speeds and redesigned works near the Roe Highway and Great Eastern Highway Bypass intersection to entirely avoid the Commonwealth listed Shrublands and woodlands of the eastern Swan Coastal Plain TEC (SCP20c). GCA also realigned the Principal Shared Path on the east side of Roe Highway, south of the interchange and adjusted the proposed clearing footprint to reduce impacts to the State listed *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a), which is a subset of the Commonwealth listed Banksia Woodlands TEC. GCA will continue to review the Project design to minimise the potential impacts to the *Banksia woodlands* of the Swan Coastal Plain TEC and other significant flora and fauna assets identified at the location.

The Project works associated with the Roe Highway and Great Eastern Highway Interchange upgrade have been determined to be a controlled action under the EPBC Act (EPBC 2020/8784), due to the

likelihood of significant impacts on MNES. These works are also subject to a clearing permit application (CPS 9948/1), required under Part V of the *Environmental Protection Act*. A supporting document for the native vegetation clearing permit has been prepared, which describes the proposed clearing, key activities associated with the clearing, potential impacts (in relation to the ten clearing principals), and strategies to minimise impacts to native vegetation. Main Roads is investigating options to develop suitable offsets involving land acquisition, enhancement of existing conservation reserves and revegetation to counterbalance the residual impacts from the Project.

Figure 7 Helena River and surrounding native vegetation.

5.2 Environmental Management

The Project will be managed in accordance with GCA's Environmental Management Plan to ensure that works are undertaken in an environmentally responsible manner and in accordance with relevant environmental approvals and associated Project conditions. The Environmental Management Plan sits within an industry-leading Health, Safety and Environmental Management System and adopts an avoid, minimise, and offset hierarchy approach to mitigate environmental impacts. Preliminary Environmental Impact Assessments (PEIA's), Clearing Assessment Reports (CAR's), Low Impact Screening Checklists and Site Environmental Plans (SEP's) have been prepared and approved prior to commencing works as is appropriate across each stage of the Project.

The following environmental or heritage approvals, licences, and permits outlined in **Table 10** are required for the successful implementation of the Project. Environmental approvals and allowances are summarised in **Table 11**.

Table 10 Approvals, legislation, and purpose for project-specific licenses and permits

Approval	Legislation	Purpose
Authorised interference to bed and banks of a watercourse or wetland	Section11/17/21A permits – *Rights in Water and Irrigation Act 1914*	Gain approval for interference to Helena Riverbed and banks during construction.
Application for development within the Swan Canning Development Control Area	Form 7 – *Swan and Canning Rivers Management Regulations 2007*	Application for permit to undertake works for the Lloyd Street Bridge and Great Eastern Highway Bypass and Roe Highway Interchange Upgrade.
Development Approval	*Planning and Development Act 2005*	Inputs required for Development Approval for works within the Swan and Canning Management Development Control Area
Approval for the clearing of native vegetation	Part V – *Environmental Protection Act 1986*	Gain approval for all works that require the clearing of native vegetation.
Licence to construct or alter a well and licence to take water	26D and/or 5C - *Rights in Water and Irrigation Act 1914*	To establish a well and draw water from the site location to meet construction water requirements.
Legal consent to cause damage, destruction, or alterations to an Aboriginal site	Section 18 – *Aboriginal Heritage Act 1972*	Allow alterations to be made around Aboriginal heritage sites. Particularly relevant to the construction of Lloyd Street Bridge.

Table 11 Environmental Allowances, Approvals and Permits

ENVIRONMENTAL ALLOWANCE TYPE	UNIT	PROJECT ALLOWANCE
Clearing Permit Allowance (CPS 818/15)	ha	Clearing of up to 2.91 ha permitted for Lloyd Street Bridge Works
Water Abstraction Licence (5C)	kL	Pending Approval
Bed and Banks Approval		Two Bed and Banks permits approved for Lloyd Street Bridge Works

5.3 Water Management

Water management and efficiency is an essential part of the Project. WA water demand continues to increase with population growth and climate change. GCA endeavours to minimise overall water usage during construction and to avoid using potable water sources where possible.

GCA has considered all possible water sources to be utilised including surface water, groundwater, scheme water and recycled wastewater, each water source was investigated for their feasibility to be utilised on the Project. GCA identified that extracting surface water from the nearby Helena River was not a feasible option due to the negative ecological and environmental impact. Both groundwater and scheme water were feasible options for the project and recycled/treated wastewater is currently being investigated for possible use, however there are supply and potential safety considerations.

GCA has modelled Water consumption across the project lifecycle and identified that the majority of

water will be used for dust suppression and earthwork compaction. Other uses that are considered minor usage include but are not limited to site office usage, watering during establishment period, pipe testing, profiling activities and water-filled barriers.

The water management approach undertaken by GCA focuses on reducing overall water usage and avoiding the use of potable water unless strictly necessary. Options to reduce water usage during dust suppression and earthwork compaction were investigated as a priority, followed by reduction options for minor usages. Wat-1 Water Use criteria from the ISC v2.0 Design & As-Built framework has been included as sustainability target and a 5% reduction in overall water use has been stated in the SWTC.

Current water use for the Project has been provided in **Table 12**.

Table 12 Water Parameters

WATER PARAMETER	TOTAL THIS PERIOD		TOTAL FOR PROJECT	
	kL	%	kL	%
Potable Water				
Standpipe / Scheme Water Purchased	554	7	554	7
Non-Potable Water				
Bore Water	7,120	93	7,120	93
Surface Water	0	0	0	0
Recycled / Wastewater	0	0	0	0
Total Water Used		**100.0**		**100.0**

5.4 Vegetation

5.4.1 Clearing

The total area to be cleared by GCA will be kept to a minimum, retaining the maximum amount of native vegetation possible. GCA has not yet undertaken any clearing of native vegetation, as indicated in **Table 8**. As part of early works, clearing of non-native vegetation has taken place across Work Pack 1 (**Figure 1**) including north of the Great Eastern Highway Bypass along parts of Arum Lily Place and between Vale Road and Stirling Crescent south of Lakes Road. The south-west quadrant of the intersection of GEHB and Abernethy Road has also had non-native vegetation cleared. Areas within Work Pack 4 (**Figure 1**) in the east quadrant of Roe Highway located north of Helena River have had invasive weed species cleared for enabling works.

A clearing permit has been submitted to the Department of Water and Environmental Regulation (DWER) for clearing of native vegetation for Work Pack 4, however it is currently pending approval. Approval to clear native vegetation on Work Pack 4 will include a requirement to implement an offset plan aimed at protecting and, where applicable, improving similar vegetation types to the TEC being cleared. Clearing Permit CPS 818/15 for Work Pack 2 has been approved and allows for the clearing of up to 2.91 hectares of native vegetation in the Lloyd Street Bridge area (**Table 11**).

5.4.2 Revegetation/Rehabilitation

Clearing for the Lloyd Street Bridge is conditional on Main Roads undertaking a rehabilitation offset within the Helena River floodplain, approximately 250 m upstream. The Lloyd Street Bridge Offset Proposal has been approved by DWER and comprises rehabilitation of 4.3 ha with native species representative of the Guildford Vegetation Complexes. This includes approximately 10,000 native

sedges and rushes, 2,000 trees, and 20,000 shrubs. A detailed Rehabilitation Plan is currently in preparation and will be approved by Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with the Lloyd Street Bridge Development Approval conditions. Additionally, a Revegetation and Landscaping Plan is currently in preparation for the Lloyd Street Bridge works, which is also subject to approval by DBCA. Separately, GCA is preparing landscaping plans to revegetate disturbed areas across the remainder of the project.

GCA is considering the inclusion of rehabilitation as an offset against impacted Conservation Category Wetlands on WP4. This is currently being discussed with DWER and DBCA.

To support revegetation efforts, GCA engaged in a seed collecting event for native vegetation in the area in November 2021 (**Figure 8**).

5.4.3 Dieback

A *Phytophthora cinnamomi* (Dieback) assessment of the Project area has been undertaken by Gambara and captured in the Topsoil and Hygiene Management Plan produced in November 2021. The report determined a majority (85%) of the Project was classified as 'Excluded' based on the degraded nature of the area. Three dieback areas covering 8.5% of the Project were considered 'Infested' and a further 6% was classified as 'Uninfested'. Based on these findings, Gambara has proposed approaches to manage and prevent the spread of dieback in the area, which include:

- Weekly inspections of clean down stations and hygiene operations
- Weekly inspection of dieback demarcation - to ensure infested and uninfested zones are clearly marked and separated
- Monthly site inspections of topsoil management, with site inspection reports to be produced.

Figure 8 Native vegetation seed collection event undertaken by GCA employees

5.5 Carbon Emissions and Energy

GCA will be aiming to achieve the level 1 in Ene-1 Energy Efficiency criteria of the ISC v2.0 Design and As-built framework. Additionally, a target of a 5% energy reduction target has been included as part of the SWTC. GCA is currently developing an Energy Model Report, that will estimate the project energy use throughout the construction and operation period.

Initial estimates for the construction period indicate a majority of carbon emission will be generated from vehicle movement due to Earthworks, Road building and dust suppressing. Other sources of energy/emission include electricity usage from both the main and site office. Although it should be noted the site office is currently running on diesel generators, but plans have been developed to connect the site office to the SWIS grid and a reduction in emission is expected after connection is established. Other energy initiatives proposed for the construction period include installation of electricity meters in offices, purchasing green energy/ large scale generation certificates, inclusion of hybrid fleet and solar light towers.

The lifecycle of the asset has been assumed to be 100 years, and this has been used for emissions/energy modelling during the operational period. GCA has identified the following activities will contribute to energy/emission during the operation period; maintenance of asset, vehicle usage, carbon sink removal and streetlighting. GCA has estimated that during the operation period based on 100 years asset life, emissions from vehicle/infrastructure usage will comprise the majority of total emissions. Initiatives that have been proposed for the operational period include the replacement of High-Pressure Sodium bulbs with LED bulbs for all streetlighting across the GEHBI project and investigating any potential action to reduce maintenance requirement throughout the asset life cycle. In terms of the infrastructure usage, GCA has submitted a technical clarification for the exclusion of these Emissions from the reduction calculation as the project has very little to no control over the production of these emissions, however it will still be estimated as part of the Energy modelling report.

Table 13 Energy Parameters

ENERGY PARAMETERS	TOTAL THIS PERIOD			TOTAL FOR PROJECT		
	LITRES	KWH	% OF TOTAL USE	LITRES	KWH	% OF TOTAL USE
Unleaded (on and off road)	0	N/A	0	0	N/A	0
Diesel Used (on and off road)	65,246	N/A	81%	66,681	N/A	81%
Liquefied Petroleum Gas (LPG)	0	N/A	0	0	N/A	0
Biodiesel	0	N/A	0	0	N/A	0
Hydrogen	0	N/A	0	0	N/A	0
Oil	0	N/A	0	0	N/A	0
Other	0	N/A	0	0	N/A	0
Purchased Electricity from Grid*	-	168,935*	19%	-	168,935*	19%
Green Power Mix	-	-	0	-	-	0
Generated from Renewable Energy Onsite and Used Onsite	-	0	0	-	0	0
Total Energy Used	-		**100%**	-		**100%**

Note: Energy in gigajoules (GJ) is calculated using the conversion values detailed in the National Greenhouse Account Factors.
**Electricity from SWIS grid is estimated based on NABERS office electricity calculator*

5.6 Materials and Recycling

As part of the development of this project, GCA is required to achieve a 5% reduction target in virgin material usage. Additionally, GCA has set objectives to reduce overall waste and maximise recycling opportunities by diverting waste from landfill for the various waste streams. To achieve these outcomes, GCA will investigate resource efficiency, waste reduction/recycling initiatives and sustainable materials that could potentially be applied to the project include but not limited to:

- Integrating reclaimed asphalt pavement (RAP) into roads
- Use of recycled fill where structurally viable
- Use of crushed recycled concrete (CRC) in road sub-base under full depth asphalt
- Use of other recycled construction materials e.g. steel, wood, rubber, and glass
- Use of Crumbed Recycled Rubber
- Introducing containers for change
- Minimising use of single-use plastics among staff

A resource efficiency workshop was held on August 2021 to further realise opportunities and assess the feasibility of integrating initiatives into the Project design and construction. The workshop assisted in establishing the foundation for GCA's Resource Efficiency Strategy (RES) and Resource Efficiency Action Plan (REAP), which will assist in effectively managing resource use and waste. Both the use of CRC and RAP is in alignment with MRWA waste strategy commitments.

Following the workshop and development of the RES and REAP, an ongoing monthly Sustainability Action Sprint meeting is held to assist in keeping momentum of identified initiatives. This meeting was also utilised as an opportunity to recognise new initiatives as the project progresses.

GCA has also begun investigating waste services and recycled material suppliers as part of the procurement process. The project team has been investigating different avenues to procure and use recycled material for the project and endeavours to divert waste produced on-site from landfill. The waste management strategy document currently in development will highlight actions and targets for the different waste stream identified for the project. The GCA project team will have a preference to use recycled material as part of this strategy where it is applicable.

The project has also considered the effects of embodied carbon associated with material manufacturing and extraction. GCA has begun to explore more sustainable material options and utilising the IS v2.0 Material calculator to evaluate embodied carbon.

A list of raw materials, recycled materials, and reused materials used on the Project have been provided below in **Table 14**, **Table 15**, and **Table 16** respectively.

Table 14 Imported Raw/Traditional Materials for the Project

IMPORTED RAW/TRADITIONAL MATERIALS			
MATERIAL	**UNIT**	**TOTAL THIS PERIOD**	**TOTAL FOR PROJECT**
Aggregate	t	2,401.06	2,401.06
Aluminium	t	0	0
Asphalt	t	0	0
Ballast	t	0	0
Bedding Aggregate	t	0	0

Bitumen	t	0	0
Bitumen Cutter (MCC)	t	0	0
Bitumen Cutter (SCC)	t	0	0
Cement	t	0	0
Cement Additives	t	0	0
Cement Stabilised Backfill	t	9	9
Clay	t	0	0
Concrete	t	112.32	112.32
Crushed Dust (including Cracker Dust)	t	1,149.00	1,149.00
Crushed Limestone	t	1,168.68	1,168.68
Crushed Rock	t	4,886.70	4,886.70
Crushed Road Base	t	0	0
Emulsion Based Prime (e.g. Ecoprime)	t	0	0
Ferricrete	t	0	0
Geofabric Polymers	t	0	0
Glass (including Glass Beads)	t	0	0
Gravel	t	0	0
Laterite	t	0	0
Lime	t	0	0
Lime Additives	t	0	0
Mechanically Stabilised Earth Backfill	t	0	0
Mulch	t	0	0
Paint (Waterborne, Thermoplastic, Cold Applied Plastics)	l	0	0
Perspex	t	0	0
Plastic	t	0	0
Precast Concrete	t	71	71
Sand	t	0	0
Steel	t	6.50	6.50
Synthetic Binders	t	0	0
Topsoil	t	0	0
Other	t	0	0

Table 15 Imported Recycled Materials for the Project

IMPORTED RECYCLED MATERIALS			
MATERIALS	**UNIT**	**TOTAL THIS PERIOD**	**TOTAL FOR PROJECT**
Crumb Rubber	t	0	0
Crushed Recycled Concrete	t	0	0
Crushed Recycled Glass	t	0	0
Eco-blocks	t	0	0
Geopolymer Concrete	t	0	0
Low Carbon Concrete	t	0	0
Mulch and Soil Conditioner (Excluding FOGO)	t	0	0
Mulch (FOGO)	t	0	0
Soil Conditioner (FOGO)	t	0	0
Reclaimed Asphalt Pavement	t	0	0
Recycled Aggregate	t	7,588.45	7,588.45
Recycled Aluminium	t	0	0
Recycled Clay	t	0	0
Recycled Granular Material	t	0	0
Recycled HDPE Plastic Pipes	t	0	0
Recycled Mineral Sand	t	0	0
Recycled Road Base	t	7,011	7,011
Recycled Sand (as per the definition in the Contractor Monthly Reporting form)	t	577.45	577.45
Supplementary Cementitious Materials – slag	t	*Pending Mix Design Release*	*Pending Mix Design Release*
Supplementary Cementitious – fly ash	t	*Pending Mix Design Release*	*Pending Mix Design Release*
Supplementary Cementitious – silica fume	t	*Pending Mix Design Release*	*Pending Mix Design Release*
Supplementary Cementitious – other	t	*Pending Mix Design Release*	*Pending Mix Design Release*
Topsoil	t	0	0
Warm Mix Asphalt	t	0	0
Other	t	0	0

Table 16 Materials Reused on the Project

MATERIALS REUSED WITHIN THE PROJECT SITE			
MATERIAL	**UNIT**	**TOTAL THIS PERIOD**	**TOTAL FOR PROJECT**

Aggregate	t	0	0
Asphalt (RAP)	t	0	0
Clay	t	0	0
General Fill	t	0	0
Granular Material	t	0	0
Limestone	t	0	0
Mulch	t	0	0
Overburden	t	0	0
Road Base	t	0	0
Sand	t	0	0
Spoil	t	0	0
Topsoil	t	0	0
Other	t	0	0

5.7 Noise and Vibration

An initial transportation noise assessment was completed in 2020, modelling the potential future noise impacts both with and without noise mitigation. GCA has developed an Out of Hours Noise and Vibration Management Plan covering potential noise and vibration impacts generated during construction activities undertaken between the hours of 7pm and 7am on Monday to Saturday, Sundays and Public Holidays. Included in this management plan are processes and mitigation measures GCA has identified that will assist in reducing both noise and vibration impact. Noise and vibration monitoring will occur during the construction phase.

5.8 Contamination

A Preliminary Site Investigation was undertaken to test for potential contaminants on-site. The preliminary assessment identified several work packs that potentially hosted contaminants and would require further investigation. GCA has undertaken Detailed Site Investigations (DSIs) for all Work Packages, collecting numerous water and soil samples across the project extent.

Further investigations identified Coal Tar Stabilised Lime (CTSL) along the Roe Highway alignment. Currently, GCA is drafting management plans including a CTSL Site Management Plan and Dewatering Management Plans for work packs impacted by other potential contaminants. These management plans will detail management strategies and mitigation actions used to minimise the risk of contamination on the Project. Additionally, GCA has developed an unexpected finds protocol in the event that unexpected contaminants are discovered to further reduce contamination risks.

5.9 Acid Sulfate Soils

Following a preliminary investigation and further site-specific investigations, GCA has prepared Acid Sulfate Soils (ASS) Management Plans for planned works for work packs 1, 2, 3a, and 4 (**Figure 1**). ASS Management Plans will include management strategies such as the staging of disturbances, staging of earthworks programs, and neutralisation of ASS material using Aglime or lime sands as the preferred neutralising material. The Soil Management Actions described will assist in reducing

the overall risk posed by ASS material and implement practical and safe measures to treat ASS on-site.

5.10 Case Study – Avoidance and Minimisation of Clearing of Threatened Ecological Communities

5.10.1 Avoidance of Shrublands and Woodlands of the Eastern Swan Coastal Plain (SCP 20c)

The original concept for the upgrade of Roe Highway resulted in direct impacts on the Shrublands and Woodlands of the Eastern Swan Coastal Plain Threatened Ecological Community (TEC) (SCP20c). The Shrublands and Woodlands of the Eastern Swan Coastal Plain TEC is known from only two occurrences, totalling 130 ha. The predicted area of impact was 3.8 ha. Main Roads carried out a significant design review and development during the planning phase to balance the needs of improving safety performance with avoiding significant environmental values. Key re-design initiatives included:

- Tightening the radius of the ramp that carries movements from Roe Highway northbound to GEHB westbound to entirely avoid any clearing of SCP20c.
- Shifting the interchange northwards to reduce the amount of overall clearing of the Commonwealth listed Banksia Woodlands of the Swan Coastal Plain TEC (state listed Priority Ecological Community, (PEC)).
- Tightening the radius of the ramp that carries movements from Roe Highway southbound to GEHB westwards and movements from GEHB eastbound to Roe Highway southbound. This change has achieved a reduction in clearing of SCP 21c (Low lying *Banksia attenuata* Woodlands or Shrublands, state listed PEC, Commonwealth TEC).
- Modifying the DE boundary to ensure there is no design creep into the Shrublands and Woodlands of the Eastern Swan Coastal Plain TEC.

As a result of these design changes, the Project reduced the area of native vegetation to be cleared and has completely avoided any clearing of the Shrublands and Woodlands of the Eastern Swan Coastal Plain TEC.

5.10.2 Reduction of clearing in State listed TEC Floristic Community Type (FCT) 20a

In late 2021, GCA reviewed the Project design to reduce clearing impacts on the State listed *Banksia attenuata* woodlands over species rich dense shrublands TEC (FCT 20a). Changes made to the design are summarised below:

- PSP was realigned to follow the boundary of an existing rural property
- Design widths south of the PSP connection were tightened
- Disturbance width for the PSP reduced to a maximum of 10 m - far less than the 30 m minimum distance for a gap between patches of *Banksia attenuata* woodlands over species rich dense shrublands TEC

The resulting changes to the design reduced native vegetation clearing requirements by 25%. The design changes also reduced impacts to the following environmental values:

- Commonwealth listed Banksia Woodlands of the Swan Coastal Plain TEC (state listed Priority Ecological Community, PEC)
- Black cockatoo foraging habitat and trees with suitable Diameter at Breast Height (DBH > 500 mm)
- Bush Forever Sites 481 and 122

- Threatened Flora *Conospermum undulatum*
- Priority Flora *Isopogon autumnalis*
- Multiple Use Wetland UFI 15266

Changes to the Development Envelope area described for SCP 20c, FCT 20a, and other reduced clearing extents illustrated in **Figure 9**.

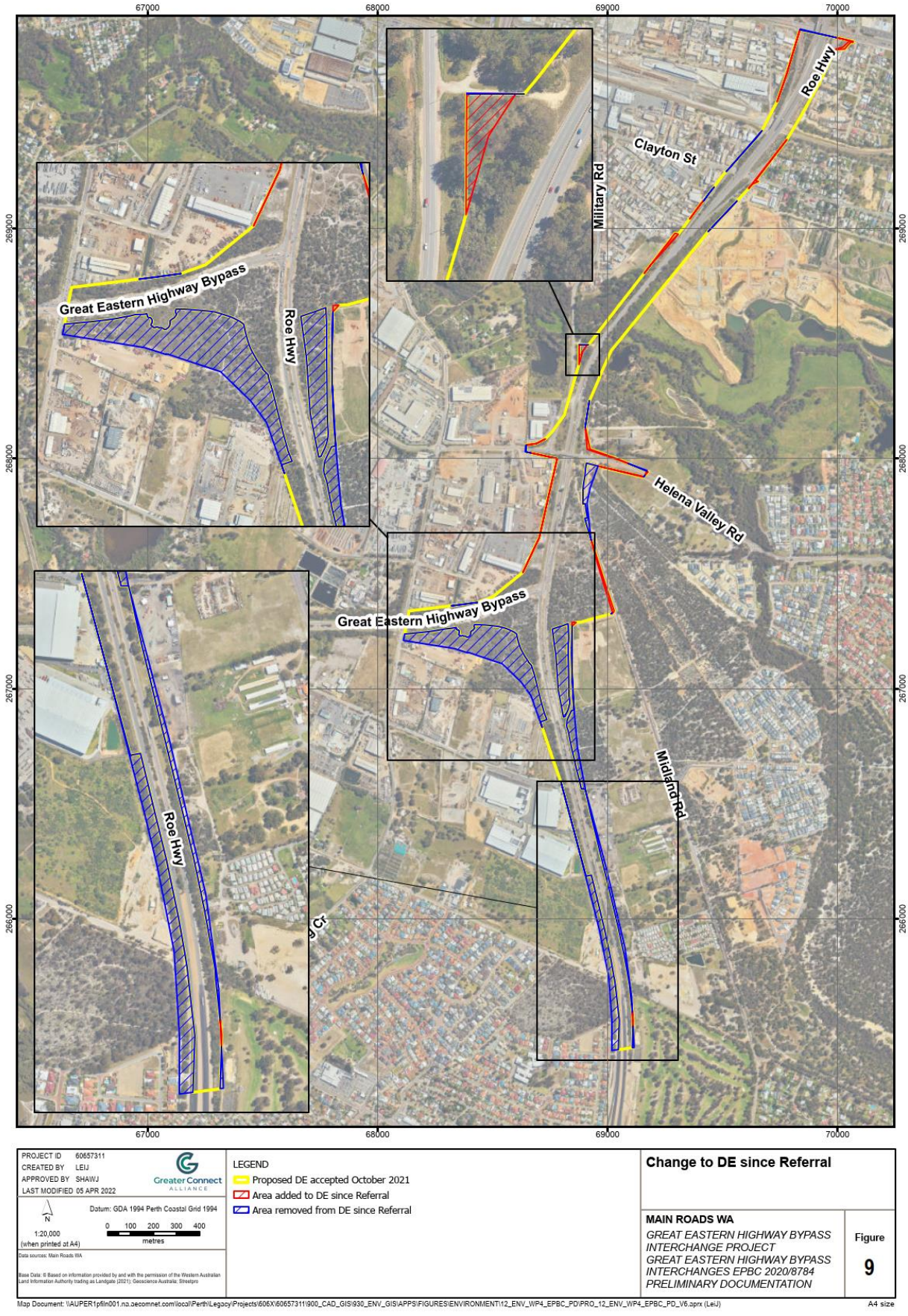


Figure 9 Change to proposed Native Vegetation Clearing area to avoid and minimise impacts

6 Social

A summary of Key social aspects and performance for the Project are summarised in **Table 17**.

Table 17 Summary of Social Aspects

SOCIAL ASPECT	UNIT	TOTAL FOR THIS PERIOD	TOTAL FOR THE PROJECT
Stakeholders engaged	#	295	873
Stakeholder enquiries received	#	73	73
Heritage sites in project vicinity*	#	10	10
Length of Principal Shared Path (Addition/Refurbished)	km	12.37	12.37
Women in Workforce	%	18	18
Indigenous People in Workforce	%	1	1
Lost Time Injury Frequency Rate (LTIFR)	#	0	0
Hours of Training Undertaken	hrs	1026	1026
Development Employees and Apprentices on the Project	#	0	0

*Heritage sites was determined during the Site Identification Archaeological and Ethnographic Aboriginal Heritage Survey.

6.1 Social Context

The Project is primarily located within the locality of Hazelmere, with Midland to the north, Helena Valley to the east, High Wycombe to the south, and South Guildford to the west. It runs through Commonwealth land leased to Perth Airport, to the southeast and west of Abernethy Road and Great Eastern Highway Bypass. The area is predominantly used for industrial purposes, with large logistics and distribution companies requiring clear and efficient accesses between their properties and the road network.

The proposed works occur within, and involve the City of Swan, City of Kalamunda, and Shire of Mundaring. Various State and Federal government agencies are also involved in the Project and play a key role in decision-making processes for the Project. The Project will impact localised regions of the Swan Coastal Plain (particularly within the approximated 31.02 ha clearing region) and the intersecting Helena River catchment. The Project also impacts a Bush Forever site and registered Aboriginal heritage sites within or directly adjacent to the Project extents, including the Helena River Flood Plain area.

Community engagement was undertaken during 2020 to identify key priorities for the local residential and business communities. Key stakeholders, businesses, local residents, road users and the broader community were provided the opportunity to view and provide input to the project design in September 2021. Engagement opportunities include face-to-face, digital and traditional methods to cater for the diverse local community. Engagement will be ongoing throughout the duration of the project with the aim of building respectful, positive, long-term relationships with communities and actively encourage our workforce to listen to local concerns and be considerate and accountable for their actions at all times.

6.1.1 Social Outcomes

Upon completion in 2025, the Project will:

- Enhance connectivity, relieve congestion, and improve safety in Perth's Eastern Metropolitan Region

- Improve road safety and reduce congestion for all users of the Great Eastern Highway Bypass and adjoining roads
- Improve freight efficiency, connectivity, and travel time
- Improve access to the Hazelmere and Forrestfield industrial areas and former railway workshops precinct in Midland
- Improve the local Principal Shared Path network.

Figure 10 Early construction works undertaken during December 2021

6.2 Community and Stakeholder Engagement

The Project's Community and Stakeholder Engagement Strategy provides a comprehensive project narrative and messaging around key issues to ensure consistency of communication, identification of key issues, risks and challenges and corresponding mitigation strategies, and identification of communication and engagement tools to be used to maximise community and stakeholder involvement.

GCA is working with local landowners and business operators to ensure the impacts of construction can be managed appropriately. GCA is also committed to engaging the broader community to ensure high levels of awareness and understanding of the Project. As the Project progresses, updates will be provided in the form of regular newsletters, construction updates, and roadworks updates. A broad range of communication methods will be used including e-bulletins and social media, through to hard copy correspondence and face to face meetings.

GCA in collaboration with Main Roads has set out the following objectives and indictive measures of

success within the Project's Community and Stakeholder Engagement Strategy to track performance and success in relation to stakeholder engagement (**Table 18**).

Table 18 Communication and stakeholder engagement objectives and success measures

Objective	Indicative measures of success
Generate **awareness** of and **support** for the project, including its rationale, objectives and benefits.	Ongoing enhancement of and inclusion of key project messaging in all communications. Required range of tailored communication activities implemented. Information about project design, works and activities, including rationale, negotiables, and non-negotiables, expected impacts and mitigation measures are communicated sensitively and in accordance with agreed approvals and notification periods. Communication is proactive and any necessary consultation occurs prior to construction activity or other impacts. Opportunities are provided for the community and stakeholders to provide feedback on the project design and construction methodology. Adequate time is provided to the community and stakeholders to understand project information and provide feedback. The feedback loop is closed by ensuring all enquiries, feedback and requests are responded to and the rationale for any decisions made is provided as part of the feedback. All enquiries, feedback, and complaints are responded to promptly. Project employees and subcontractors encouraged to modify work practices and be innovative to reduce community impacts or improve community outcomes where practicable. Surrounding community believes Greater Connect Alliance and Main Roads is doing a good job communicating and responding to feedback and is open, honest, and transparent.
Ensure the community and stakeholders are kept **well informed** about project design and construction including all works or activities that may impact on them; and they have an opportunity to have their **feedback and concerns considered**.	
Understand stakeholder and community aspirations, opportunities, issues and concerns associated with the project.	
Obtain community input to, **buy-in** and acceptance of the project development and design and construction methodology, ensuring that where practical, project delivery reflects the wishes of the community.	
Deliver the project with **minimal complaints, escalations or outrage** and ensure that concerns raised are managed in a proactive, timely, transparent and empathetic manner.	
Build **strong, open and honest relationships** with the local community, improving levels of trust and confidence in Main Roads and their vision for the road network.	

Key communication and engagement activities undertaken between 1st July 2021 – 30th June 2022 included:

- Targeted stakeholder engagement - ongoing individual meetings and briefings with a variety of key stakeholders including relevant state and local government authorities, Perth Airport, utility

service providers, directly impacted landowners and businesses, Whadjuk Native Title Claim Group members, and local interest groups.

- Broader community consultation - a series of consultation activities provided the opportunity for the community to learn more about the project and provide feedback. These were in the form of project information displays at shopping centres and a communication and engagement program that included a formal, advertised, four-week consultation period involving various consultation tools, such as a Quick Poll, social pinpoint map, and community surveys hosted on an on-line project portal (MySay).
- Commitment to keeping the community and stakeholders informed throughout project delivery. Updates will continue to be provided on the project website, via project newsletters and social media, and through targeted engagement around specific design elements and potential construction-related impacts.
- Engaged with Traditional Owners to assist the projects Design Team and Public Artist to support the overall Public Art Strategy

6.3 Community Satisfaction and Amenity

Effective communication and stakeholder engagement is central to the successful delivery of the Project. Through regular, structured meetings, project personnel are provided the opportunity to influence and shape the strategy and associated actions. This includes the agreement of key negotiable and non-negotiable matters, identification of potential social, environmental, and economic constraints, and how engagement activities associated with these assessments and any related regulatory approvals must be incorporated and supported.

Community & Stakeholder Engagement is a key agenda item for GCA to report on during weekly Alliance Management Team meetings, at fortnightly meetings with Main Roads' Project Director and Strategic Communications Specialist, and monthly Alliance Board meetings. These structured meetings are supported by a day-to-day internal communication process that ensures all project team members are aware of the importance of identifying emerging issues and communicating the details to the Community and Stakeholder Engagement Manager for consideration/action.

For the duration of the Project, all community and stakeholder interactions are to be recorded and managed using Main Roads' Customer Relationship Management (CRM) software (known as CONNECT). This includes records of telephone or face-to-face conversations; email exchanges; meeting minutes; and information pertaining to the resolution of community issues or concerns.

A range of communication and engagement activities will be implemented to heighten awareness and facilitate two-way dialogue during project development, pre-construction, and construction stages. Mechanisms for communications and engagement across the contract shall be chosen to best reach the target audience in the most efficient and cost-effective way.

6.4 Heritage

The Project intercepts land that is native to the Whadjuk Noongar Title Claim group. To account for potential heritage values within the Project scope, two Aboriginal archaeological surveys and two Aboriginal ethnographic surveys were conducted. These surveys identified no new Aboriginal archaeological ethnographic sites; however, it should be noted this does not eliminate the possibility of sub-surface archaeological materials existing.

To protect Aboriginal Heritage values intercepting the Project, an Aboriginal Cultural Heritage Management Plan (ACHMP) has been created by GCA. The document outlines the management

actions necessary to minimise impacts to Aboriginal Heritage across the Project. Management actions within the document to be implemented throughout the design and construction phases include:

- Aboriginal Cultural Heritage Inductions for all GCA staff and contractors, providing Cultural Awareness Training and supplies appropriate contact details for reporting incidents
- Employment of Aboriginal Heritage Monitors as per the advice of Brad Goode and Associates, for pre-determined zones which intersect known Aboriginal Heritage Sites
- Undertaking environmental rehabilitation in consultation with Whadjuk Traditional Owners
- Procedures and project reporting relating to ground disturbance, unexpected finds, incident reporting, and other reporting forms.

To further conserve Aboriginal heritage, GCA has developed an initiative to revegetate areas surrounding the Helena River that are encapsulated by the Lloyd Street Bridge works. Revegetating this region serves not only to protect the native flora and fauna, but also preserves the Aboriginal heritage that is valuable to the Whadjuk Noongar people. This initiative ensures environmental and Aboriginal heritage impacts to the Helena River system are reduced and minimised upon completion of the Project.

Main Roads submitted an application under section 18 of the *Aboriginal Heritage Act (1972)* to disturb portions of the Helena River. This application has since been granted consent with conditions, allowing works to proceed. However, in alignment with reducing impacts to Aboriginal Heritage, GCA is currently considering a new alignment for the Lloyd Street Bridge proposed by Traditional Owners and conservation groups with the intention of moving the Bridge further west to a narrower crossing of the Helena River. More information on the new alignment proposal for the Lloyd Street Bridge can be found on the Government of Western Australia's Media Statement webpage.

Non-Indigenous desktop investigations have been undertaken and have not highlighted any areas of heritage value or interest relevant to the Project.

6.5 Road Safety

Safety for all road users is of paramount consideration for the Project. To improve road safety in the area, the road design has reduced the number of unprotected right hand turning movements across traffic. Left-in, left-out access only has been implemented in the design for the staggered-T intersection between Lakes Road and Lloyd Street.

6.6 Diversity

The Project provides an opportunity to establish a diverse and inclusive workforce that offers employment, training, and business development pathways to a wide diversity of people. To support GCA's commitment to social sustainability and procurement practices, an Aboriginal Participation Plan (APP) has been drafted which outlines key targets for Aboriginal Participation. These targets are measured as key performance indicators (KPI), used to express GCA's commitment to Aboriginal participation. Several KPIs that have been developed to assess Aboriginal involvement include, but are not limited to:

- Number of Aboriginal people employed as a proportion of total employment (FTE)
- Aboriginal employment target – at least 10% total workforce be undertaken by Aboriginal Persons (excluding Development Phase hours)
- Number of Aboriginal people employed by subcontractors

- Number of contracts and/or subcontracts awarded to Aboriginal Businesses
- Percentage of contracts and/or subcontracts awarded to Aboriginal Businesses and companies as a proportion of the total contracts awarded
- Aboriginal Business procurement target – works and/or services to a value of at least 5% of the contracts over $20,000 are undertaken by Aboriginal Businesses (and/or $10 million)
- Number of apprenticeships and traineeships created for Aboriginal people
- Length of tenure that Aboriginal people are employed by the Project
- Cultural Awareness Training Levels (100% of workforce (on site for 90 days or longer) to receive Cultural Awareness Training).

Key activities to be undertaken to support Aboriginal Participation include:

- Cultural awareness programmes
- Mentoring programmes
- Education/awareness raising activities (e.g. NAIDOC Week, Reconciliation Week, toolbox sessions)
- Business development activities (e.g. contracting models, support to Aboriginal Businesses, referral to external support).

Aside from targets towards greater Aboriginal participation, a diversity and inclusion policy has been created which outlines GCA's commitment to attracting and developing the most talented people regardless of their race, sexual orientation, religion, age, gender or disability status.

GCA is also in the process of drafting a diversity and social inclusion plan, which will provide additional targets, objectives, and initiatives to establish a diverse workforce and ensure GCA upholds our commitments to encouraging and promoting a diverse and inclusive workplace environment.

6.7 Traffic Management & Community Safety

A Project Traffic Management Plan (PDMP) has been completed by GCA, outlining the traffic control and management procedures that will be undertaken during the construction delivery of the Project. Specific Traffic Management Plans will be developed in addition to the PTMP for the delivery of specific on-site scope of works related to the Project. The objectives of the Traffic Management Plan are to ensure:

- The safety of the road workers
- All road users, including vulnerable road users, are safely guided around, through or past the work site
- The performance of the road network is not unduly impacted and the disruption and inconvenience to all road users are minimised for the duration of the works
- Impacts on users of the road reserve and adjacent properties and facilities are minimised.

To meet these objectives the Traffic Management Plan will incorporate the following strategies:

- Providing a sufficient number of traffic lanes to accommodate vehicle volumes.
- Ensuring delays are minimised.
- Ensuring all road users are managed including motorists, pedestrians, cyclists, people with disabilities and people using public transport.
- Ensuring work activities are carried out sequentially to minimise adverse impacts.

- Provision will be made for works personnel to enter the work area in a safe manner in accordance with safety procedures.
- All entry and exit movements to and from traffic streams shall be in accordance with the requirements of safe working practices.

6.8 Workforce Safety

The GCA aims to do monthly planned field inspections that is conducted by a management team of Superintendent/Supervisors, HSE Team & Engineers. Supply Chain audits are conduction against safety management plans and are focused on high consequence risks. GCA utilises FSR/ SER assessment tool to implement critical controls and determining if the critical controls is properly demonstrated. All safety Criteria must be met for a critical control to be considered as working effectively.

Safety initiatives to assist and encourage workplace safety beyond standard practice include:

- Next Gear Inclusion & Wellbeing program which challenges us to move beyond traditional safety practices and measures, by applying a framework described in the three principles:
  - People are the solution (versus people are the problem)
  - Safety in the presence of positives (versus safety is the absence of negatives)
  - Safety is an ethical responsibility (versus safety is a bureaucratic activity).
- Toolbox Discussions
- Collective Insight discussion is used on the project to engage with supply chain and employees. The tool allows for group buy in to have a discussion on site specific topics to explore any gaps and reinforce the positives.

A recent audit in May 2022 conducted by the Office of Federal Safety Commission verified that the GCA is compliant with the Work, Health and Safety practices, systems, and documentations, that the project has developed.

6.9 Legacy Commitments

As part of the IS v2.1 Design & As-Built framework, the GCA will be targeting the Leg-1 Leaving a Lasting Legacy credit. The Project team is currently investigating potential legacy initiatives and other commitments that can be applied to the Project.

6.10 Workforce Development

GCA aims to facilitate ongoing development of our People to perform to their highest possible level while working on the Project. GCA strives to create a constructive working culture that drives innovation and high performance while also allowing team members to develop and broaden their experience/skill base to increase opportunities for career advancement. GCA aims to provide opportunities to learn, not only from within facilitated programmes, but from experiences working on projects with some of the most capable people in our industry.

To achieve these objectives, GCA has established an Employee and Team Development Plan and a Training and Competence plan that outlines the management measures proposed to develop our workforce. Potential measures identified in the Team Development Plan to improve workforce skills and capabilities include, but are not limited to:

- Establishing personal development plans to provide structured conversations between employees and their line managers to discuss career aspirations, competency levels, and future development.

- Skills analysis – appropriate managers of GCA will conduct a skills analysis across the project to confirm what training needs to be completed in the short, medium and long term.
- Training Matrix – A tool used to support ongoing skills and training gap analysis between required and actual knowledge levels
- Next Gear Training – The Next Gear strategy centres around three principles: people are the solution, not the problem; health and safety is the presence of positives, not the absence of negatives; health and safety is an ethical responsibility, not a bureaucratic process. All employees will undertake Next Gear training, including subcontractor employees who will be trained to deliver the Next Gear safety programme to their employees.

GCA has already provided a total of 1026 hours of training to our current workforce (**Table 17**), and endeavours to continue providing opportunities for future development and growth as the Project progresses.

6.11 Case Study – Inspiring STEM+ Programme

GCA has been involved with the Inspiring STEM+ Programme, hosted by Laing O'Rourke in alignment with their commitment to transform the construction industry and advance gender equality. The programme aims to address the low intake of female university students graduating with engineering degrees by encouraging young female students to increase their representation and follow an educational and personal development path within STEM (Science, Technology, Engineering, and Mathematics). The STEM+ Programme has been conducted at Penrhos College in Perth and has been attended by an array of qualified professionals from GCA including Senior Engineers, Digital Engineers, Project Director, People Lead, and Commercial Graduate (**Figure 11**).

Two sessions have been run with a third organised for August 2022. The two sessions already hosted are outlined below:

- Session 1, 9th May – Intro to construction
- Session 2, 31st May – Digital Engineering

The sessions have described a list of projects involving Laing O'Rourke, including the Great Eastern Highway Bypass Interchange Project, and has compiled a series of fun, practical, and engaging activities to foster learning around each topic. The next topic is set around Sustainability and will involve Sustainability leaders and advisors from GCA to present on their personal experiences working as part of an alliance, driving innovation and inspiring sustainable practices within the workplace.

Figure 11 STEM+ session run at Penrhos College, Perth

7 Glossary

A glossary of terms used throughout this document is detailed in **Table 19**.

Table 19 Glossary of Terms

Term	Description	Link to Further Information
Credits	Each IS v2.0 credit has up to three levels of achievement and addresses a specific aspect of sustainability performance within the category.	ISC Website
ISC Framework	Infostructure Sustainability Council: The IS Rating Scheme (IS) is Australia and New Zealand's only comprehensive rating system for evaluating economic, social and environmental performance of infrastructure across the planning, design, construction and operational phases of infrastructure assets.	ISC Website
Material; Materiality	Relevant topics are those that may reasonably be considered important for reflecting the organisation's economic, environmental, and social impacts, or influencing the decisions of stakeholders.	Global Reporting
National Greenhouse Accounts Factors	The National Greenhouse Accounts (NGA) Factors has been prepared by the Department of Industry, Science, Energy and Resources and is designed for use by companies and individuals to estimate greenhouse gas emissions. The NGA Factors is not published for the purposes of reporting under the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act). While drawing on the National Greenhouse and Energy Reporting (Measurement) Determination 2008, the methods described in the NGA Factors have a general application to the estimation of a broader range of greenhouse emissions inventories.	Australian National Greenhouse Account Factors
Scope 1 Emissions	Scope 1 greenhouse gas emissions are the emissions released to the atmosphere as a direct result of an activity, or series of activities at a facility level. Scope 1 emissions are sometimes referred to as direct emissions.	Clean Energy Regulator
Scope 2 Emissions	Scope 2 greenhouse gas emissions are the emissions released to the atmosphere from the indirect consumption of an energy commodity. Scope 2 emissions from one facility are part of the scope 1 emissions from another facility.	
Scope 3 Emissions	Scope 3 emissions are indirect greenhouse gas emissions other than scope 2 emissions that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business. Some examples are extraction and production of purchased materials, transportation of purchased fuels, use of sold products and services, and flying on a commercial airline by a person from another business.	

8 Appendices

Appendix	Title
Appendix 1	List of Project Stakeholders
Appendix 2	Project Sustainability Policy (Only if not publicly available)
Appendix 3	List of Protected Areas
Appendix 4	Protected/Conservation Significant Flora and Fauna Species and Habitat

Appendix 1 – List of Project Stakeholders

Category	Stakeholder/s	Relevance to project	Level of engagement required/tools
Federal Government	MPs: • Federal Minister for Infrastructure, Catherine King • Member for Hasluck, Tania Lawrence	Providing 80% funding. Supportive - as principal funder	Approval of communication collateral Individual briefings as required, or on request
	Agencies: • Department of Infrastructure, Transport, Cities and Regional Development	Perth Airport estate is on Commonwealth land leased to PAPL	Approval of communication collateral
State Government	MPs: • Minister for Transport Rita Saffioti MLA	Providing 20% funding Supportive – as secondary funder	Individual briefings/briefing notes Ministerial and media events Project Updates
	• Belmont MLA Cassie Rowe (LAB) • Midland MLA Michelle Roberts (LAB)	Political representatives of residents / business owners in project area Michelle Roberts is also a senior Government Minister	Add local members to subscribers list for email updates. Provide advanced copies of Construction Updates as FYI.
	Agencies: • Department of Transport (DoT) • Department of Planning, Lands and Heritage (DPLH) • Public Transport Authority • Department of Water and Environmental Regulation (DWER) • Environmental Protection Authority (EPA)	PSP networks Interface with state planning Owns the rail infrastructure and is planning for future Midland Freight Rail realignment Responsibility for environmental issues	Stakeholder workshops/risk workshops Involve in discussions re. Abernethy Rd/airport land Consult where rail interfaces with infrastructure, re. clearances/access etc. Approves all access to rail corridor, along with ARC. Refer for environmental approvals, as required
Local Government	• City of Swan • City of Kalamunda • Shire of Mundaring	Project within 3 LGA regions Collaboration and engagement required to develop project concept and ensure interface with planned local road projects meets local needs	Regular LGA meetings with technical officers (with individual LGAs and combined, as necessary) Council briefings at key milestones, and on request

Category	Stakeholder/s	Relevance to project	Level of engagement required/tools
		LGAs will have interest in, and input into, landscaping and urban design framework Hazelmere Enterprise Area development (CoS)	Ongoing collaboration to ensuring joint advocacy and alignment on messaging.
Perth Airport	• Perth Airport Estate • Perth Airport Pty Ltd	Development of leased land, impacts to tenants and access arrangements Airport access for commuters during construction	Involve Perth Airport Estate and tenants in meetings/discussions re. access and local road network Add PAPL to subscribers list for updates during planning, development and construction
Rail operators	• ARC Infrastructure	Leases rail from PTA Approves all access etc to existing rail corridor, along with PTA	Requires consultation on all interfaces with existing PTA rail line as operator. Must have Early Engagement Agreement in place for consultation during planning. Will require consultation during delivery re. access and shutdowns
Utility providers	• Atco Gas • APA Gas • Dampier Bunbury Pipeline • Water Corporation • Western Power • Telstra • NBN • Optus • Vocus	Approves all access to/protection/relocation of services	Will require consultation as design is developed to identify high risk services and constraints. May require consultation on design of interchanges and local road treatments. Service relocations will require approval from relevant provider.
Freight industry	• Freight and Logistics Council of WA • WA Road Transport Association • Freight Operators • Heavy Vehicle Services (HVS)	Heavy vehicles incl. OSOM will be impacted by final design and construction	May require consultation on design of interchanges and local road treatments. MRWA HVS to keep operators informed during construction.
Emergency Services	• St John Ambulance • Department of Fire & Emergency Services • WA Police	Requires emergency access	Will require up to date information on any works impacting access.

Category	Stakeholder/s	Relevance to project	Level of engagement required/tools
Business (Hazelmere / High Wycombe / Forrestfield)	• Hazelmere Enterprise Area (incl. Abernethy Road Access User Group) • Forrestfield Industrial area • Development WA	Coordinated development and access for heavy vehicles Hobby farming, including water quality and access Owns Lot 792 on Lloyd St (western paddock) – this is contaminated but material may be suitable for road projects	Consult via meetings as required GCA to consider suitability of representative forum / roundtable etc to complement one-on-one engagement Develop business-specific email list General community awareness to seek feedback Noted for construction Operator and leaseholder contact maintained
Business (Midland)	• Midland town centre businesses / shopping centres • Bunnings and other new businesses off Clayton Street	Major access improvements resulting from Lloyd Street Bridge Project is a catalyst for ongoing development and regeneration	Add to subscribers list Project Updates Project webpage Build relationships and obtain key contact details Operator and leaseholder contact maintained
Directly Impacted Landowners including Traditional Owners (Whadjuk Noongar)	• Properties both north and south of the GEHB • Properties on east and west side of Roe Highway • Properties on east and west side of Lloyd Street and Adelaide Street • Properties on east and west side of Abernethy Road and Stirling Crescent	Land required for road purposes Business access changes Impacts such as noise, vibration and dust Impacts on Aboriginal Heritage	Process ongoing Land Acquisition Register (including schedule of land take) Business access strategy/plans List of agreed accommodation works (if any) Operator and leaseholder contact maintained
Schools	• Matthew Gibney Catholic Primary School • High Wycombe Primary School • High Wycombe Pre-Primary School • Edney Primary School	Outside project area to the south in High Wycombe, however may be impacted by potential work on Kalamunda Road	Added to subscribers list Project Updates Project webpage
Hospital	• St John of God Midland Hospital	Major access improvement following Lloyd Street bridge opening Catalyst for hospital expansion and precinct development	Added to subscribers list Project Updates
Community/Sporting groups	• WestCycle • Hillview Public Golf Course	PSP design/connections Landowner adjacent to Roe Hwy PSP extension	Consult on PSP designs, through DoT Notify of works
Environmental and community groups/representatives	• Helena River Alliance • Helena River Catchment Group	Impacts on flood plain, vegetation, connectivity and Aboriginal Heritage Revegetation	Engage in concept design Added to subscribers list

Category	Stakeholder/s	Relevance to project	Level of engagement required/tools
	• Lower Helena Association Inc • Guildford Association Inc • Friends of Woodbridge Bushland • Blackadder Woodbridge Catchment Group • Woodbridge Ratepayers and Friends Association Inc • Swan Chamber of Commerce	Weed control Contamination	
Heritage	• Whadjuk Native Title Working Group	Traditional ownership/sacred sites	Heritage surveys Aboriginal Engagement Manager manages direct interface
Local residents and businesses	• Within prescribed locality	Access and construction impacts Landscaping and noise walls	Letters Project updates Drop-in sessions Email subscriptions Project webpage Construction updates
Road users	• Motorists • Cyclists • Pedestrians • People using mobility aids	Access and delays, travel times PSP connections/detours Mobility access	Project updates Travel map Email subscriptions Project webpage

Appendix 2 – Project Sustainability Policy

Great Eastern Highway Bypass Interchanges
Sustainability Policy

Greater Connect ALLIANCE

Sustainability is about maximising our environmental, economic, and socio-economic performance in the interests of the business, our stakeholders, and our planet.

Transport is essential to the development of Western Australia and plays a vital role in creating competitive economies and liveable, inclusive communities by enabling the movement of people and freight.

The Greater Alliance Connect Project is committed to developing a transport network that meets social, economic, and environmental needs and implementing a strategy which aims to create sustainable growth by meeting the economic, social, and environmental challenges of our rapidly changing world. We will expect to:

- Deliver a road-based transport system that improves community amenity, mobility and travel choice whilst reducing indirect environmental impacts.
- Develop appropriate responses and adaptations to meet the demands of our changing climate.
- Reduce our impact on the natural environment by focusing on emissions, pollution, waste, land use and resources.
- Develop and sustain a culture of sustainability within our organisation, our industry, and the community.
- Ensure high standards in governance by measuring and reporting our sustainability performance against our key sustainability aspects.
- Reduce the environmental footprint of our project.
- Engage with industry and apply sustainability clauses in our contracts for high impact goods and services, ensuring our supply chain is assessed and monitored for compliance against key sustainability risks and targets.
- Ensure key sustainability aspects are considered within all decisions.
- Utilising purposeful technologies to harness the benefits in operational efficiency that will help deliver quality and demonstrate conformity of products and services.
- Ensure that any major decisions to be made are engaged by the Responsible Decision Making framework. This is a decision-making philosophy that gives our people the ability to navigate, determine and act upon choices that reflect the values, duties, relationships, ethics and impacts of the business.

This will be achieved by:

- Enabling decision forums to consistently make more robust and sustainable decisions for future project works and activities
- Making ethical operations, transparency and consistency in decision making a basic requirement in a climate of increasing marketplace complexity and pace.
- Making collaboration with clients, supply chain, industry partners, research organisations and other stakeholders fundamental to how we develop and implement a sustainability strategy. We will aim to be as transparent in reporting on these strategic targets.

The Greater Connect Alliance is committed to ensuring that this policy is implemented in line with legislation, regulations, and codes of practice, by all employees and supply chain partners.

Approved By:

Ewan Gee
Director, Greater Connect Alliance
13 May 2022

Policy No: GEHBI-GCA-POL-A000-PM-00004_1

Great Eastern Highway Bypass Interchanges

Greater Connect ALLIANCE

Appendix 3 – List of Protected Areas

PROTECTED AREA	DETAILS	LOCALITY/ PROXIMITY	POTENTIAL IMPACT
Environmental			
Commonwealth Listed			
Banksia Woodlands of the Swan Coastal Plain TEC	Commonwealth listed TEC (Endangered) (state listed Priority Ecological Community, PEC). State listed PEC includes FCT 23a and 28 which intercept the DE.	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Up to 14.94 ha to be cleared. The Proposal has been re-designed to reduced clearing by 6.83 ha (since October 2021 Proposal). Offsets for this TEC are currently being calculated and will form part of the EPBC Offset Strategy.
Shrublands and Woodlands of the eastern Swan Coastal Plain	Commonwealth listed TEC (Endangered)	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	0 ha to be cleared. The Proposal has been re-designed to entirely avoid clearing for this TEC.
State Listed			
Banksia attenuata woodlands over species rich dense shrublands	State listed Threatened (Endangered), Floristic Community Type (FCT) 20a	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Up to 5.78 ha to be cleared. The Proposal has been re-designed to reduced clearing by 3.71 ha (since October 2021 Proposal). Offsets for this FCT are currently being calculated and will form part of the NVCP Offset Strategy.
Shrublands and Woodlands of the eastern side of the Swan Coastal Plain	State listed Threatened (Critically Endangered), FCT 20c (also listed separately under the EPBC Act)	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	0 ha to be cleared. The Proposal has been re-designed to entirely avoid clearing for this FCT.
Low lying *Banksia ilicifolia* woodlands	State listed Priority 3, FCT 21c	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Up to 2.53 ha to be cleared. Offsets for this FCT are currently being calculated and will form part of the NVCP Offset Strategy.
Central *Banksia attenuata* – *Banksia menziesii* woodlands	State listed Priority 3, FCT 23a (forms part of Banksia woodlands of the Swan Coastal Plain)	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Up to 6.17 ha to be cleared. Offsets for this FCT are currently being calculated and will form part of the NVCP Offset Strategy.

Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands	State listed Priority 3, FCT 28 (forms part of Banksia woodlands of the Swan Coastal Plain)	Within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Up to 0.46 ha to be cleared. Offsets for this FCT are currently being calculated and will form part of the NVCP Offset Strategy.
Black Cockatoo Foraging Habitat	Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo, and Baudin's Black Cockatoo foraging habitat	Located throughout the DE, but mostly within Roe Highway between 300m north of Clayton Street and Kalamunda Road, including a grade separation at the intersection SLK 37.54	Black Cockatoo foraging habitat quality ranges from completely degraded to degraded – pristine. The proposed clearing currently (subject to change) comprises up to 43.89 ha of Carnaby's and Baudin's Black Cockatoo foraging habitat and 42.90 Forest Red-tailed Black Cockatoo foraging habitat. 23.29 ha has been deemed high quality for all three Black Cockatoo species. Offsets for this FCT are currently being calculated and will form part of the EPBC and NVCP Offset Strategy.
Bush Forever Site 481	Bush Forever Site 481 is known to contain Banksia Woodland TEC	Extends approximately 1km South of the Roe Highway and Great Eastern Highway Bypass Intersection, bounded by Midland Road to the East and Stirling Crescent to the West	Up to 12.75 ha to be cleared. The Proposal has been re-designed to reduced clearing by 3.19 ha (since October 2021 Proposal). Offsets for the Bush Forever Site are currently being calculated and will form part of the EPBC and NVCP Offset Strategy.
Bush Forever Site 122	Bush Forever Site 122	Located South off Roe Highway near the DE boundary. North boundary of the bush forever site runs parallel to Adelaide Street, West of Roe Highway.	0 ha to be cleared. The Proposal has been re-designed to entirely avoid clearing for Bush Forever Site 122.
Conservation Category Wetland (UFI 15440)	Conservation Category Wetland - UFI 15440. Includes vegetation type L3, P3, P6 ranging from degraded to excellent condition	located within the Development Envelope and associated with the Helena River	Up to 2.47 ha to be cleared where Roe Highway bridge crosses Helena River north of the Roe Highway and Bushmead Road intersection. Offset Strategy currently being drafted to reduce the clearing impact.
Multiple Use Wetland	Multiple Use Wetland - UFI 1526. Includes vegetation type P4, L5, P1, P2 ranging from good to excellent condition	Southwest of the Roe Highway and Great Eastern Highway Bypass intersection	Up to 0.91 ha to be cleared within DE. Design changes have reduced clearing by 1.07 ha, further action will be outlined in the Offset Strategy.

Heritage			
Munday Swamp	Registered Aboriginal Heritage Site 3719	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Helena River	Registered Aboriginal Heritage Site 3758	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Munday Swamp: Poison Gully	Registered Aboriginal Heritage Site 3888	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Helena River A-C	Registered Aboriginal Heritage Site 3967	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Melon Glch, Milit. Base	Registered Aboriginal Heritage Site 3968	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Metro Meats	Registered Aboriginal Heritage Site 4010	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Waterhall Road	Registered Aboriginal Heritage Site 4378	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal

			Heritage monitors will be present during ground disturbing works.
Bushmead Road Complex	Registered Aboriginal Heritage Site 4385	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Great Eastern Highway / Stirling Crescent Scatter	Registered Aboriginal Heritage Site 16110	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Poison Gully Creek	Registered Aboriginal Heritage Site 25023	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
Adelaide Street	Other Heritage Places to which the *Aboriginal Heritage Act* 1997 may apply – Place ID 17506	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.
BMP ISO#2	Other Heritage Places to which the *Aboriginal Heritage Act* 1997 may apply – Place ID 18451	Intersects the Project Area	Potential disturbances include the use of heavy machinery for excavation, clearing, and the transportation of materials and fill. Aboriginal Heritage monitors will be present during ground disturbing works.

Appendix 4 – Conservation Significant Flora and Fauna Species and Habitat

SPECIES	CONSERVATION SIGNIFANCE CODE		POTENTIAL IMPACT
	FEDERAL	STATE	
Flora			
Conospermum undulatum	VU	VU	Proposed removal of one individual of *Conospermum undulatum*
Isopogon autumnalis	-	Priority 3	Proposed removal of up to 27 *Isopogon autumnalis*
Hypolaena robusta	-	Priority 4	Proposed removal of up to two *Hypolaena robusta*
Johnsonia pubescens subsp. *cygnorum*	-	Priority 2	Proposed removal of up to two *Johnsonia pubescens* subsp. *cygnorum*
Verticordia lindleyi subsp. *lindleyi*	-	Priority 4	Species has been entirely avoided by the DE
Fauna			
Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)	VU	VU	Up to 23.29 ha of high quality Forest Red-tailed Black Cockatoo foraging habitat
Calyptorhynchus baudinii (Baudin's Black Cockatoo)	EN	EN	Up to 23.29 ha of high quality Baudin's Black Cockatoo foraging habitat
Calyptorhynchus latirostris (Carnaby's Black Cockatoo)	EN	EN	Up to 23.29 ha of high quality Carnaby's Black Cockatoo foraging habitat
Coracina novaehollandiae (Black-faced Cuckoo-shrike)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.
Dasyurus geoffroii (Chuditch, Western Quoll)	VU	VU	Included in MNES Likelihood Assessment. Assessment confirmed species or species habitat is known to occur within area.
Grallina cyanoleuca (Magpie-lark)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.
Hirundo neoxena (Welcome Swallow)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.
Isoodon fusciventer (Quenda)	-	Priority 4	Up to 22.97 ha of potential Quenda habitat (currently) from proposed clearing
Petrochelidon nigricans (Tree Martin)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.

Threskiornis spinicollis (Straw-necked Ibis)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.
Todiramphus sanctus (Sacred Kingfisher)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.
Zosterops lateralis (Silvereye)	MA	-	Species observed in level 2 of the Survey Area. Patches of vegetation throughout DE may provide suitable habitat. Not included in Likelihood of Occurrence Assessment.