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From		**Project No.**	12670915
Project Name	Perth Entertainment and Sporting Precinct		
Subject	Greenhouse Gas Assessment		

1. Introduction

The Perth Entertainment and Sporting Precinct (the project) is proposed to be a new multi-use entertainment and sporting precinct in Burswood Park, as shown in Figure 1.1Figure 1.1.

GHD Pty Ltd (GHD) was engaged by Main Roads WA (MRWA) to prepare a preliminary greenhouse gas (GHG) emissions assessment of CO_2-e generated from a three day Supercars event, including a high level GHG assessment for construction and operations of the project.

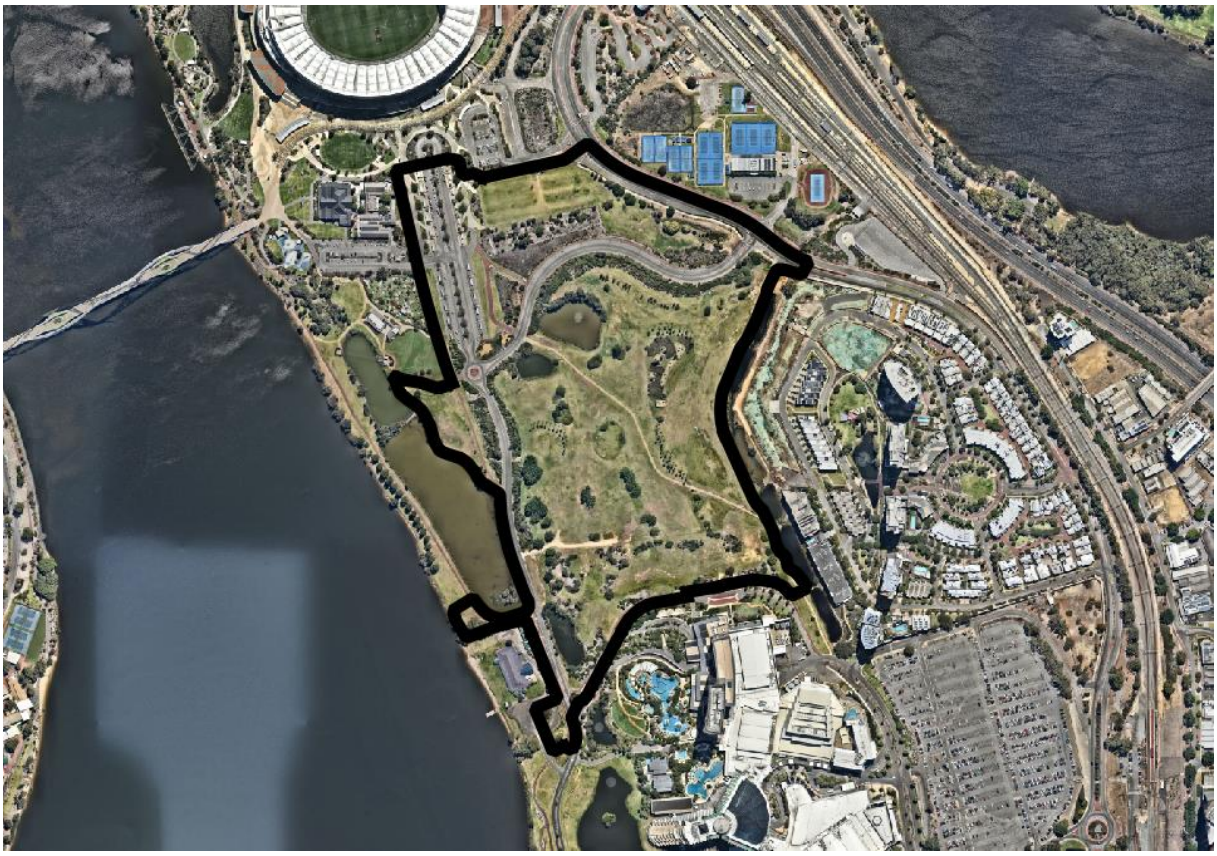

Figure 1.1 Project boundary (shown in black outline)

1.1 Purpose and scope of this memorandum

The purpose of this memorandum is to present outcomes of a high-level greenhouse gas assessment, including an estimate of Scope 1 and Scope 2 GHG emissions for the following:

– Construction of the project

– Operation of the project (annual basis)
– Three day Supercars event.

The memorandum documents the relevant assumptions, methodologies, and reporting boundaries on which the assessment was conducted.

1.2 Limitations

This memorandum has been prepared by GHD for Main Roads WA and may only be used and relied on by Main Roads WA for the purpose agreed between GHD and Main Roads WA as set out in Section 1.1 of this memorandum.

GHD otherwise disclaims responsibility to any person other than Main Roads WA arising in connection with this memorandum. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this memorandum were limited to those specifically detailed in the memorandum and are subject to the scope limitations set out in the memorandum.

GHD has prepared this memorandum on the basis of information provided by Main Roads WA and others who provided information to GHD (which may also include Government authorities), which GHD has not independently verified or checked for the purpose of this memorandum. GHD does not accept liability in connection with such unverified information, including errors and omissions in the memorandum which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this memorandum are based on conditions encountered and information reviewed at the date of preparation of the memorandum. GHD has no responsibility or obligation to update this memorandum to account for events or changes occurring subsequent to the date that the memorandum was prepared.

The opinions, conclusions and any recommendations in this memorandum are based on assumptions made by GHD and described in this memorandum (refer Section 1.3 of this memorandum). GHD disclaims liability arising from any of the assumptions being incorrect and liability for any decisions taken by Main Roads WA as a consequence of GHD recommendations.

If this memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

Several high-level assumptions have been made in order to best represent the GHG emissions inventory related to construction and operation of the project. These high-level assumptions have been detailed below.

– Data provided by MRWA was assumed to be accurate and representative of proposed project construction and operation activities, these have not been verified.
– Data provided by MRWA was assumed to be accurate and representative of proposed Supercars event operations, these have not been verified.
– Scope 3 emissions are excluded from the scope of this memo, and have not been estimated.

Assumptions related to different estimation methodologies used and data assumptions or estimates applied are detailed in the relevant sections of this memorandum.

2. Project background

2.1 Construction

The construction phase of the project will be undertaken in two phases:

– Early works (Pre-loading) - Phase 1 will involve demolition of existing structures (footpaths, roads etc), ground improvement (pre-loading), topsoil and tree removal and bulk earthworks. P
– Phase 2: Construction of the track, roads, footpaths, building and amphitheatre.

2.2 Operations

The operations phase of the project includes:

– A new outdoor amphitheatre for live music and other events.
– A multi-use track, including for use by FIA approved Supercars, cycling criterium and community sport.
– A multi-purpose building, including event and function facilities and meeting spaces.

The proposed detail of the Supercars event is presented in Table 2.1.

Table 2.1 Supercars event detail

Day	Race series	Number of laps	Number of vehicles
Friday	Aussie race cars	17	32
	Touring car masters	17	30
	Toyota 86	17	34
	Dunlop Super2 series	42	22
	Superutes	17	18
	Aussie race cars	17	32
	Supercars (practice/qualifying)	17	26
	Touring car masters	17	30
	Dunlop Super2 series	42	22
	Toyota 86	17	34
	Superutes	17	18
	Supercars (practice/qualifying)	7	26
	Dunlop Super2 series	26	22
	Supercars (practice/qualifying)	7	26
Saturday	Aussie race cars	17	32
	Touring car masters	17	30
	Toyota 86	17	34
	Superutes	17	18
	Aussie race cars	17	32
	Touring car masters	17	30
	Dunlop Super2 series	16	22

Day	Race series	Number of laps	Number of vehicles
	Supercars (practice/qualifying)	7	26
	Toyota 86	17	34
	Superutes	17	18
	Aussie race cars	17	32
	Dunlop Super2 series	31	22
	Supercars	125	26
Sunday	Touring car masters	17	30
	Toyota 86	17	34
	Superutes	22	18
	Aussie race cars	17	32
	Supercars (practice/qualifying)	7	26
	Dunlop Super2 series	16	22
	Touring car masters	17	30
	Toyota 86	17	34
	Supercars (practice/qualifying)	7	26
	Superutes	17	18
	Dunlop Super2 series	31	22
	Supercars	125	26

Three different fuel types will be used across the event; EF75, Elf Race 102 and 98RON.

The EF75 fuel will be used for the Supercars race series and the Dunlop Super2 series. The EF75 fuel is a new lower carbon race fuel created by bp, the official fuel supplier, and “contains more than 80 percent of second generation fuel components that are sourced from renewable feedstocks, significantly reducing the emissions compared to traditional race fuels (bp, n.d.).

The fuel composition of both the Elf Race 102 and 98RON fuel is 100 percent petrol and will be used across the other race series in the event.

3. Carbon accounting methodology

Carbon accounting is the process of identifying and measuring the amount of GHG emissions, measured in tonnes of carbon dioxide equivalents (t CO_2-e), emitted by a company, either during normal operations or during specific construction or project related activities. Carbon reporting is the process of reporting on the outcomes of the accounting process.

Undertaking carbon accounting and reporting processes can help an organisation manage its potential ‘carbon’ risks, as well as enable it to identify risk reduction opportunities more effectively. The creation of a GHG emissions inventory also facilitates public carbon reporting, enables participation in voluntary and/or mandatory GHG reporting programs and, where applicable, participation in GHG or ‘carbon’ markets.

In alignment with the general principles for estimating emissions contained in the National Greenhouse and Energy Reporting (NGER) framework, the project GHG emissions inventory assessment has been based on the principles outlined in Table 3.1.

Companies should balance trade-offs between principles depending on their individual business goals.

Table 3.1 Description of the general principles for estimating emissions

Principle	Description
Relevance	Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.
Completeness	Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.
Consistency	Use consistent methodologies to allow for meaningful performance tracking of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
Transparency	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
Accuracy	Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable confidence as to the integrity of the reported information.

The following documents were used for the purposes of defining appropriate methods for quantification of emissions from individual sources:

– *National Greenhouse and Energy Reporting (Measurement) Determination 2008*
– *Australian National Greenhouse Accounts (NGA) Factors 2024*
– *Greenhouse Gas Protocol Corporate Accounting and Reporting Standard*

The Scope 1 and 2 emission factors used in the emissions estimates were taken from the *National Greenhouse Accounts (NGA) Factors 2024* derived from *National Greenhouse and Energy Reporting (NGER) Measurement Determination 2008*.

The GHG Protocol Corporate Standard divides a company's emissions into direct and indirect emissions:

– **Direct emissions**: are emissions from sources that are owned or controlled by the reporting company.
– **Indirect emissions**: are emissions that are a consequence of the activities of the reporting company but occur at sources owned or controlled by another company.

Emissions are further divided into three scopes described in Table 3.2, while a company has *control* over its direct emissions, it has *influence* over its indirect emissions.

Table 3.2 Overview of emissions scopes

Emission type	Scope	Definition	Examples
Direct emissions	Scope 1	Emissions from operations that are owned or controlled by the reporting company.	Emissions from combustion include diesel gensets, etc.
Indirect emissions	Scope 2	Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company.	Use of purchased electricity.
	Scope 3	All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including upstream and downstream emissions.	Employee travel, capital goods, etc.

For the purposes of this assessment, the Scope 3 emissions estimates have not been assessed.

Table 3.3 Project emissions boundary

Emission Type	Scope	Emission Boundary	Activity	Data Classification
Direct emissions	Scope 1	Operational control	Stationary Energy	Diesel – Stationary plant
			Transport Energy	Diesel – Transport Ethanol – Transport Biofuel – Transport Petrol - Transport
			Petroleum based oils or greases	Petroleum based oils
			Land Clearing	Land Clearing
Indirect emissions	Scope 2	Operational control (Third-party)	Purchased electricity	Power Generation – Non-Renewable

4. Greenhouse gas emissions inventory

4.1 Total GHG emissions

The project's total Scope 1 and 2 emissions for the construction and annual operations periods are shown in Table 4.1. All GHG emissions estimates are based on data provided by MRWA. A detailed breakdown of the emissions estimates is presented in Appendix A.

Table 4.1 Total GHG emissions by scope for the project construction and operational activities

Source	Construction emissions (t CO_2-e)
Scope 1	2559
Scope 2	0
Total Scope 1 and 2 emissions	2559
Source	**Annual operational emissions (t CO2-e)**
Scope 1	65
Scope 2	99
Total Scope 1 and 2 emissions	**165**

Table 4.2 Annual total operational emissions by event type

Scope	GHG emissions source	Emissions (t CO_2-e/yr)	%
Normal operations			
Scope 1	Transport energy, petroleum based oils or greases	1	
Scope 2	Purchased electricity	33	
Total Scope 1 and Scope 2		**35**	20.96%

Scope	GHG emissions source	Emissions (t CO_2-e/yr)	%
3-Day Supercars Event			
Scope 1	Transport energy	64	
Scope 2	Purchased electricity	31	
Total Scope 1 and Scope 2 emissions		**95**	57.37%
Music events			
Scope 2	Purchased electricity	36	
Total Scope 2		**36**	21.67%
Total operational emissions (Scope 1 and 2)			**165**

4.2 Scope 1 GHG emissions

4.2.1 Scope 1 GHG emissions sources

4.2.1.1 Stationary energy

Construction emissions relating to the consumption of diesel for stationary energy purposes related to construction activities has been estimated for the construction period. Emissions relating to the consumption of diesel for stationary energy purposes were estimated in accordance with the requirements of Part 2.4 Division 2.4.2 of the NGER measurement determination.

Table 4.3 Stationary energy categories for construction and operational emissions

Stationary energy categories	Description	Construction emissions	Operational emissions
Stationary power equipment	Fuel consumption of stationary power equipment	✓	×

4.2.1.2 Transport energy

The consumption of diesel for transport energy purposes during operational activities has been estimated on an annual basis. Emissions relating to the consumption of diesel for transport energy purposes were estimated in accordance with the requirements of Part 2.4 Division 2.4.2 of the NGER measurement determination.

The consumption of various fuel types for the proposed three day Supercars event has been estimated on an annual basis. Emissions relating to the consumption of ethanol, biofuels, and petrol for transport energy purposes were estimated in accordance with the requirements of Part 2.4 Division 2.4.2 of the NGER measurement determination.

The fuel type and composition for the proposed three day Supercars event has been provided by MRWA and Supercars. There are three fuel types assumed to be used in the event: EF75, Elf Race 102 and 98RON.

– The EF75 fuel composition is 75 percent ethanol, 10 percent synthetic petrol and 15 percent petrol.
– The Elf Race 102 and 98RON fuel composition is 100 percent petrol.

It has been assumed that all vehicles have been manufactured after 2004.

Table 4.4 Transport energy categories for construction and operational emissions

Transport energy categories	Description	Construction emissions	Operational emissions
Light vehicles	Fuel consumption for site-based vehicles	×	✓
EF75 fuel type – Supercars event	EF75 fuel composition 75% ethanol 10% synthetic petrol 15% petrol	×	✓
Elf Race 102 fuel type – Supercars event	Elf Race102 fuel composition 100% petrol	×	✓
98RON fuel type – Supercars event	98RON fuel composition 100% petrol	×	✓

4.2.1.3 Petroleum based oils and greases

The consumption of petroleum based oils (other than petroleum based oil used as fuel) related to construction activities and operational activities has been estimated for the construction period, and on an annual operational basis. Emissions relating to the consumption of petroleum based oils were estimated in accordance with the requirements of Part 2.4 Division 2.4.5A of the NGER measurement determination.

Table 4.5 Petroleum based oils and greases categories for construction and operational emissions

Petroleum based oils and greases categories	Description	Construction emissions	Operational emissions
Petroleum based oils	Consumption of petroleum based oils	✓	✓

4.2.1.4 Land clearing

Emissions relating to the loss of potential carbon sequestration in vegetation have been estimated using the Vegetation Emissions Methodology described in the *Greenhouse Gas Assessment Workbook for Road Projects*. The methodology specifies the emissions factor in t CO_2-e/ha, based on the location specific maximum potential biomass, and the vegetation classes of the proposed land clearing area.

Table 4.6 Land clearing categories for construction and operational emissions

Land clearing categories	Description	Construction emissions	Operational emissions
Land clearing	Lost carbon sequestration potential	✓	×

4.2.2 Scope 1 GHG emissions estimates

4.2.2.1 Construction emissions

The estimated Scope 1 emissions attributable to the construction period are outlined in Table 4.7.

Table 4.7 Total construction Scope 1 emissions

Source	Details	Emissions (t CO_2-e)	Method of Calculation
Stationary energy	Stationary plant	523	Estimated consumption of diesel and NGER measurement determination Schedule 1 Part 3

Source	Details	Emissions (t CO_2-e)	Method of Calculation
Petroleum based oils and greases	Petroleum based oils	0	Estimated consumption of petroleum based oils and NGER measurement determination Schedule 1 Part3
Land clearing	Lost carbon sequestration potential	2036	Based on the total clearing area, known vegetation classes, estimated potential maximum biomass class and subsequent tCO_2-e/ha emissions factor (Greenhouse Gas Assessment Workbook for Road Projects)
Total emissions		**2559**	

4.2.2.2 Operational emissions

The estimated annual Scope 1 emissions attributable to operational activities and event types are outlined in Table 4.8.

Table 4.8 Annual operational Scope 1 emissions

Event	Source	Details	Emissions (t CO_2-e/yr)	Method of Calculation
Normal operations	Transport energy	Site based light vehicles	1	Estimated consumption of diesel (post-2004 vehicles) and NGER measurement determination Schedule 1 Part 4 Division 4.2
Normal operations	Petroleum based oils and greases	Petroleum based oils	0	Estimated consumption of petroleum based oils and NGER measurement determination Schedule 1 Part3
3-day Supercars event	Transport energy	Fuel types: EF75, Elf Race 102, 98RON	64	Estimated consumption of EF75, Elf Race 102, and 98RON fuels, and NGER measurement determination Schedule 1 Part 4 Division 4.2
Annual operations	**Total emissions**		**65**	

4.3 Scope 2 GHG emissions

4.3.1 Scope 2 GHG emissions sources

The project will be connected to and purchasing electricity from the South West Interconnected System (SWIS), the main electricity grid for Western Australia, for the operational phase of the project.

Table 4.9 Purchased electricity for construction and operational emissions

Purchased electricity	Description	Construction emissions	Operational emissions
Purchased electricity	Purchased electricity	×	✓

4.3.2 Scope 2 GHG emissions estimates

4.3.2.1 Construction emissions

No Scope 2 emissions are anticipated for the construction phase of the project. Electricity will be supplied by stationary energy plants, as estimated in Section 4.2.2.1.

4.3.2.2 Operational emissions

The estimated annual Scope 2 emissions attributable to operational activities and event types are outlined in Table 4.10.

Table 4.10 Annual operational Scope 2 emissions

Phase	Source	Details	Emissions (t CO_2-e/yr)	Method of Calculation
Normal operations	Purchased electricity	Lights and buildings	33	Estimated electricity consumption and NGA Factors 2024 Table 1
3-day Supercars event	Purchased electricity	Additional purchased electricity	31	Estimated electricity consumption and NGA Factors 2024 Table 1
Music events	Purchased electricity	Additional purchased electricity	36	Estimated electricity consumption and NGA Factors 2024 Table 1
Annual operations		**Total emissions**	**99**	

5. References

bp p.l.c. Supercars 2025. Available at: https://www.bp.com/en_au/australia/home/community/sponsorship/supercars.html

Commonwealth Government (2008). National Greenhouse and Energy Reporting (Measurement) Determination 2008. Available at: https://www.legislation.gov.au/F2008L02309/latest/text

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024). Australian National Greenhouse Accounts Factors. 2024. Available at: https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2024.pdf

GHG Protocol (2004). A Corporate Accounting and Reporting Standard, Revised Edition. WRI/WBCSD. Available at: https://ghgprotocol.org/corporate-standard

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Appendices

Appendix A

Emissions sources and activities

Table 5.1 Construction emissions breakdown

Phase	Emission Type	Activity Type	Fuel/Energy/ Commodity	Description	Quantity	Unit	Energy (GJ)	Total Emissions (t CO2-e)	Key Data Inputs
Con	Scope 1	Stationary Energy	Diesel	Consumption of diesel for construction equipment	*193*	kL	7,450	523	*Quantity provided by MRWA*
Phase	Emission Type	Activity Type	Fuel/Energy/ Commodity	Description	Quantity	Unit	Energy (GJ)	Total Emissions (t CO2-e)	Key Data Inputs
Con	Scope 1	Petroleum based oils and greases	Petroleum based oils	Consumption of petroleum based oils and greases, other than fuel use	*1*	kL	23	0	*Quantity provided by MRWA*
Phase	Emission Type	Activity Type	Fuel/Energy/ Commodity	Description	Quantity	Unit	Energy (GJ)	Total Emissions (t CO2-e)	Key Data Inputs
Con	Scope 1	Land Clearing	Land Clearing of vegetation	Landscaped grasses - Grassland - Maximum bioclass 2	*11*	ha	-	1,232	*Total land clearing of 14 hectares.* *Land clearing hectares and emissions split by vegetation class.* *Landscaped grass - 80%* *Landscaped trees - 20%*
Con	Scope 1	Land Clearing	Land Clearing of vegetation	Landscaped trees - Mallee and Acacia Woodland and Shrubland - Maximum bioclass 2	*3*	ha	-	804	*Total land clearing of 14 hectares.* *Land clearing hectares and emissions split by vegetation class.* *Landscaped grass - 80%* *Landscaped trees - 20%*
					Total Construction Emissions (Scope 1)			**2,559**	**t CO2-e**

Table 5.2 Operations Scope 1 emissions breakdown

Event type	Emission Type	Activity Type	Fuel/Energy/Commodity	Description	Quantity	Unit	Energy (GJ)	Annual Emissions (t CO2-e/yr)	Key Data Inputs
Normal operations	Scope 1	Transport Energy	Diesel	Light vehicles on site	*1*	kL	19	1	*Quantity provided by MRWA*
Supercars Event	Scope 1	Transport Energy	EF75 - Ethanol content	Supercars & Dunlop cars	*21*	kL	500	0	*Fuel quantity per event* *26 Supercars per event, 800 Litres per car* *22 Dunlop cars per event, 350 Litres per car* *EF75 Fuel composition* *75% Ethanol* *10% Synthetic petrol* *15% Petrol*
Supercars Event	Scope 1	Transport Energy	EF75 - Synthetic petrol content	Supercars & Dunlop cars	*3*	kL	67	0	*Fuel quantity per event* *26 Supercars per event, 800 Litres per car* *22 Dunlop cars per event, 350 Litres per car* *EF75 Fuel composition* *75% Ethanol* *10% Synthetic petrol* *15% Petrol*
Supercars Event	Scope 1	Transport Energy	EF75 - Petrol content	Supercars & Dunlop cars	*4*	kL	146	10	*Fuel quantity per event* *26 Supercars per event, 800 Litres per car* *22 Dunlop cars per event, 350 Litres per car* *EF75 Fuel composition* *75% Ethanol* *10% Synthetic petrol* *15% Petrol*
Supercars Event	Scope 1	Transport Energy	Elf Race102	Carrera Cup & Touring Car Masters	*12*	kL	410	28	*Fuel quantity per event* *32 Carrera Cup cars, 200 Litres per car* *30 Touring Car Masters cars, 160 Litres per car* *Elf Race102 Fuel composition* *100% Petrol*
Supercars Event	Scope 1	Transport Energy	98RON	SuperUtes, Toyota 86 & Trans Am	*11*	kL	383	26	*Fuel quantity per event* *26 SuperUtes cars, 160 Litres per car* *34 Toyota 86 cars, 80 Litres per car* *32 Trans Am cars, 160 Litres per car* *98RON Fuel composition* *100% Petrol*
Event type	**Emission Type**	**Activity Type**	**Fuel/Energy/Commodity**	**Description**	**Quantity**	**Unit**	**Energy (GJ)**	**Annualised Emissions (t CO2-e/yr)**	**Key Data Inputs**
Normal operations	Scope 1	Petroleum based oils and greases	Petroleum based oils		*0*	kL	2	0	*Quantity provided by MRWA*

Operational Emissions (Scope 1)	**65**	**t CO2-e/yr**

Table 5.3 Operations Scope 2 emissions breakdown

Event type	Emission Type	Activity Type	Fuel/Energy/Commodity	Description	Quantity	Unit	Energy (GJ)	Annual Emissions (t CO2-e/yr)	Key Data Inputs
Normal operations	Scope 2	Purchased electricity	Purchased electricity	Lights and buildings	*65,000*	kWh	-	33	*Quantity provided by MRWA Estimated 65MWh per year*
Supercars Event	Scope 2	Purchased electricity	Purchased electricity	Additional purchased electricity	*0*	kWh	-	31	*Quantity provided by MRWA Estimated 2MW * 10hr/day * 3days = 60MWh per year*
Music Event	Scope 2	Purchased electricity	Purchased electricity	Additional purchased electricity	*2*	kWh	-	36	*Estimated 2MW * 5hr/day * 7days music events = 70MWh per year*
Operational Emissions (Scope 2)								**99**	**t CO2-e/yr**