Hunter River High School

36 Elkin Avenue, Heatherbrae

NET ZERO STATEMENT

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E-LAB Consulting

Where science and engineering inspire design.

Document QA and Revisions

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3				
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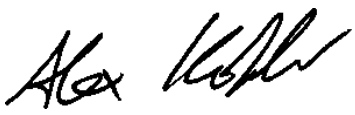

Alex Kobler | Director Sustainability

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Abbreviations

TERM	DEFINITION
Greenhouse Gas Emissions	The release of gases, such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), into the atmosphere that have the potential to enhance the greenhouse effect and contribute to global warming and climate change.
Carbon Neutrality	Achieving a state in which the net emissions of carbon dioxide (CO2) and other greenhouse gases (GHGs) released into the atmosphere are equal to the amount removed from the atmosphere, resulting in a net-zero carbon footprint.
Emission scopes	A mechanism for classifying different sources of GHG emissions used in carbon accounting. There are three 'scopes'
Scope 1 GHG Emissions	Greenhouse gas emissions that result from sources owned or directly controlled by an organization or entity. These emissions typically include those from on-site combustion of fossil fuels, such as natural gas and diesel.
Scope 2 GHG Emissions	Greenhouse gas emissions associated with the consumption of purchased electricity, steam, or heating/cooling, but not directly owned or controlled by the organization. These emissions result from the generation of energy used by the organization.
Scope 3 GHG Emissions	Greenhouse gas emissions that occur as a result of an organization's activities but are not directly owned or controlled by the organization. These emissions encompass a wide range of indirect sources, such as supply chain, transportation, and employee commuting.
Carbon Offset	A compensatory measure in which an organization or individual invests in activities or projects that reduce or remove an equivalent amount of greenhouse gas emissions from the atmosphere to offset their own emissions, helping achieve carbon neutrality.

Executive Summary

Richard Crookes Construction (RCC) is dedicated to delivering a development that can operate Net Zero Carbon and minimise the Greenhouse Gas Emissions of the development. This report summarises the expected GHG-e of the development at 36 Elkin Avenue, Heatherbrae, and highlights the design steps taken to reduce the carbon in the development.

The subsequent report offers a comprehensive overview of the strategies employed to achieve this goal, specifically in the case of the Hunter River High School development.

Table 1 presents an analysis of the existing operational Scope 1 and 2 GHG emissions associated with Hunter River High School. These calculations are derived from the NABERS reverse calculator for schools and are based on emissions originating from the current electricity grid. Additionally, projections have been made for the year 2050, anticipating that the electricity grid will have achieved carbon neutrality by then.

Table 1 - Summary of estimated GHG Emissions

	Hunter River High School 2024 – GHG EMISSIONS	Hunter River High School 2050 – GHG EMISSIONS
GHG Emissions (KgCo2e)	47,163	3,236

To advance towards a zero-carbon future, an action plan has been developed for the building, aiming to achieve climate positivity by relying entirely on renewable energy while offsetting the remaining scope 1 and 2 emissions.

1 INTRODUCTION

1.1 PURPOSE

This Net Zero Carbon Statement outlines the actions to achieve Net Zero Greenhouse Gas emissions for the Hunter River High School development.

The following plan aims to achieve the below objectives:

- Detail how the development will be fossil fuel-free during operational use.
- Describe energy reduction initiatives.
- Describe renewable energy generation infrastructure as part of the development.
- Estimate energy consumption of the development.
- Estimate GHG emissions for energy use of the development.

1.2 THE PROJECT

The Hunter River High School development is located at 36 Elkin Avenue, Heatherbrae, NSW, and is comprised of multiple school building blocks, a new linking road and kiss and drop bay and a carpark. The development includes the following buildings and amenities:

- Block X: Administration Unit
- Block Y: Gymnasium
- Block Z: Support Learning Hub

This Net Zero Carbon Statement only relates to the Administration Unit (Block X) and the Support Learning Hub (Block Z), as per this REF submission for the Huter River High School project

1.3 SCOPE

This Net Zero Carbon Statement has been developed in alignment with the NSW Sustainable Buildings SEPP. It delineates the approach of the project towards eradicating dependency on fossil fuels, with a specific focus on mitigating scope 1, 2, and 3 emissions. Furthermore, "net zero" is defined within the context of operational energy exclusively, encompassing emissions stemming from on-site fossil fuels and electricity consumption. It excludes consideration of energy associated with waste or transportation.

2 PROJECT DESCRIPTION

RCC is developing multiple school building blocks and a new linking road and kiss and drop bay for Hunter River High School. The development has been designed and constructed to achieve a 4 Star Green Star rating through the Green Star Design & As Built V1.3 pathway. To reach this objective Hunter River High School will comply with the Sustainable Buildings SEPP requirement of operating at net zero GHG emissions.

To assess the project's scope, the following elements are being assessed:

- Fossil fuel free Development.
- On and off-site renewable energy sources.
- Measures for reducing emissions.
- Energy consumption.
- GHG emissions.

2.1 FOSSIL FUEL FREE

The development at Hunter River High School will not include any new connections to fossil fuels on-site.

2.2 ON AND OFF-SITE RENEWABLE ENERGY SOURCES PATHWAY

To achieve zero on-site fossil fuel consumption during the operational stage of the project, all energy must be procured from renewable sources. Currently, Hunter River High School has not entered into a Purchase Power Agreement (PPA); however, Photovoltaic Systems will be installed on site. The school has the option to enter into a PPA to accomplish the goal of zero on-site fossil fuel consumption by 2025.

2.3 EMISSION REDUCTION MEASURES

To minimise the building's emissions, a variety of emission reduction measures have been incorporated into the design. These measures encompass:

- A high-performance façade
- High efficiency LED lighting
- Energy meters and monitoring systems
- Solar PV

2.4 ENERGY CONSUMPTION

The only path to a low carbon economy and achieving a “2°C world”, where the average global temperature is kept to less than 2°C above pre-industrial levels, is through comprehensive and complete consideration of how the development consumes resources, including energy, water, and material efficiency.

The energy efficiency strategy generally follows the energy efficiency pyramid of design in Figure 2. In the first instance demand for greenhouse gases should be reduced. Consideration should be to remove the need for energy to be consumed where possible. Beyond this, energy can be more efficient, through efficient lighting, mechanical systems, and appropriate services.
Once the system has reduced all available energy-consuming elements and made the remaining systems as efficient as possible, renewable energy sources will be considered. PV will be installed at a rate that maximises the coverage of the non-trafficable roof area provided. Only after all the above steps have been completed should offsets be used to close the gap and achieve neutrality.

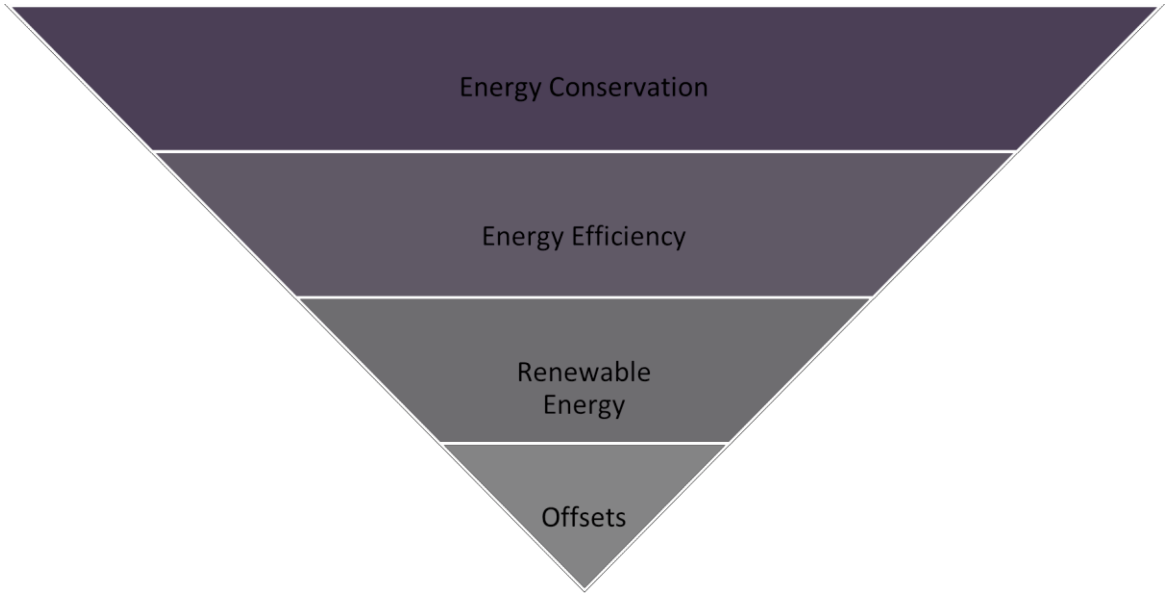
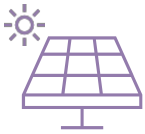


Figure 2. Energy efficiency pyramid: pathway to carbon neutrality.

To achieve the above, the following initiatives are proposed:



Renewable Energy – The roof area provides an excellent opportunity for installation of a solar photovoltaic system. The sizeable system will generate renewable electricity to offset grid use and minimise stress on the grid at peak times. PV will be installed at a rate that maximises the coverage of the non- trafficable roof area. The development will also potentially look into providing onsite battery storage to further reduce reliance on the grid. This will allow the site to store generated energy throughout the day.

Efficient Lighting Systems – High efficiency LED lighting throughout, including in common areas with efficiency controls to meet the requirements of NCC 2022 Section J. Controls will include motion sensors, time clocks and zoned switching.

Controls, Energy Metering and Monitoring – Energy meters and monitoring systems will be provided to comply with NCC 2022 Section J Part J8 requirements. Preference for natural ventilation and comfort through adaptive cooling and shading.

Facade – high performance façade systems and shading systems will reduce load on the HVAC system.

3 NET ZERO CARBON STATEMENT

3.1 NET ZERO CARBON OVERVIEW

RCC is committed to developing Hunter River High School as net zero carbon for the entirety of the development's operational use. To reach this goal Hunter River High School will employ the following strategies and create a future pathway to net zero.

- Energy efficient design
- High performance building systems
- Fossil fuel free

3.2 ENERGY EFFICIENT DESIGN

The development will be employing passive design features to create energy-efficient buildings, while reducing dependence on the electrical grid.

Integrating passive design features into the developments design, we can reduce reliance on the building's mechanical systems by accessing the natural resources available. The development will be utilising a high-performance façade and shading systems to reduce the load on the HVAC system. This façade will use strategically placed eaves, awnings, and landscaping to reduce this load. Additionally, cross ventilation and high-quality insulation will contribute to the reduction of the heat gain and loss of the buildings.

3.3 HIGH PERFORMANCE BUILDING SYSTEMS

Throughout the development high-performing building systems will be installed to reduce demand to the electrical grid. These systems include:

- High efficiency LED lighting throughout, including in common areas with efficiency controls to meet the requirements of NCC 2022 Section J. Controls will include motion sensors, time clocks and zoned switching.
- Energy meters and monitoring systems will be provided to comply with NCC 2022 Section J Part J8 requirements. Preference for natural ventilation and comfort through adaptive cooling and shading.
- The development will supply most of the irrigation needs from an on-site rainwater tank. Rainwater will be captured from the roof of the buildings to reduce potable water demand and consumed in the park.

3.4 RENEWABLE ENERGY SOURCES

The roof area provides an excellent opportunity for installation of a solar photovoltaic system. The sizeable system will generate renewable electricity to offset grid use and minimise stress on the grid at peak times. PV will be installed at a rate that maximises the coverage of the non-trafficable roof area.

In order to ensure that 100% of the site's energy consumption is derived from renewable sources in the future, off- site renewable electricity will need to be obtained through the energy market.

3.5 ESTIMATES ENERGY CONSUMPTION

The estimated annual total energy consumption of the development is summarised in the table below.

Table 2. NABERS Reverse calculator - Estimated Annual Energy Consumption

	ELECTRICITY (kWh/year)
BENCHMARKING EMISSIONS AT 5 STAR NABERS ENERGY (SCHOOLS)	64,607

3.5.1 ENERGY SOURCES

The development is fossil fuel-free and incorporates on-site renewable energy sources.
Electricity consumption has been estimated using the NABERS Reverse calculator for schools.

Additionally, refrigerants have been assessed, considering an estimated usage and accounting for a 2% loss factor annually. The primary refrigerant in use is R410A.

3.6 ESTIMATED GHG EMISSIONS

The following table summarise the total GHG Emissions for the Hunter River High School development based on the NABERS reverse calculator for a 5 Star development. The predicted energy consumption is shown in the table below.

Table 3 - Total Greenhouse Gas Emissions breakdown for 2024.

SCOPE	EMISSION SOURCE	GHG EMISSION (kgCO2-e/year)	GHG EMISSIONS %
1	Gas consumption	0	0%
	Diesel	0	0%
	Refrigerants	3,236	6%
2	Electricity Consumption	51,040*	94%
1,2 & 3	TOTAL	54,276	100%

*Scope 1, 2 and 3 emissions as per NABERS reverse calculator for Schools

3.6.1 SCOPE 1 EMISSIONS

Hunter River High School is committed to the electrification of the development and will not include any gas within the project.

The table below offers an overview of the total refrigerants associated with the building's services and their corresponding annual emissions. This calculation has been derived from the mechanical specifications for the development, assuming the refrigerant type to be R410A.

Table 5 - Annual Refrigerant GHG Emissions

REFRIGERANT	GWP (KGCO2E/KG)	TOTAL CHARGE (KG)	EMISSIONS (KGCO2E)
R-410A	2,088	155	3,236.4

***Assuming a 2% leakage factor**

3.6.2 SCOPE 2 EMISSIONS

The development's annual electrical consumption and the associated carbon emissions are summarised in the table below.

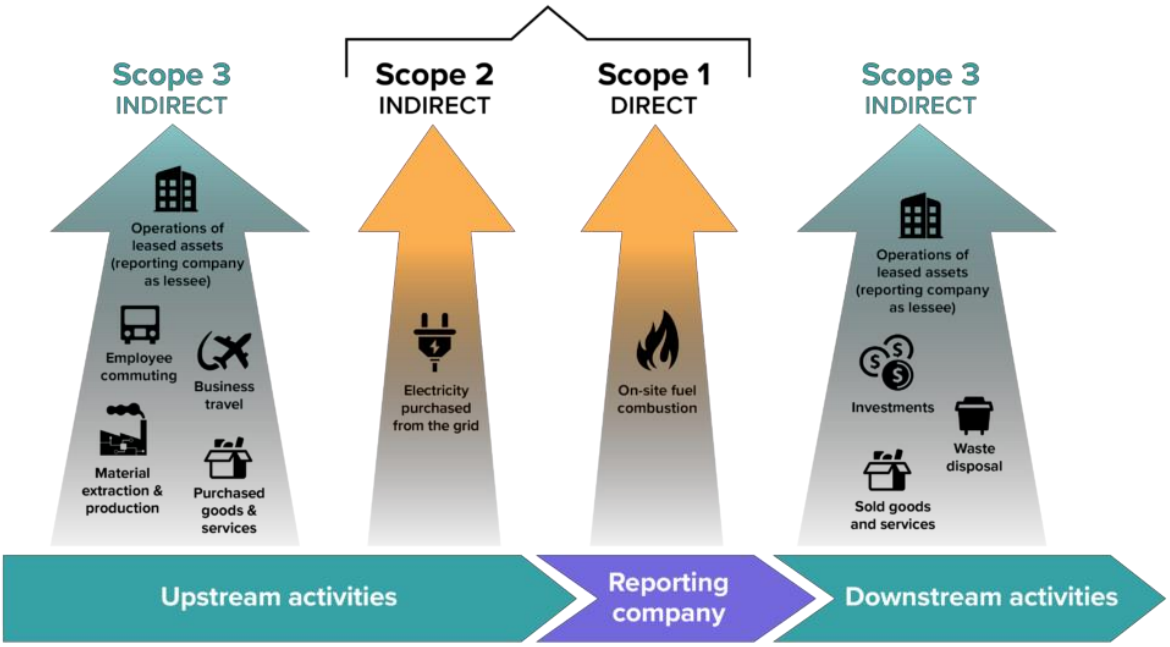
Table 6 - Electricity consumption and GHG Emissions

EMISSION SOURCE	ELECTRICITY CONSUMPTION (KWH)	EMISSIONS (KGCO2E)
ELECTRICITY CONSUMPTION	64,607	47,163*

*Scope 1 and 2 emissions as per NABERS reverse calculator for Schools

3.6.3 SCOPE 3 EMISSIONS

Scope 3 emissions are all indirect emissions within the supply chain. This includes *upstream* activities such as energy in goods and services consumed and employee travel and *downstream* activities such as waste, investments and actions that occur from what Mainbrace produce.
This area of carbon emissions is the hardest to track as it requires a full assessment of the supply chain.



It is typical to not assess the entire process, but only the elements that make up say 95% of the total. The remaining elements that make up the resulting 5% are not a focus as they are a small part of the total.

Typically, Scope 3 emissions are made up of the following:

UPSTREAM SCOPE 3	DOWNSTREAM SCOPE 3
Category 1: Purchased goods and services	Category 9: Downstream transportation and distribution
Category 2: Capital goods	Category 10: Processing of sold products
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	Category 11: Use of sold products
Category 4: Upstream transportation and distribution	Category 12: End-of-life treatment of sold products
Category 5: Waste generated in operations	Category 13: Downstream leased assets
Category 6: Business travel	Category 14: Franchises
Category 7: Employee commuting	Category 15: Investments

3.7 CARBON OFFSETS

All carbon emissions accumulated from the development will have to be offset to achieve net zero status. All climate active carbon neutral works will be applicable to the operation of a building. The following steps are proposed to achieve Carbon Neutral Certification for the development:

Step 0: Enter into a Carbon Neutral Licence Agreement.

Step 1: Establish Baseline by Calculating Emissions

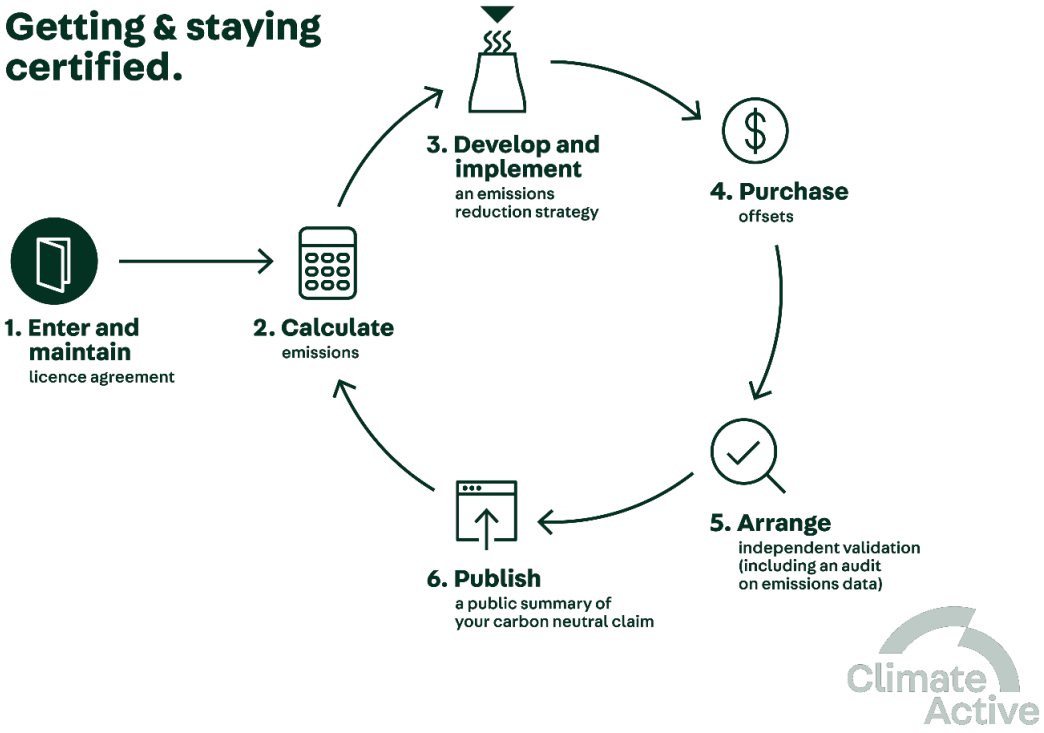
Step 2: Develop and Implement an Emissions Reduction Strategy

Step 3: Reduce Emissions

Step 4: Offset Emissions

Step 5: Audit

Step 6: Certification



Net Zero. Source: climateactive.org.au

The following are initiatives Hunter River High School will employ to reduce Scope 3 emissions. The final strategy will be need to be developed to allow business certainty and continuance.

- Include Supplier form to request any or all information they have on Scope 3 emissions for their products.
- Explore opportunities in the supply chain to use less carbon-intensive technologies and solutions.
- Explore reductions in Scope 3 emissions. This includes:
    - FSC Paper for all printing
    - Extending life of AV/IT equipment where possible
    - In-office on-site waste separation and diversion
    - Carbon Neutral consumables
- Consider methods to improve emissions associated with employee commuting.
- Continued development of “Skip the Bin” to assist in end of life treatment of sold products.
- Improved upstream transportation i.e. zero carbon shipping/freight

4 CONCLUSION

The subsequent report offers a comprehensive overview of the strategies employed to achieve net zero status. This statement outlines the strategies delineated for attaining carbon neutrality at Hunter River High School.

Table 1 presents an analysis of the existing operational Scope 1 and 2 GHG emissions associated with Hunter River High School. These calculations are based on emissions originating from the current electricity grid. Additionally, projections have been made for the year 2050, anticipating that the electricity grid will have achieved carbon neutrality by then.

Table 7 - Summary of estimated GHG Emissions

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To advance towards a zero-carbon future, an action plan has been developed for the building, aiming to achieve climate positivity by relying entirely on renewable energy while offsetting the remaining scope 1 and 2 emissions.

This report is intended solely to offer an approximate assessment of this development's performance concerning greenhouse gas emissions, as per the Green Star criteria. To this end, certain assumptions have been made regarding the development's energy consumption, which may not precisely mirror the building's actual consumption. Numerous factors linked to the building's tenancy, such as the loads from process equipment, occupancy rates, and operational schedules, will influence the building's energy consumption and the emissions associated with it. Consequently, any information concerning this development's specific energy usage and greenhouse gas emissions is unlikely to precisely represent the building's real-world performance.

Instead, this report serves as a guideline for understanding the magnitude of emissions and the necessary steps required for the building to attain a state of zero operational carbon emissions.

APPENDIX A

NABERS Reverse Calculator for Schools

NABERS Energy and Water for Schools
Reverse Calculator

Version: V27 **Date:** Jan-24

The NABERS rating for Schools reverse calculator helps you calculate the maximum amount of energy and water a school campus can use to achieve a star rating that you specify. To ensure you achieve the rating, you should allow a factor of safety, and not design to the minimum figure for each star band. The output is the maximum amount of energy allowed to be used to achieve the rating you nominate.

1. ENTER THE STAR RATING YOU WISH TO ACHIEVE

	5	STARS
	4	STARS

2. ENTER THE RATING INFORMATION

Building Postcode		2324
School Sector		Government School
What is the remoteness area classification of the School?		Outer Regional
Site Area (m²)		22000
Gross Floor Area (m²)		1478
Number of FTE staff (Per Annum)		45
Number of FTE ELC Students		0
Number of FTE Primary Students		0
Number of FTE Secondary Students		842
Number of FTE Special Needs Students		0
Presence of Swimming Pool?		No
Percentage Breakdown of Energy Consumption:	Electricity	100%
	Gas	0%
	LPG	0%
	Diesel	0%

RESULTS - REVERSE CALCULATOR

NABERS ENERGY

Predicted Average Benchmarking Emissions for this School	95,699	$kgCO_2$-e/year
Maximum Benchmarking Emissions at 5 Star NABERS Energy	51,040	$kgCO_2$-e/year
Reporting Emissions for this School - Scope 1, 2 and 3	51,040	$kgCO_2$-e/year
Reporting Emissions for this School - Scope 1 and 2	47,163	$kgCO_2$-e/year
Energy Intensity at 5 Star NABERS Energy	157.4	MJ/m².year
Maximum Allowable Fuel Consumption		
Electricity:	64,607	kWh/year
Gas:	-	MJ/year
LPG:	-	L/year,
Diesel:	-	L/year

NABERS WATER

Predicted Average Water Consumption for this School	5,691	kL/year
Maximum Water Consumption at 4 Star NABERS Water	4,552	kL/year
Water Intensity at 4 Star NABERS Water	0.21	kL/m².year

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