

NEW GRAFTON CORRECTIONAL CENTRE
ECOLOGICAL SUSTAINABLE DEVELOPMENT
REPORT

MAY 2017





NEW GRAFTON CORRECTIONAL CENTRE ECOLOGICAL SUSTAINABLE DEVELOPMENT REPORT

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TABLE OF CONTENTS

1	INTRODUCTION AND OVERVIEW	1
1.1	Background.....	1
1.2	Stage 1 Consent.....	1
1.3	Approvals Framework.....	2
1.4	The Site and its Context.....	3
1.4.1	Regional Context.....	3
1.4.2	The Site.....	5
1.5	The Proposal.....	6
1.6	Purpose of this Report.....	8
1.7	Report Structure.....	9
2	INCORPORATION OF ESD PRINCIPLES	10
2.1	Project Approach to ESD.....	10
2.2	Staged Incorporation.....	10
2.2.1	Design Stage.....	11
2.2.2	Construction.....	11
2.2.3	Commissioning.....	11
2.2.4	Operations.....	11
3	ASSESSMENT TO MEET INDUSTRY BEST PRACTICE	13
3.1	Assessment.....	14
3.2	Benchmarking.....	14
3.3	Project Technical Requirements.....	16
4	MEASURES TO MINIMISE CONSUMPTION OF RESOURCES, WATER AND ENERGY	17
4.1	Water Consumption.....	17
4.2	Energy Efficiency.....	19
4.3	Indoor Environment Quality.....	23
4.4	Materials and Resources.....	24
4.5	Water Sensitive Urban Design.....	25
4.6	Waste Management.....	26



5	SUMMARY AND CONCLUSIONS	27
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1 INTRODUCTION AND OVERVIEW

1.1 BACKGROUND

In 2016, the NSW Government called for Expressions of Interest from the private sector to design, build, operate and maintain the NGCC. Following a competitive tender process, NorthernPathways were announced as the preferred bidder. The project is being delivered a Public Private Partnership (PPP) which means NorthernPathways will design, construct, operate and maintain the new facility on behalf of the NSW Government for the next 20 years.

Infrastructure NSW (INSW) is the Proponent for the environmental impact statement and lodgement of an application for environmental and planning approval. INSW is working with NorthernPathways on the community consultation and public exhibition of this environmental impact statement.

NGCC will be the major multifunctional, regional correctional facility servicing the northern part of NSW and will be the primary correctional facility for all corrections operations from the Queensland border in the north to Kempsey in the south, and Tamworth in the southwest.

The vision for the project is to operate in accordance with innovative best practice, both in providing safety and security and providing dynamic, pro-social management of inmates.

1.2 STAGE 1 CONSENT

On 14 March 2017 consent was granted to the concept proposal for the staged development of New Grafton Correctional Centre (NGCC) comprising:

- 1,700 maximum and minimum security beds, consisting of:
 - - 1,000 maximum security beds for male inmates;
 - - 300 maximum security beds for female inmates; and
 - - 400 minimum security beds for male inmates.
- core correctional facility buildings including: maximum and minimum accommodation units; special accommodation units; health facilities; education and programs areas; administration; workshops; staff amenities; and visitor facilities;
- a recreational oval within the perimeter of the facility;
- a six metre high fence or wall around the perimeter of the facility, with light and security camera poles up to 10 metres in height;
- store buildings, small ancillary facilities, a central energy plant, black-water treatment facilities and a drug dog detection unit and yard located outside the perimeter wall / fence;
- fire access roads on the inside and the outside of the perimeter wall/ fence of the facility;
- water, power, wastewater and communication utilities within the site;
- a maximum building height of 12 metres (approximately three storeys);
- total GFA of approximately 100,000 sqm;
- vegetative buffer of 50 metres along the northern boundary, 15 metres along the eastern boundary and 30 metres along the southern boundary; and
- asset protection zone of 100 metres from every boundary or vegetation buffer;

- one vehicular entry/exit point from Avenue Road;
- 500 car parking spaces;
- 1.5 metre high boundary fence; and
- landscaping of ground cover and /or shrubbery.

All development under the concept proposal consent (Stage 1 consent) is to be the subject of a subsequent development application with the exception of the Stage 1 works.

The approved Stage 1 works include:

- vegetation clearance and biodiversity management activities;
- bulk excavation and site stabilisation works;
- demolition of the existing house and sheds;
- construction of access roads including fire access roads to the extent required to conduct Stage 1 works
- construction of auxiliary facilities such as construction compound, construction staff parking facilities and stockpiles sites;
- temporary provision of water, power and communication services within the site to the extent required to conduct Stage 1 works; and
- landscaping.

These Stage 1 works will be undertaken to facilitate the subsequent development as envisaged in the concept proposals.

At the same time, Infrastructure New South Wales (INSW) is arranging for the delivery of services to the site including a mains water supply, electricity, telecommunications and access.

The subsequent development application (Stage 2 DA) will be generally consistent with the concept proposal as outlined on the previous page.

NGCC will be constructed and maintained by John Holland and Serco will operate the correctional centre.

1.3 APPROVALS FRAMEWORK

NGCC is a State significant development with planning approval being obtained in two stages:

- Stage 1 – for the concept proposal and Stage 1 works; and
- Stage 2 – for the design and construction of the facility.

The Stage 1 consent was obtained by the Infrastructure NSW (INSW) on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice, with approval perceived 14 March 2017.

INSW, on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice is the applicant for this Stage 2 development application.

The development to which the Stage 2 development application relates is also State significant development. Clause 8(1)(b) in Part 2 of State Environmental Planning Policy (State and Regional development) 2011 (“the SRD SEPP”), development is declared to be State significant development if the development is specified in Schedule 1 or 2 of the SRD SEPP. Schedule 1 includes paragraph 16:

16 Correctional centres

Development for the purpose of correctional centres that has a capital investment value of more than \$30 million.

The proposed NGCC has a capital investment value of over \$30 million and is State Significant Development.

The Minister for Planning is the consent authority for State Significant Development.

As part of the Secretary's Environmental Assessment Requirements for the project Ecological Sustainable Development (ESD) Principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the proposal.

The project will be required to;

- Detail how the ESD Principles have been incorporated in the design and ongoing operation
- Demonstrate that the proposal has been assessed against a suitably accredited rating scheme to meet industry best practice.
- Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.

1.4 THE SITE AND ITS CONTEXT

1.4.1 REGIONAL CONTEXT

The site is located 23 kilometres by road to the south east of Grafton, 5 kilometres north east of Grafton Airport and 7 kilometres east of the Pacific Highway at 313 Avenue Road Lavadia on the Mid North Coast of New South Wales.

The Pacific Highway provides connections north towards Queensland and south towards the Hunter and Sydney. The Gwydir Highway provides a connection between the North Coast and the New England and Summerland Way extends north connecting Grafton, Casino and Kyogle to the Mt Lindesay Highway.

Grafton is a focal point for regional road, river and other transport networks and a focus for higher order services to the Clarence Valley sub-region. It is the sub-region's major employment centre and a centre for government administration.

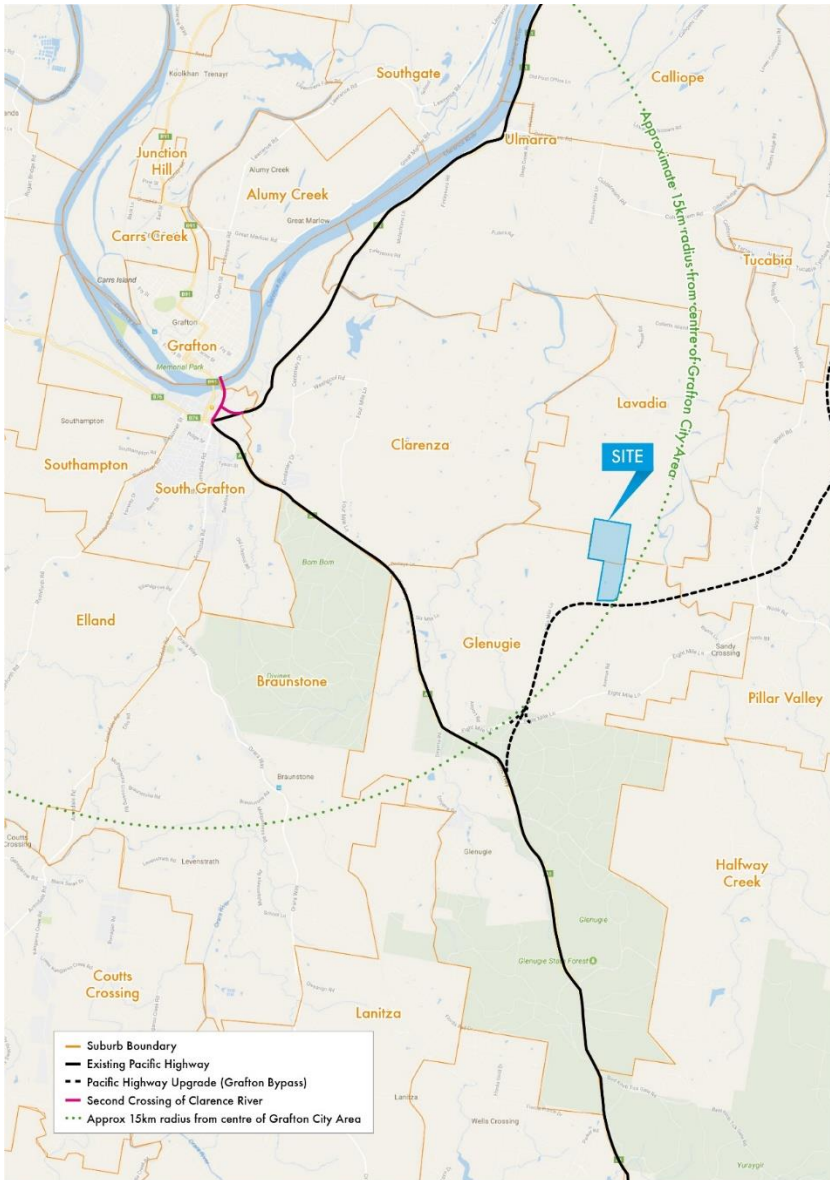


Figure 1-1 - Location

1.4.2 THE SITE

The site comprises Lot 26 DP751376 and Lot 1 DP 1190399 each roughly rectangular with a total area of 195 hectares. It is known as 313 Avenue Road Lavadia although the site straddles the boundary between the localities of Lavadia and Glenugie.

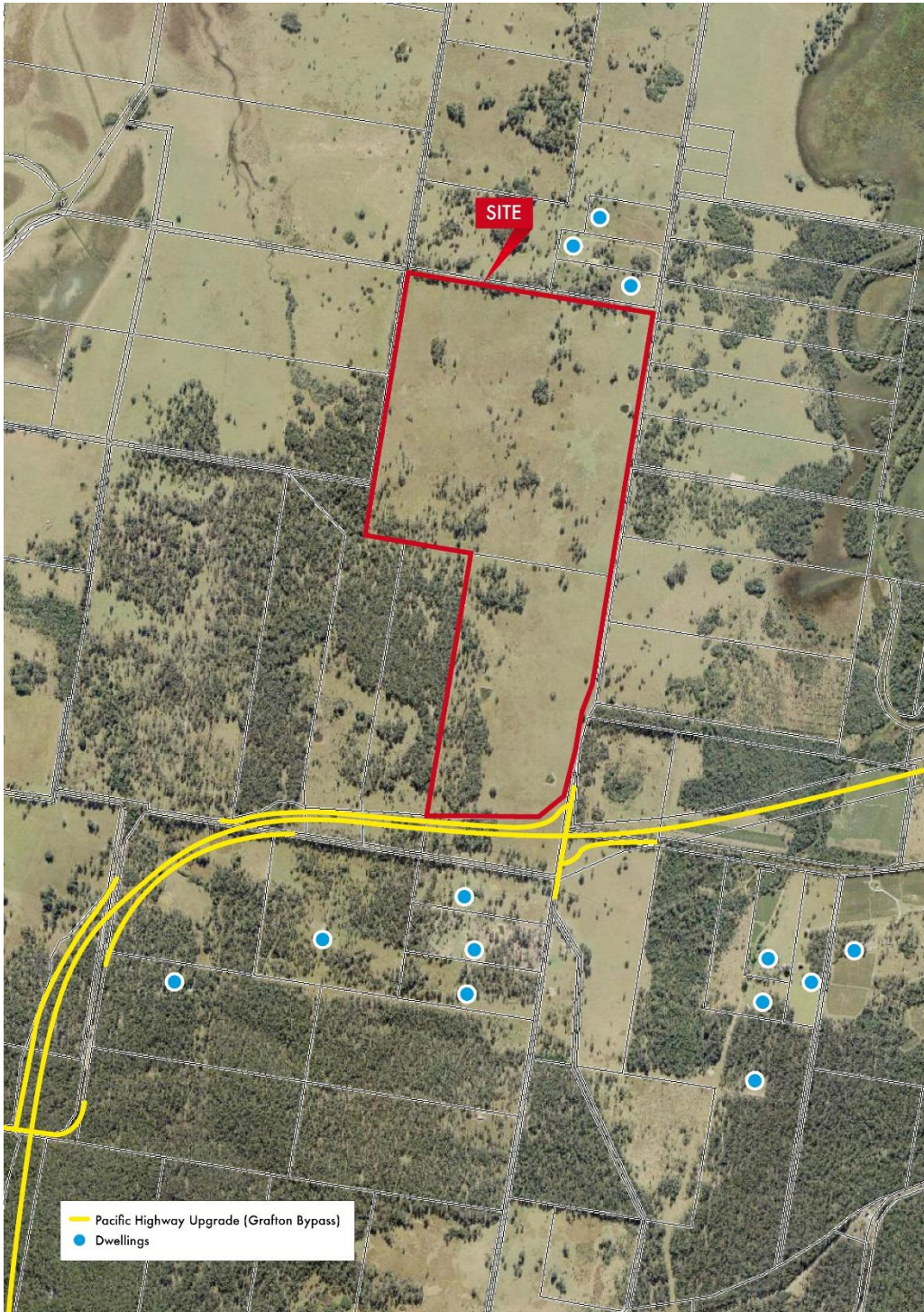


Figure 1-2: Site

It has a frontage to Avenue Road of approximately 2.2 Kms, a northern boundary to an unformed Crown road of 1.1 Kms, a western boundary to adjoining private property and unformed Crown roads of 2.3 Kms and a southern boundary of 627 metres to the Pacific Highway under construction including the relocated Old Six Mile Lane.

1.5 THE PROPOSAL

The proposed development comprises the construction of a new correctional centre designed to accommodate 1,700 male and female inmates comprising 14 different cohorts including but not limited to:

Classification	Number	Gender
Maximum Security Classification Inmates	1000	Male
Maximum Security Classification Inmates	300	Female
Minimum Security Classification Inmates	400	Male
Total	1,700	

Other associated facilities include but are not limited to:

- Recreational oval, special accommodation units, administration, industries and educational facilities, workshops, staff amenities, visitor facilities, prisoner reception and health facilities (including beds and some diagnostic facilities), access, parking and utilities;
- An overall Gross Floor Area (GFA) of approximately 90,700 square metres;
- Secure perimeter fences to the two correctional precincts comprising concrete and anti-climb mesh fences with a Sterile Zone;
- Additional beds for remand/reception management and management of unforeseen contingencies such as a requirement to separate inmates;
- Associated support and ancillary buildings for the delivery of services (other than functions);
- Provision of integrated power, fire, general infrastructure and security & communications backbone;
- Provision of furniture, fittings & equipment (FF&E) to deliver the services and other functions.

Two distinct correctional precincts for the management of maximum and minimum security inmate cohorts are proposed with movement of staff, inmates and visitors managed through individual gatehouses.

These are located either side of central facilities such as parking areas, visitor arrivals areas and staff amenities.

The facility has been designed to be legible for all users, engendering a feeling of personal safety. In providing the physical spaces requisite for the execution of day-to-day operations and achievement of high-level goals, the design results in efficiencies and minimised impact on the environment through the location of buildings and design of movement systems.

The design provides a campus-style layout for the three correctional centres – male maximum, female maximum and male minimum and positions each centre on either side of the existing ridgeline running on a north–south axis through the Site. This ridgeline offers views to Glenugie Peak in the distance to the south, captured by the proposed cultural centre located between the male maximum and female maximum centres. Views to this significant feature are symbolic and meaningful to locals, and particularly for the Indigenous community.

Each centre is designed with a ‘spine’ or ‘street’ of support facilities, and a number of neighbourhoods of residential accommodation. These spines are set out along a gentle curve, generated from the existing topography and natural landforms.

The male maximum and female maximum centres are enclosed by one maximum-security perimeter and designed with physical, visual and acoustic separation between male and female inmates. This is achieved through the

natural ridgeline layering the support facilities spines for each centre on either side of a green space. A secure line between each of the centres prevents inmates from accessing the other.

Each centre is accessed from the support facilities spine through a series of managed secure officer posts in lieu of a central movement control post, facilitating ease of movement into the campus facilities (e.g. recreation, industries, programs and education). The facilities are set out along a curved communication spine determined by functional requirements, acting as the 'wayfinding' across the facility. This pathway network provides a functional solution aligned with operational needs and accommodates natural 'desire' lines of pedestrians. Movement areas are observed by staff points, and movement within the centres' shared spaces is controlled using buildings and landscape elements to define circulation routes.

The landscape design follows the campus style design approach being integrated into the existing local environmental context. Areas of existing vegetation are retained, wherever possible, and extensive screen planting of endemic trees, shrubs and grasses to the boundaries, the drainage lines, and the hill to the north. The entrance road planting of informal groves of local trees, retains the local rural character.

Secure perimeter fences would be provided to the two correctional precincts comprising 6.0m high concrete and anti-climb mesh fences with a secure sterile zone. Detection monitoring and CCTV coverage of perimeter security zones will be provided with security lighting.

A single point of entry and control would be provided from Avenue Road. Internal access roads and parking carparking for approximately 700 car spaces comprising:

- 350 staff car parking spaces and 10 motorcycles spaces
- 350 visitor car parking spaces and 10 motorcycles with a standover space with an overflow area accommodating a further 150 cars

A bus stop close to the visitor reception area would be provided with provision for bus

NorthernPathways propose to design, build and operate a Membrane Bioreactor (MBR) Waste Water Treatment Plant to accommodate inmates, staff and visitors and all peak load periods. The proposed MBR system is the combination of an activated sludge biological treatment plant with Ultra filtration membrane process utilising a suspended growth bioreactor producing Class A+ potable water. This water would be reticulated as recycle water through the facility, with excess directed to travelling surface irrigators. The plant would be fully automated and be remotely monitored for additional offsite technical support.

The facility would be constructed in one stage with occupancy managed by gradual ramp up to capacity over a period of 6 months. The facility will commence construction pursuant to the Stage 1 consent issued in March 2017 and, subject to works under a Stage 2 DA, is due for completion in early 2020 ready for occupation from July 2020.

The construction and delivery of the project will be undertaken in coordination with other major projects in the region, namely the Pacific Highway upgrade currently under construction by the Roads and Maritime Services and the additional bridge crossing of the Clarence River in Grafton.

Detailed consideration has been given to construction planning and management.

It is estimated that some 580 jobs would be provided at the facility with approximately 350 of these being custodial officers. During construction, some 1,100 jobs would be provided.

1.6 PURPOSE OF THIS REPORT

This Ecologically Sustainable Design Report is prepared to support the Stage 2 Environmental Impact Statement (EIS). The purpose of this report is to address the Secretary's Environmental Assessment Requirements (SEARs) relevant to Ecologically Sustainable Development (ESD). The SEARs relevant to this report and where they are addressed are provided in Table 1-1.

Table 1-1: Summary of SEARs relevant to this report

SEARs	Cross Reference
<p>Relevant Policies and Guidelines:</p> <ul style="list-style-type: none"> NSW Government Resource Efficiency Policy <p>Development Standards</p> <p>Identify compliance with the development standards applying to the site and provide justification for any contravention of the development standards.</p> <p>Grafton Correctional Centre Concept Proposal</p> <p>In accordance with section 83D(3) of the Environmental Planning and Assessment Act 1979, demonstrate that the proposal is not inconsistent with the development consent granted for the Grafton Correctional Centre concept proposal (SSD 7413)</p>	<p>Section 3 Assessment to meet Industry Best Practice references applicable assessment to meet best practice</p>
<p>9. Ecologically Sustainable Development (ESD)</p> <ul style="list-style-type: none"> Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the proposal. Demonstrate that the proposal has been assessed against a suitably accredited rating scheme to meet industry best practice. Include a description of measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy 	<p>Section 2 Incorporation of ESD Principles – this section describes how ESD principles will be incorporated during stages of design, delivery and operation</p> <p>Section 3 Assessment to meet Industry Best Practice – this section provides context relative to accreditation rating schemes for correctional centres and the adopted approach to achieving industry best practice.</p> <p>Section 4 Measures to Minimise Consumption of Resources, water and Energy – this section outlines initiatives to be implemented relative to the project.</p>

The project will be required to comply with Condition B20 of the Consent Conditions as outlined in the table below.

Condition B20	Cross Reference
The development application for Stage 2 must demonstrate how the principles of ESD have been	Section 2 Incorporation of ESD Principles

incorporated into the design, construction and on-going operation of the proposal.	
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1.7 REPORT STRUCTURE

The structure of the report is summarised in Table 1-2

Table 1-2: Report Structure

Section Reference	Section Heading	Description
Executive Summary	Executive Summary	Summary of this report and key findings
1	Introduction <ul style="list-style-type: none"> • Background • Project Description • Purpose of Report • Report Structure 	Description of the project, an overview of the project purpose and structure of this report
2	Incorporation of ESD Principles	Description of how ESD principles will be incorporated during stages of design, delivery and operation
3	Assessment to Meet Industry best Practice	Description of assessment methods
4	Measures to Minimise Consumption of Resources, Water and Energy	Initiatives to minimise consumption of resources, water and energy

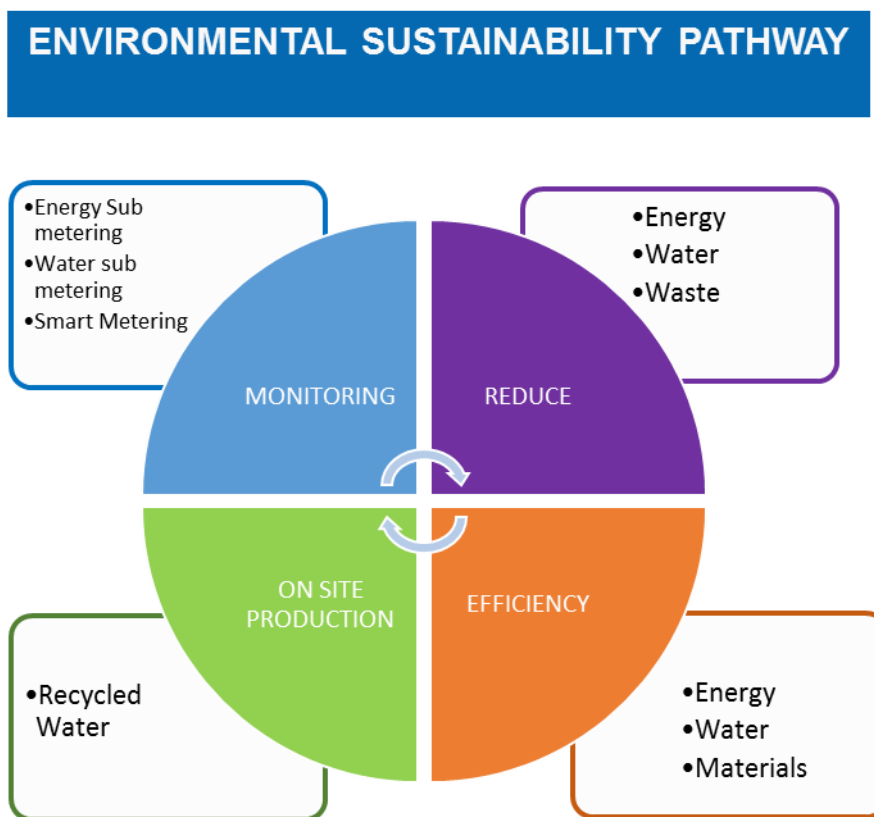
2 INCORPORATION OF ESD PRINCIPLES

2.1 PROJECT APPROACH TO ESD

The aim of this paper is to communicate the New Grafton Correctional Centre's (NGCC) approach to implement ESD initiatives into the project both in design and operation.

The approach to the ESD features of the project is to incorporating energy and water efficient components while achieving a sound commitment to a reduction in natural resource consumption. This document aims to assist with communicating the ESD initiatives of the project by selecting the most suitable initiatives for the client from this report.

The ESD approach can be summarised the diagram below:



2.2 STAGED INCORPORATION

At the current stage of design it should be recognised that a large degree of environmental benefit in the urban planning and development can be achieved. The master-planning stage has provided an opportunity to maximise the sustainability performance of the development by early intervention. Viability of sustainability targets are proven to provide a focus for continuing design development

2.2.1 DESIGN STAGE

The detailed design process for the facility provides a substantial opportunity to reduce consumption through a combination of advanced building fabric and systems analysis, and smart controls. Provision has been made receive any future on-site generation of green energy.

We propose a detailed modelling exercise to explore:

- Optimal approach to thermal comfort to support natural ventilation in non-secure areas where possible;
- Optimal approach to passive solar design through shading and high performance building fabric;
- Value of smart controls for HVAC and lighting optimisation (such as daylight harvesting);

2.2.2 CONSTRUCTION

By providing an Environmental Management Plan and Waste Management Plan, the construction phase of the development will minimise waste and environmental harm. A target of 80% waste to be recycled should be met during this time.

During the entire phase of the construction of the project a dedicated ESD manager will be employed so as to maximise the environmental and sustainable aspects in the development.

2.2.3 COMMISSIONING

Building Commissioning is a critical factor in the planning and design of any new development. A number of ESD initiatives are aimed at improving the overall management process. These generally relate to the commissioning of the building at the end of the construction phase and after 12months of initial operation. In the context of NGCC where operation considers a 20-year term, the ability to regularly monitor performance is particularly important.

Good management and documentation allows the design potential of the building to be realised. It means that the design initiatives are more likely to work at their optimum efficiency. This is critical in terms of ensuring the performance of the building in the future.

Building Commissioning process are to reference:

- Building services specification requirements
 - Design parameter for each system
 - Listed required commissioning activities
 - Define how each system is intended to operate
 - List the acceptable tolerances during commissioning
- Commissioning plan

2.2.4 OPERATIONS

In addition to the communication of ESD initiatives to staff, inmates and visitors via the use of signage and training courses a Building Users Guide (BUG) will be developed to provide further detailed information to staff. The BUG will cover the following areas;





Energy and Environmental Strategy	<ul style="list-style-type: none">• Information on energy efficient features and strategies in relation to the building type• Overview of potential savings in terms of economic and environmental impact
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Monitoring and Targeting	<ul style="list-style-type: none"> • Energy targets and benchmarks for the building type • Metering and sub-metering strategy • How to read, record and present meter readings
Building Services	<ul style="list-style-type: none"> • Basic functions and operations • Description of energy saving features • Simplified system diagrams • An explanation of how it operates • A list of what the main components are (including controls) and the importance of their efficient use • Details on maintenance, including recommended frequency • A list of likely and tell-tale signs of system failure, system ‘do’s and don’ts’ and notes on inefficient operation • All of the above is known for the following systems: <ul style="list-style-type: none"> ○ Ventilation ○ Heating system ○ Cooling system ○ Lighting ○ Domestic hot water
Transport Facilities	<ul style="list-style-type: none"> • Car parking requirements • provision of cycling facilities • Conditions of access
Materials and Waste Policy	<ul style="list-style-type: none"> • What can be recycled • Where the recycling storage areas are • Schedules for waste / recycling removal • Instructions on proper use for less common practices such as composting
Expansion / Re-Fit Consideration	<ul style="list-style-type: none"> • List of environmental recommendations for consideration
Reference and Further Information	<ul style="list-style-type: none"> • Websites • Publications • Organisations pertaining to energy and water conservation • Efficient building operation

3 ASSESSMENT TO MEET INDUSTRY BEST PRACTICE

Currently in Australia there are no references within rating schemes to rate the ESD credentials of correctional centres, however principles of Green Star Design and As-Built v1.1 tool are used for guidance where there are similarities to functions.

A number of other globally recognised rating tools have been reviewed to establish the most appropriate tool to benchmark industry best practices. The table below details this review of local and international ESD rating tools and their applicability to an Australian located correctional facility.

RATING TOOL	ORGANISATION	DESCRIPTION	APPLICABILITY
Green Star Design & As Built v1		Green Star Design & As Built certifies the design and construction of buildings or major refurbishments across a number of impact categories.	Provides a good framework for a number of key impact categories however several credits are not applicable to correctional facilities. Is based in Australia and therefore provides benchmarks that are considered Australian industry best practice.
LEED for Building Design & Construction		LEED for Building Design and Construction (LEED BD+C) provides a framework for building a holistic green building, giving you the chance to nail down every sustainability feature, maximizing the benefits.	Similar framework to Green Star however benchmarks and the standards referenced are most applicable to projects located in the United States.
BREEAM International New Construction		BREEAM International New Construction (NC) can be used to assess the sustainability of new buildings at the design and construction stages of a project. It enables developers to evaluate, improve and demonstrate the sustainability credentials of their buildings in a consistent way.	Similar framework to Green Star however benchmarks and the standards referenced are most applicable to projects located in the United Kingdom.
WELL Building Standard		WELL is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and wellbeing, through air,	Is largely targeted at the commercial office sector. A large number of features are not relevant to a correctional facility.

		water, nourishment, light, fitness, comfort, and mind.	
Green Star Interiors		Green Star – Interiors is an independent, national, voluntary rating tool to drive the development of healthy, productive and sustainable interior fitouts.	Heavily focussed on office fit outs and therefore is not applicable to a correctional facility.

3.1 ASSESSMENT

Various targets have been proposed to establish ESD targets to guide the ESD design of the centre. The ESD targets were established with reference to the following:

- A design that encompasses Industry Best Practice
- ESD principles inferred from regulatory policies and plans
- Benchmarking of like corrections centres

3.2 BENCHMARKING

Industry Benchmarks - in order to establish the benchmarking of the project against Industry Best Practice, elements of the Green Star Design & As-Built v1.1 tool has been used.

Facility Benchmarking via the comparison of energy and water consumption from like facilities has been used to establish the performance benchmarks below;

Energy Consumption

The predicted energy consumption for the prison is:

- Gas: 69,800 MJ/day
 - Electricity: 214,195 MJ/day
- i.e. Total: 283,995 MJ/day

This corresponds to an energy demand per person of 118 MJ/person/day.

The energy demand of the project aims to be a 10% improvement on a comparable benchmark building. This comparison will take into account factors including access to energy infrastructure as a result of geographical constraints as well as the operational nature of the building.

During the detailed design phase of the project the project team will continue to review and analysis opportunities for improving the energy efficiency of the correctional centre.

Water Demand and Wastewater Generation

As referenced in the Integrated Water Management Plan Table 3-4:

Water Demand

Facility / Source	Site particulars including typical flow rate	Flow on a per-inmate basis L/inmate/day
Jacobs (2016)	Modelled Average Daily Water use, 410kL/day	241
Sevineratne (2007)	New South Wales Correctional Facilities range	320 - 1290
	USA Correctional Facilities range	300 - 570
	UK Correctional Facilities range	320 - 390
New Grafton Correctional, Water Balance Results	1700 inmates, 315 kL/day	185

Wastewater Generation

Facility / Source	Site particulars including typical flow rate	Flow on a per-inmate basis L/inmate/day
Lotus Glen Correctional	900 inmates, 250-300 kL/day, pressure sewer, Commercial laundry (external clients)	280 - 340
Gatton Correctional	350 inmates, ~85 Kl/day, pressure sewer, water controls and recycling	~240
Rockhampton Correctional	1000 inmates, 450-600Kl/day, limited recycling and water controls	450 - 600
Woodford Correctional	1000 inmates, ~400 /day, limited recycling and water controls	440
Jacobs (2016) model results	Modelled Average Daily Wastewater Generation, 470 Kl/day	276
New Grafton Correctional, Water Balance Results	1700 inmates, 498Kl/day	276

Comparison of benchmark data from a range of other sites indicates the scheme is realistic and in the expected range.

3.3 PROJECT TECHNICAL REQUIREMENTS

As documented within the project RFP Volume 4 Part C – Technical Requirements the project must report on how the following ESD Initiatives are achieved:

- water consumption;
- energy efficiency;
- indoor environment quality;
- construction management;
- materials and resources;
- sustainable sites;
- emissions and atmosphere; and
- innovation in design.

4 MEASURES TO MINIMISE CONSUMPTION OF RESOURCES, WATER AND ENERGY

Measures to minimise consumption of resources, water and energy, as well as providing better environmental quality outcomes are included within design of the facility and the operational procedures post occupancy.

4.1 WATER CONSUMPTION

Water efficient fixtures, fittings and practices

Water efficient fixtures and fittings reduce the demand for potable water by limiting the flow to water uses such as showers, taps and toilets. Water efficient fixtures and fittings are utilised.

Additionally, water controls such as timers on the showers reduce the water demands on site.

Initiatives: Water Conservation

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Reduced potable water consumption for sanitary use, wash down, laundry, fire and mechanical equipment compared to base case conditions	Reduced potable water consumption	Sanitary fixtures and tapware selected with consideration to Water Efficiency labelling and Standards (WELS) ratings. Toilets, basins and showers to cells and suites electronically operated and controlled, to limit fixture operation to pre-determined lengths of time.	Water management system monitored from a site level down to individual cell level to allow focused management.
WELS-rated appliances for washing use	Reduce potable water consumption compared to base case conditions	District blackwater scheme provides a non-potable water supply reticulated around the site (Quality A+). Recycled blackwater 'backed up' by mains potable water in case of emergency. Selected appliances considered 'Best Practice'.	The blackwater recycling system issues fault alarms to the BMS. Full-time on-site Staff monitor and maintain the plant and all appliances to ensure they are in good working order.
Drainage for fire protection system test water and maintenance drain-downs for re-use. Each floor fitted with sprinkler system featuring isolation valves to allow floor-to-floor testing	Fire system water reduction. Water used in fire testing is recycled through the blackwater scheme. Overall volume of water used for fire system is minimised.	All test water from fire pumps and flow meter testing re-circulated back into the storage tanks. Sprinkler valve sets at each building incorporate a test drain that discharges into the sewer drainage system and recycles.	Visual inspection carried out during testing.
Water leak detection system	Leaks detected and wastage avoided	Water leak detection systems interfaced with BMS to alert FM staff	Intervene when leaks are identified

Wastewater treatment and reuse on site

Blackwater treatment on site will generate Grade A water for non-portable uses such as toilet flushing, irrigation, and washdown.

Initiative: Irrigation water sourced from recycled water

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Irrigation: sourcing from water onsite	Reduced potable water consumption for irrigation by a minimum of 90% from calculated base. Volume of water used for irrigation is minimised.	Blackwater harvesting and recycling system will meet landscape irrigation demands. Volume of water used for irrigation is minimised through the use of very low water-use plant and grass species.	Consumption monitored through water meters via the BMS.

Water Metering

Installation of water sub-meters on all major water uses in the building and include as a minimum wash-down and irrigation, fire hydrant and sprinkler services and hot water services. These meters are linked to a BMS or monitoring system to provide a leak detection system. The water leak detection system will include automatic time and / or volume controls to provide alarms to either alert the facility managers or completely shut off water when abnormal consumption is detected.

Metering of major plant item or equipment would require a spatial allowance 1m x 2m each. Meters will generally be installed within plant areas.

Initiative: Water sub-metering

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Water sub-metering: install water meters for all major water uses (individual buildings, evaporative heat rejection systems, irrigation systems, recycled water supply) in the Correctional Centres and Complex	Monitors consumption and able to respond with improved practices and operating conditions	Every building provided with a minimum of two water meters (metering the mains potable water supply and recycled non-potable water supply). Landscape irrigation and wet fire metered. BMS programmed to alert unusual consumption and out-of-hours usage.	Meters connected to BMS to record consumption and benchmark against targets. Meters can be used to detect leaks.

Water Consumption Systems

Other opportunities will be implemented to beneficially reduce demand or maximise re-use, including:

Prevent water losses / waste during system tests and maintenance drain-downs for re-use on site e.g. for fire protection system

Storage of Grade A water produced under a black-water system for bushfire prevention.

4.2 ENERGY EFFICIENCY

The energy efficient design of the project will focus on facilitating efficient energy usage and provision to incorporate the utilisation of energy generated by low-emission sources.

During the detailed design phase of the project opportunities for the future provision and accommodation of renewable energy technology will be investigated. This will allow for the incorporation of low emission technologies in the future operation of the project.

The flow chart below details the project approach to energy minimisation and reduced carbon emissions.

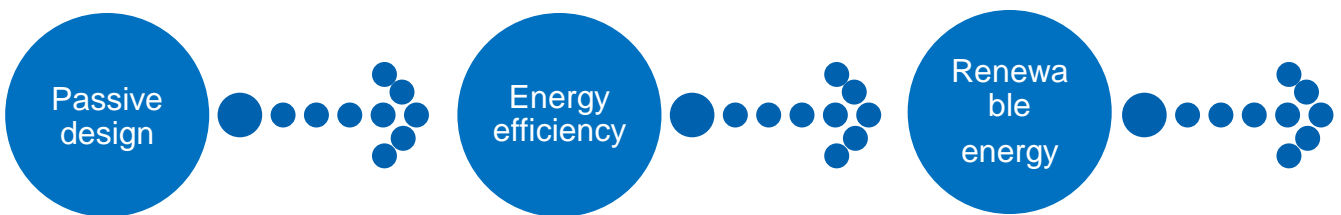


Figure 4-1: Priorities for ESD and energy use

Passive Design

Passive design considers the building design in conjunction with the local climate to maximise the environmental performance of the building.

Passive design elements to include;

Building orientation

External shading

Appropriate use of thermal mass

Performance glazing

Thermal efficiency of building fabric

Initiatives: Passive Design

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Balance daylight, shading and glazing specification	<p>Minimise sizing requirement for A/C systems</p> <p>Minimise ongoing operational energy usage</p>	Appropriately qualified consultants and effective modelling used in the design process. During the design phase, shading is located in a manner to limit heat gain.	Actual conditions of light penetration monitored and provision of shading reviewed to further optimise outcomes.

	Improve occupant thermal comfort by limiting solar radiation		
Optimised thermal performance of walls and roof	Reduced heating and cooling loads	External building elements subjected to fabric analysis for thermal performance	Not applicable

Ventilation and Cooling

Naturally ventilated spaces use zero air conditioning energy and, where permitted with security and safety of spaces considered, provide increased comfort to occupants, increase reliability of conditions, decrease costs. Free cooling and heating with outside air cycles and air-to-air exchangers are adopted to utilise favourable ambient conditions.

Initiatives: Ventilation and Cooling

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Natural ventilation utilised in lieu of air-conditioning where project performance requirements allow	Maximised benefits of passive controls and minimised capital costs	Comfort levels and equipment loads considered in the design to determine opportunities for operating without mechanical cooling system.	Usage of mechanical systems reviewed in operations to determine opportunity to reduce.
Free cooling and heating with outside air cycles and air-to-air heat exchangers	Reduced energy usage	Outside air cycles and air-to-air heat exchangers utilised to provide free heating and cooling when outside air temperatures are favourable	BMS - controlled

Air Conditioning System

To meet the operational requirements for the corrections centre and based on site specific constraints, central energy plant has not been utilised. Separate air conditioning systems for each building and each zone adopted to provide better response to load demand for individual zones and better control of consumption of energy.

Initiative: Air-conditioning system

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Separate air conditioning systems for each building and each zone	Limits failures to zones; addresses load demand by zone and improves efficiency	Match load distribution with separate systems	BMS and sensors provide real time data regarding operations

Domestic Hotwater

Initiative: Pipe insulation

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Pipe insulation	Reduced heat loss from hot water ring main; reduced cold water wastage; and constant cold water temperature during summer	Wall / insulation of 20mm minimum thickness provided on all hot water flow and return ring mains; and on all cold water reticulation pipes within roof space.	Gaps in insulation identified through detection of condensation – sealed to maximise benefit

Renewable Energy

Provision has been made to accept site based renewable energy in the future.

Sub-Metering

Electrical energy consumption is the major contributor of greenhouse gas emissions from commercial scale buildings. To effectively manage electrical consumption, sufficient data will be provided through sub-metering of all major uses to allow effective monitoring of the building to allow fine tuning of operational procedures.

Initiative: Energy sub-metering

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
energy sub-metering	Monitors consumption in select areas and able to respond with improved practices and operating conditions	Electrical sub-meters located at each electrical distribution board to monitor consumption. All meters are linked to the Building Management System (BMS)	Sub-meters linked to the BMS, allowing load profiles to be monitored for consistency; action is taken when anomalies are detected.

Systems and Equipment Controls, including lighting

Systems design will incorporate controls, measurement of consumption and monitoring processes to allow energy efficiency to be enhanced during operation of the corrections centre.

Lighting

The lighting design system will be optimised by correctly zoning each area and linking lights to a control system.

Lighting will be adjusted to individual zones to suit the occupancy of the space or turned off in areas that are not in use.

Lighting systems that are located around the perimeter of buildings will, where practical operationally, be linked to a daylight sensor so that natural lighting can be utilised. Motion detectors and timers will be adopted additionally. Please note operational security requirements around lighting levels will take precedence over automated dimming or switching on/off.

Initiatives: Systems, controls and automation

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Lighting controls and automation	Reduced running costs without compromising operational requirements	Automation provided in non-critical areas; pre-set dimming installed in day-rooms and for perimeter lighting interfaced to alarm activity	All lighting is Digital Addressable Lighting Interface (DALI) controlled. Fine tuning of controls conducted early in the Operating Phase.
external lighting controls and light-emitting diode (LED) technology	Reduced running costs while achieving a functional, non obtrusive external lighting outcome	LEDs controlled via time switches and photoelectric cells. Perimeter lighting dimmed to a pre-determined level, increasing to full lighting levels in the event of a perimeter alarm	Controls monitored visually and adjusted / fine-tuned to suit operational needs. LED lighting is intrinsically efficient.
Automatic shutdown of the heating, ventilation and air conditioning (HVAC) system in each separate enclosed space within agreed upon areas when unoccupied / not in use	Minimised wastage by avoiding use of systems when rooms unoccupied or not in use	HVAC system shuts down in unoccupied areas e.g. administration areas and intermittent use areas such as toilets, change rooms, storage areas, cleaner's rooms, kitchen, recreation and laundry.	Manual and BMS controlled
Temperature controlled mechanical ventilation system	Temperature controllers are provided to reduce energy usage for areas like substations, main switchrooms, etc	Temperature monitored / reported – alarm; running of ventilation fans reported via BMS	Temperature monitored / reported – alarm; running of ventilation fans reported via BMS
Provision of carbon monoxide detectors to sallyport	Carbon monoxide detectors are provided for sallyport areas	Calibration of system	Monitoring of fan operational hours vs carbon monoxide levels

Energy and Water Efficient Equipment

White goods on the market are already rated in terms of their energy and water efficiency. By choosing white goods that are rated within 1 Star of the highest rating, water and energy consumption can be saved.

Electrical equipment will be selected based on energy efficiency.

Initiatives: Energy and Water Efficient Equipment Selection

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
High-efficiency pump motor (Variable frequency drive)	Reduced running costs (minimum of 20-30% savings forecast against base case)	Pump motor selected in line with the latest European motor	Overall consumption values monitored through meters; high performance rated

	conditions)	efficiency standard (IE3)	equipment considered during replacement.
Bulk power factor correction at each main switchboard location	Minimised reactive power losses	Lagging power factor corrected which minimises reactive power losses	Annual testing and inspections conducted.
High-efficiency LED fittings used	Minimised artificial lighting energy consumption. Reduced operating costs without compromising on strict operational and security requirements.	Luminaires selected to provide maximum output without compromising important factors e.g. glare and colour rendering. Lighting distributed in a uniform manner, with minimal spill, in line with strict operational requirements.	Ongoing monitoring during the operating Phase eliminated. Lighting designed and installed in a compliant manner. Opportunities for better performance / technology considered during replacement cycle.
Equipment with superior energy performance ratings	Optimised equipment performance with maximum energy efficiency	Selection criteria for equipment to credit superior performance	Maintenance program monitored to optimise equipment performance. Replacement strategy considered improved technology and performance.

4.3 INDOOR ENVIRONMENT QUALITY

Daylight and Views

By providing daylight and views to a space the occupants can feel connected to the outside which helps with fatigue.

Initiative: Daylight and Views

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Daylight accessibility of between 1.8% and 4% as per the project RFP	Improved occupant health and comfort	Detailed daylight modelling	Review of construction documentation against detailed design.

Thermal Comfort

The thermal comfort of occupied spaces is measured via two different approaches, depending on the primary method of ventilation:

Air Conditioned Spaces – Predicted Mean Vote (PMV) is an index that considers: air temperature, mean radiant temperature, air velocity, relative humidity, the level of activity of occupants and the type of clothing worn. It is a qualitative way of determining how comfortable a space will be by predicting the percent of the population that would sense a certain level of comfort.

For naturally ventilated space ASHRAE 55 – Adaptive Thermal Comfort will be used to measure and assess occupant's thermal comfort. Adaptive Thermal Comfort considers that people in naturally ventilated buildings adapt to their climate. It follows that in winter people accept lower temperatures and in summer occupants accept slightly higher temperatures.

Initiatives: Thermal Comfort

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Air-conditioned Spaces – Thermal Comfort to be measured against Predicted Mean Vote	Improved occupant health and comfort	Thermal Comfort modelling to confirm occupied spaces to target a PMV +/-1	Review of construction documentation against detailed design.
Naturally Ventilated Spaces – Thermal comfort to be measured against Adaptive Thermal Comfort	Improved occupant health and comfort	Modelling to confirm appropriate levels of thermal comfort are achieved within these spaces.	Review of construction documentation against detailed design.

Material Emissions

The choice of materials offers the opportunity to implement ESD strategies. It has a significant impact on the environmental sustainability and the indoor environment of the building.

Many materials used in building interiors (generally paints, carpets, sealants or composite wood products) release volatile organic chemicals (VOC) or formaldehyde into the air in the building, reducing the quality of the internal air.

All paints, carpets, sealants and composite wood products used in the development will be specified with low VOC and low emission formaldehyde content.

Air Quality Systems

The air quality in the space greatly affects the well-being of the occupants and consequently the efficiency and quality of the work being achieved in that space. The following initiatives will be investigated;

Initiative: Air quality systems

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Mechanical plant and location design ensure is both sides of all moisture / debris-generating components	Access to cooling coils, heating coils and filters for easy maintenance	Ductwork cleaned in accordance with AIRAH HVAC Hygiene Best Practice Guideline 2010 or the National Air Duct Cleaners Association ACR 2006 Standard	Audit condition of ductwork to ensure no accumulation of products within air paths – cleaning conducted as necessary

4.4 MATERIALS AND RESOURCES

The project has focused on material resource efficiency and the procurement of materials that have a lower environmental impact via both the manufacturing process and the embodied energy.

Initiative: Selection of Materials with low environmental impact

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Material Efficiency	Minimisation of material waste	Full coordination of major construction works and internal fitout	Appropriate material selection and monitoring of construction works
Specification of Best Practice PVC	Reduce the environmental impacts and health risks associated with manufacture of PVC products	Minimisation of PVC via material specification	Recording and monitoring of material delivered to site
Reduced embodied energy of Concrete	Reduce the environmental impacts associated with manufacture of concrete	Reduction of Portland Cement Content Reduction in the use of virgin aggregates Increase in the volume of recycled water	Recording and monitoring of material delivered to site
Reduced embodied energy of Steel	Reduce the environmental impacts associated with the manufacturing of steel	Structural design to target reduction in structural and/or reinforcing steel used in the project design	Recording and monitoring of material delivered to site
Environmentally Sustainable Furniture and Fittings	Reduce the environmental impacts associated with the manufacturing furniture and fittings	Specification of furniture and fitting with third party certification where durability and project performance criteria are met.	Recording and monitoring of material delivered to site

4.5 WATER SENSITIVE URBAN DESIGN

Stormwater Management - Water Sensitive Urban Design (WSUD)

Stormwater treatment allows the site to have a positive impact on the external environment. There will be overland flows on the site from the ridge areas to existing streams.

Incorporating water sensitive urban design elements into the design of the carpark and / or surrounding interfaces within the site and groundwater will improve the environmental credentials and ecology of the site.

Initiative: Water-sensitive urban design (WSUD) principles

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Water-sensitive urban design (WSUD) principles	Neutral / beneficial effects on environment and adjoining property	The stormwater drainage system conveys roof water, surface water and groundwater to detention basins prior to discharge to natural watercourses.	Ongoing monitoring and maintenance of swales, pits and pipes to ensure correct performance.

4.6 WASTE MANAGEMENT

Operational Waste Management

During the operation of the development it is necessary to have a well designed waste system that looks at the separation, collection, and recycling of rubbish. This is to encourage the recycling of waste in the development.

Blackwater Treatment

A blackwater treatment system will be provided for collection of waste water / sewage and processing it to World Health Organisation drinking standards, i.e. termed Grade A water.

Reference reports ex Sedgman.

Initiative: Blackwater treatment

INITIATIVE	BENEFITS	METHODOLOGY FOR COMPLIANCE	MONITORING DURING OPERATIONS
Treated sludge from sewage treatment plant recovered and re-used	Treated sludge packaged for sale as fertiliser	End product as a result of treatment to be recovered and made fit for distribution	Quality of output product for distribution reviewed; efficiency of operation of plant monitored to optimise operations.

5 SUMMARY AND CONCLUSIONS

Ecologically sustainable Development principles will be incorporated during the development stages of design, construction, commissioning and operation of the Corrections Complex to meet best industry practice.

There are no references in rating schemes in Australia to rate the ESD credentials for Corrections Complexes, but the principles from rating schemes have been referenced where applicable for similar functions and where practical within operations practices for Corrections Complexes.

Industry benchmarks for Corrections Complexes have been reviewed but in terms of consumption, there is diversity in systems configuration and facilities which limit the comparison to those benchmarks as being within subject ranges. Comparison indicates that values for the New Grafton Corrections Complex tend to lower bounds of range of comparative consumption of water and energy.

A number of initiatives to minimise consumption of resources, water and energy have been factored into current project design documentation and planning for project delivery and operations. Implementation of the initiatives will realise the opportunity to achieve industry best practice values for consumption.