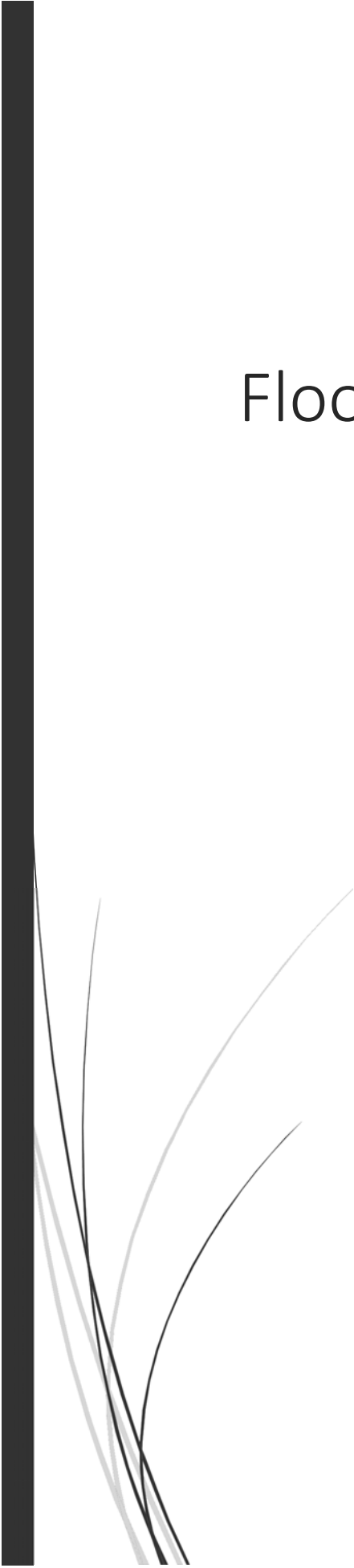




Appendix F

Flooding Working Paper

New Grafton Correctional Centre SSDA 7413
INFRASTRUCTURE NSW

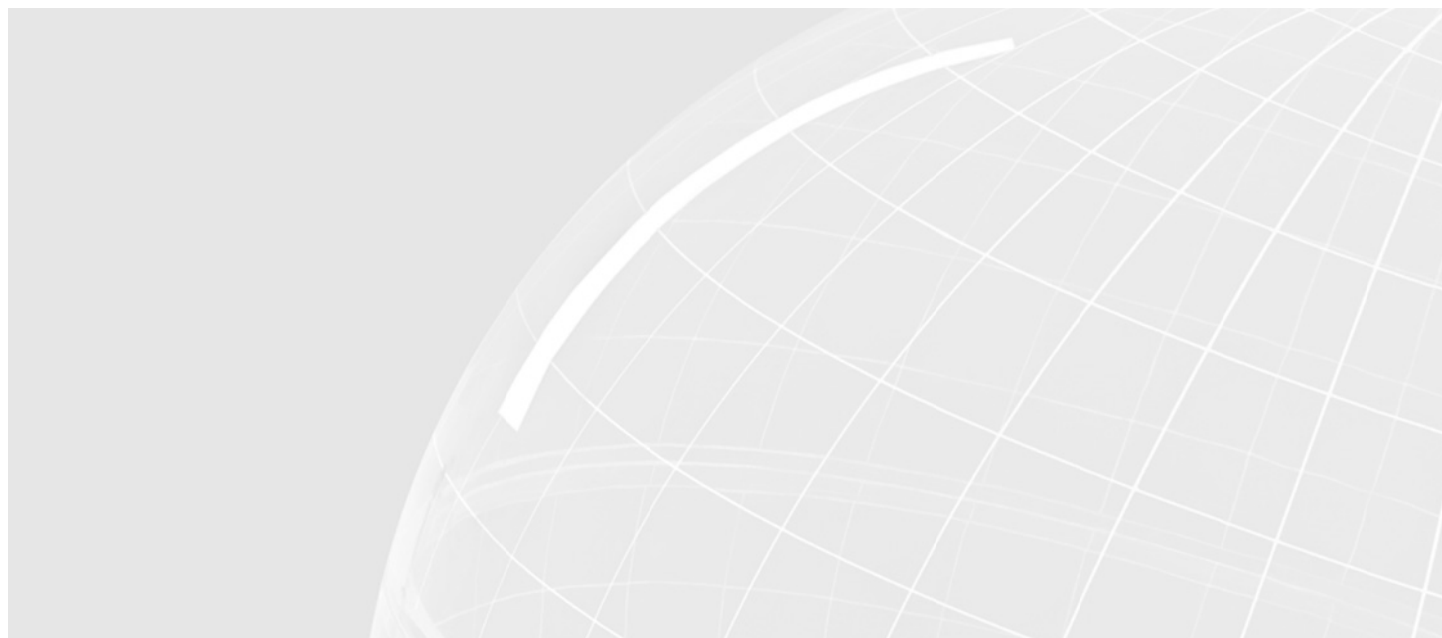
New Grafton Correctional Centre

Infrastructure New South Wales

Flooding Working Paper

Final | 5

1 August 2016



New Grafton Correctional Centre

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 Report_20160801\ToIssue\IA101200_NGCC_Flooding_Working Paper_Revised
 Final_20160801_ToIssue.docx

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Document history and status

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Terms and acronyms in this document

Acronym	Definition
AEP	Annual exceedance probability – the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage.
CSNSW	Correctional Services New South Wales
CVC	Clarence Valley Council
DECCW	Department of Environment and Climate Change
DPE	Department of Planning and Environment.
EIS	Environmental Impact Statement.
FPL	The Flood Planning Level (FPL) are the combinations of flood levels derived from significant historical flood events or floods of specific AEPs and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporate in management plans.
INSW	Infrastructure NSW.
LGA	Local government area.
NGCC	New Grafton Correctional Centre.
NSW	New South wales
PMF	The Probably Maximum Flood (PMF) is the largest Flood that could be conceivably occur at a particular location, usually estimated from the probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.
Project	Comprises the New Grafton Correctional Centre which will provide up to 1,700 new prison beds, within a maximum and minimum security correctional centre with relevant support services and facilities.
Project Site	Comprised of two properties Lot 26 DP 751376 and Lot 1 DP 1190399 and is located at 313 Avenue Road, Lavadia.
Proposal	Comprises the concept proposal and the Stage 1 works development application.
SEAR	Secretary's Environment Assessment Requirements.
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011.</i>
SSD	State Significant Development.

Executive Summary

Infrastructure NSW (INSW) on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice, is seeking approval under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal and Stage 1 Development Application (DA) for the New Grafton Correctional Centre (the Project). The Project is located approximately 12.5 kilometres (km) southeast of Grafton, within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The concept proposal and the Stage 1 works application comprise the Proposal.

The Project satisfies the criteria of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* as the capital investment value of the correctional centre as proposed exceeds \$30 million. As such, the Project is declared to be a State Significant Development (SSD) under Division 4.1, Part 4 of the EP&A Act and the Minister for Planning is the consent authority for the application. The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal were issued by the Department of Planning and Environment (DPE) on 21 December 2015.

It is a requirement of SEARs No. 15, and the *NSW Floodplain Development Manual 2005*, to assess the potential impacts associated with the Project with respect to climate change, increases to rainfall intensity, compatibility with the hydraulic functions and stability of downstream water courses as well as any changes flood behaviour which may impact on the emergency management measures within the locality. This working paper addresses this requirement.

The *Clarence River Flood Study 2013* (CVC, 2016) has been reviewed and deemed satisfactory in determining the flood risk for the Project Site. Therefore, it is considered that no additional modelling is required to determine the effect and impact of the proposed project on flood behaviour.

As the Project Site is located outside of the probable maximum flood extent determined by the Clarence River Flood Study 2013 (CVC, 2016), it is concluded that the Project has no risk of flooding. Further, due to the size of the site in relation to the Clarence River floodplain, it is also concluded that the Project would not have any effect on the downstream Clarence River floodplain.

The Project Site is unlikely to be affected by sea level rises associated with climate change as well as increases in rainfall intensity.

This working paper has considered the SEARs No 15 which was to assess any flood risk on site and to consider any relevant provisions of the *NSW Floodplain Development Manual* (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity.

1. Introduction

1.1 Background

Infrastructure NSW (INSW) on behalf of Corrective Services NSW, a division of the Department of Justice, is seeking approval under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal and Stage 1 Development Application (DA) for the New Grafton Correctional Centre (the Project). The concept proposal and the Stage 1 works application comprise the Proposal.

The Project satisfies the criteria of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* as the capital investment value of the correctional centre as proposed exceeds \$30 million. As such, the Project is declared to be a State Significant Development (SSD) under Division 4.1, Part 4 of the EP&A Act and the Minister for Planning is the consent authority for the application. The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal were issued by the Department of Planning and Environment (DPE) on 21 December 2015.

1.2 Locality

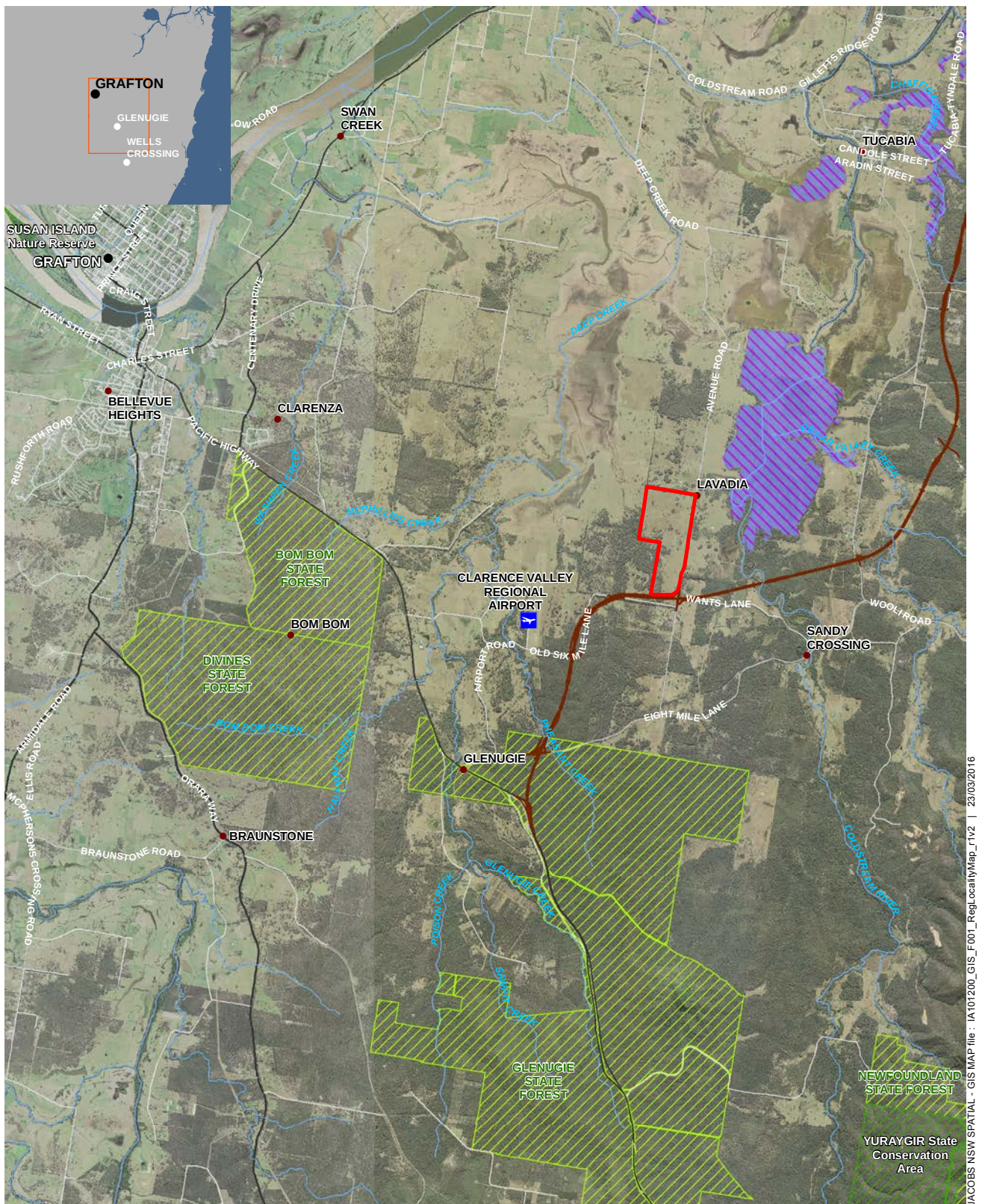
The Project is located approximately 12.5 kilometres southeast of Grafton (refer to **Figure 1-1**) within the Clarence Valley Local Government Area (LGA) at 313 Avenue Road, Lavadia (the Project Site). The Project Site is zoned RU2 - Rural Landscape under the *Clarence Valley Local Environmental Plan 2011*. Development for the purpose of a correctional centre is permissible with consent within the RU2 Rural Landscape zone.

The Project Site includes two properties comprised of Lot 26 DP 751376 and Lot 1 DP 1190399 and is 195 hectares (ha) in size (refer to **Figure 1-2**). The site has historically been used for cattle grazing. In July 2015, development consent for a dwelling house in the southeast corner of Lot 1 DP 1190399 was granted by Council and construction of the house and adjacent shed is complete. The site is bounded by Avenue Road (also recognised as Golden Mile Road) to the east, and Old Six Mile Lane to the south. Avenue Road connects to the Pacific Highway via Eight Mile Lane to the south and Old Six Mile Lane connects to the Pacific Highway to the west.

It is noted that the Grafton bypass portion of the upgraded Pacific Highway project (by Roads and Maritime Services) will, in addition to the reconfigured Old Six Mile Lane, form the southern boundary of the site once completed in approximately 2019. As part of that project, Avenue Road will pass over the Pacific Highway and the intersection of Avenue Road and Old Six Mile Road will be upgraded to improve local access, without direct connection to the highway.

1.3 Project description

The New Grafton Correctional Centre (NGCC) requires a staged development application that sets out a concept proposal for a new correctional centre at Grafton that provides maximum and minimum security facilities and includes a total of 1,700 beds. The concept proposal includes a maximum built form height of 12 metres (approximately three storeys) with a gross floor area of approximately 100,000 square metres. The staged development application also seeks concurrent Stage 1 approval for site clearance and preparatory works. **Table 1-1** provides a summary of the Proposal's key components and features.



Legend

- The Project
- Grafton Bypass (proposed)
- SEPP 14 Wetlands
- National Park Reserves
- State Forests

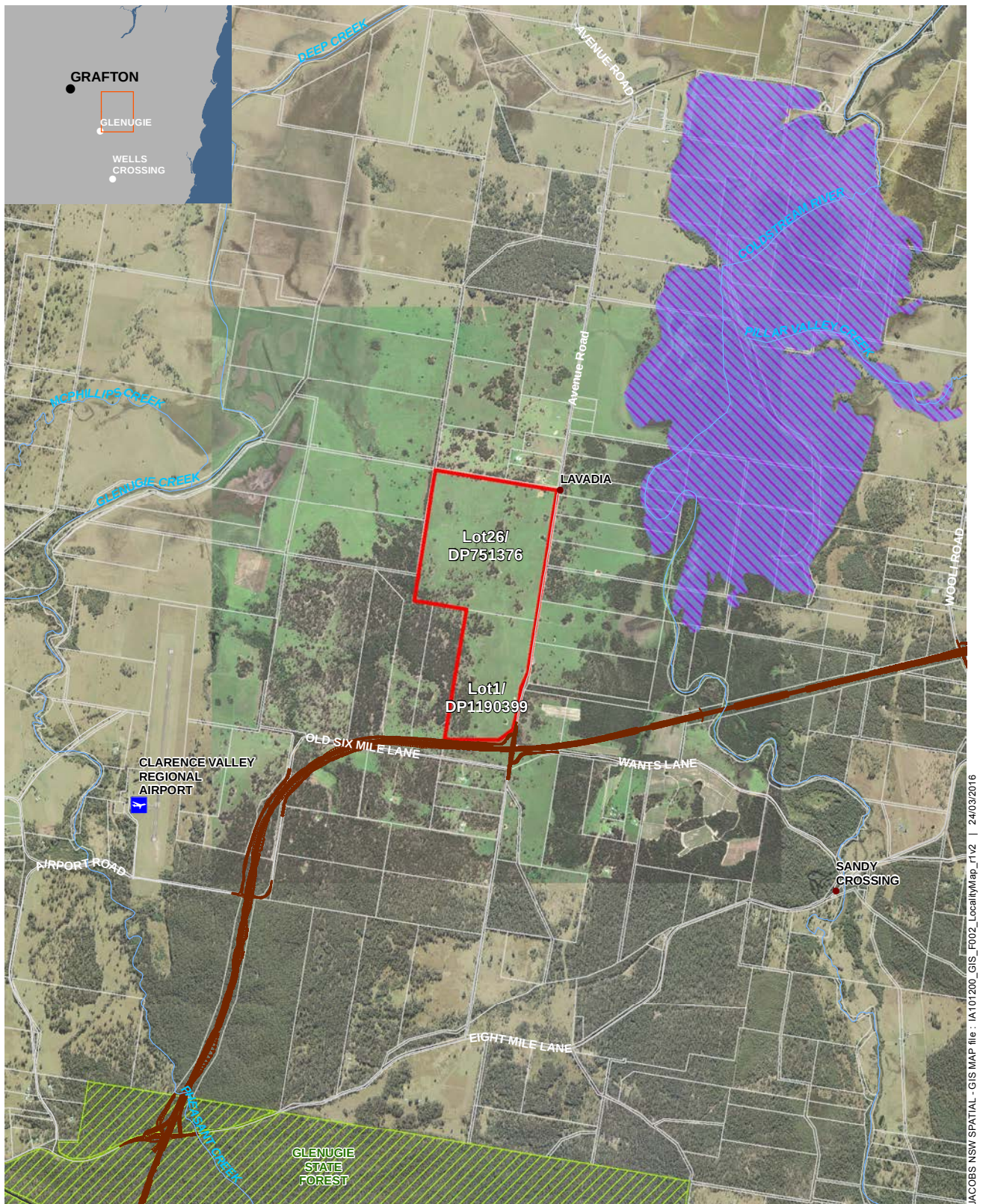
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Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-1 | Regional Locality



JACOBS NSW SPATIAL - GIS MAP file: I:\101200_GIS_F002_LocalityMap_r1v2 | 24/03/2018

Legend

- The Project
- Grafton Bypass (proposed)
- SEPP 14 Wetlands
- State Forests

0 1 2 Km
1:50,000 @ A4



Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-2 | The Project

Table 1-1 Key Project Components

Stage	Description
Development summary	The staged SSD application for the site seeks approval for: • A concept proposal for the New Grafton Correctional Centre. • First stage site clearance and preparatory works for the Project. • Together referred to as the Proposal.
Project Concept Proposal	The NGCC includes a maximum and minimum security correctional centre of 1,700 beds comprised of: • A maximum security section of 1,300 beds that will include: • 1000 beds for male inmates. • 300 beds for female inmates. • A minimum security section that will include: • 400 bed residential accommodation for male inmates. The building envelope including the configuration, location and number of building structures required for the project would not be determined until the detailed design is completed as part of the Stage 2 works. Consequently, the Stage 2 construction works for the Project could occur anywhere within the development zone shown in Figure 1-3. The total footprint around both the maximum and minimum correctional centres, including the carpark, is around 45 ha. Features of the Project include the following: • The concept proposal includes a maximum built form height of 12 metres (approximately three storeys). • The gross floor area will be approximately 100,000 square metres. • A six-metre-high fence or wall will be constructed around the perimeter of the facility, with light and security camera poles up to 10 metres in height. • Store buildings, small ancillary facilities and a central energy plant will be located outside the perimeter walls / fences. • Internal access into and out of the correctional centre from Avenue Road will be provided. • Car parking for approximately 500 car spaces. • Other associated facilities include recreational oval, special accommodation units, health facilities, education and programs areas, administration, workshops, staff amenities, visitor facilities and utilities. • A 100-metre wide Asset Protection Zone (APZ) would be cleared around the correctional centre and associated facilities and car parking area in accordance with the <i>Rural Fires Act 1997</i> and requirements of the <i>Planning for Bush Fire Protection</i> (PBP; NSW Rural Fire Service [RFS], 2006). • A vegetation buffer outside the APZ would be provided along the northern, eastern and southern boundaries of the Project Site. The buffer would be 50 metres wide along the northern property boundary, 15 metres wide to the east along Avenue Road and 30 metres wide along the southern property boundary. • Fire access roads on the inside and the outside of the perimeter fence of the facility will be constructed to ensure safe operational access for emergency services personnel responding to a bushfire event. • Water, wastewater, power and communication utilities within the Project Site. • Landscaping of ground cover and /or shrubbery in areas to be defined.

Stage	Description
Stage 1 Site Clearance and Preparatory Works	Stage 1 (early works), includes preparatory work within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP 1190399. This would involve: • Vegetation clearance and biodiversity management activities. • 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. • Demolition of the existing house and sheds. • Bulk excavation and site stabilisation works. • Landscaping.
Value	The capital investment value for the Project is in excess of \$30 million
Project Site	• Located at 313 Avenue Road, Lavadia. • Lot 26 DP 751376. • Lot 1 DP 1190399. • Project Site is 195 hectares (ha) in size.

Future works regarding the design, construction and servicing of the Project will be based on the final design and layout of the facilities and will be the subject of future staged development application(s).

The construction activities associated with the Stage 1 site clearance and preparatory works is estimated to take six to 12 months and provide around 50 full time equivalent positions.



JACOBS NSW SPATIAL - GIS MAP file : IA101200_GIS_F003_Project_r3v2 | 20/06/2016

Legend

- The Project
- Asset Protection Zone
- Development Zone
- Landscaping zone
- Grafton Bypass (proposed)

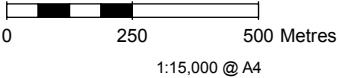


Figure 1-3 | The Project

Data sources
 Jacobs 2015
 LPI 2015
 NSW DPE 2015
 RMS 2013 (W2B Alliance)

1.4 Project objectives

The objectives of the Project are to:

- 1) Be a safe and secure correctional centre.
- 2) Be a humane and ethically managed centre.
- 3) Help reduce the risk of re-offending through (among other things) preparing inmates for reintegration into the community on release from the CSNSW network.
- 4) Manage resources effectively and efficiently, enhancing value for money.
- 5) Utilise effective governance arrangements.
- 6) Produce strong economic and social benefits to the local Grafton region, the northern NSW region and the broader NSW community.
- 7) Be a valuable physical asset for the duration of the Operating Phase and beyond.
- 8) Be operated in such a way as to keep pace with best correctional practice over the term of its operational life.
- 9) Be operated so that it links with the broader management strategies and operational needs of the CSNSW network.

1.5 Report structure

This working paper addresses flood risk and supports the EIS as required under Division 4.1, Part 4 of the EP&A Act. The structure of the working paper is summarised in **Table 1-2**. SEARs relevant to this working paper and where they have been addressed in the paper are summarised in **Table 1-3**.

Table 1-2 Report structure

Section reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings
1	Introduction - Background - Locality - Proposal description - Proposal objectives - Report structure	Description of the project relevant to potential flood impacts. Provides an overview of the study objectives and structure of working paper.
2	Assessment requirements	Identifies the key legislation that this study must follow.
3	Existing environment and potential impacts of the Project.	Establishes existing flood risk to the project site and identifies key flood risk impacts related to the development.
4	Management of impacts	Identifies key flood risk impacts related to the development.
5	Conclusions and recommendations - Conclusions - Recommendations	Concise statement of key findings of the construction and operational impacts of the Project relating to flood risk.

Table 1-3 Summary of SEARs relevant to this working paper

SEARs	Cross reference
SEARs No 15 - Flooding Assess any flood risk on site and consideration of any relevant provisions of the <i>NSW Floodplain Development Manual</i> (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity.	Section 3

2. Assessment requirements

2.1 Legislative requirements

The Project satisfies the criteria of Clause 16, Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011*, as it is for the purposes of a new correctional centre that has a capital investment value of more than \$30 million. As such, the Project is declared to be State Significant Development (SSD) in accordance with Section 89C of the EP&A Act. The Minister for Planning, or his delegate, is the consent authority for the SSD under Section 89 D of the EP&A Act.

A staged development application is being made for the Project in accordance with Section 83B and Section 89D of the EP&A Act. The EIS, and this working paper, provides an assessment of the concept proposal and Stage 1 of the Project. Subsequent applications will be made for future stages of the Project.

Under Section 78(8A) of the EP&A Act, an EIS must accompany an application for SSD. The SEARs for the Project were issued by DPE on 21 December 2015 in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. This working paper has been prepared in accordance with the SEARs.

2.1.1 Technical area - flooding

As required by SEARs No. 15, the Project must assess the flood risk and consideration of any relevant provisions of the NSW Floodplain Development Manual (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity.

The objective of this assessment is to determine whether the development of the Project would:

- Cause changes to the current downstream floodplain behaviour.
- Impact on the operation of the Project, safe evacuation of the facility during a flood event, and the security requirements of the Project.

Ultimately, this assessment needs to determine the direct impact of the Project on the Clarence River Floodplain, which includes the upstream tributaries of Coldstream River.

3. Assessment methodology

3.1 Overview

This working papers provides the assessment of the flooding impacts associated with the construction and operation of the onsite infrastructure within the Project Site (i.e. within the footprint of Lot 26 DP 751376 and Lot 1 DP 1190399).

3.2 Construction

In assessing the impacts of the Project associated with construction, it has been assumed that no works or activities would extend beyond the Project boundary (i.e. all works would remain within the footprint of Lot 26 DP 751376 and Lot 1 DP 1190399).

This assessment has relied upon the hydraulic modelling results provided by Clarence Valley Council (the Council) for the Clarence River floodplain. As this study was recently undertaken (2013) in accordance with the NSW Floodplain Management Manual and adopted by Council, it is considered suitable for this assessment.

3.3 Operations

In assessing the impacts of the Project associated with operations, it has been assumed that no works or activities would extend beyond the Project Site (i.e. all works would remain within the footprint of Lot 26 DP 751376 and Lot 1 DP 1190399).

This assessment has relied upon the hydraulic modelling results provided by Clarence Valley Council for the Clarence River floodplain. As this study was recently undertaken (2013) in accordance with the NSW Floodplain Management Manual and adopted by Council, it is considered suitable for this assessment.

4. Existing environment and potential impacts of the Project

4.1 Flood Assessment and Mapping

4.1.1 Base case flood risk

To meet the requirements of SEARs No. 15, the flood risk to the Project was assessed.

The extent of the probable maximum flood and the flood planning level as determined by the Clarence Valley Council Local Environmental Plan has been provided in **Figure 4-1**. **Figure 4-1** shows the Project Site is not affected by the current floodplain mapping for the Clarence River floodplain. The definition of probable maximum flood and flood planning level is provided in **Section 8**.

It was determined that the Project Site was located above and outside the mapped extent of the probable maximum flood for the Clarence River, as determined by the *Clarence River Flood Study 2013* (CVC, 2016). Therefore, the Project Site is not considered to be located on flood prone/liable land, as defined by the NSW *Floodplain Development Manual 2005*.

It was considered that no additional hydraulic modelling was warranted as part of this assessment. Moreover, it is not possible to model the impact of development on the floodplain as it is outside the floodplain.

4.1.2 Climate change, increase in rainfall intensity, and projected sea level rises

It is a requirement of the *NSW Floodplain Development Manual 2005* to assess the Project Site for the impacts associated with climate change, increases to rainfall intensity, compatibility with the hydraulic functions and stability of downstream water courses as well as any changes to flood behaviour which may impact on the emergency management measures within the locality. This assessment has been provided in the following sections.

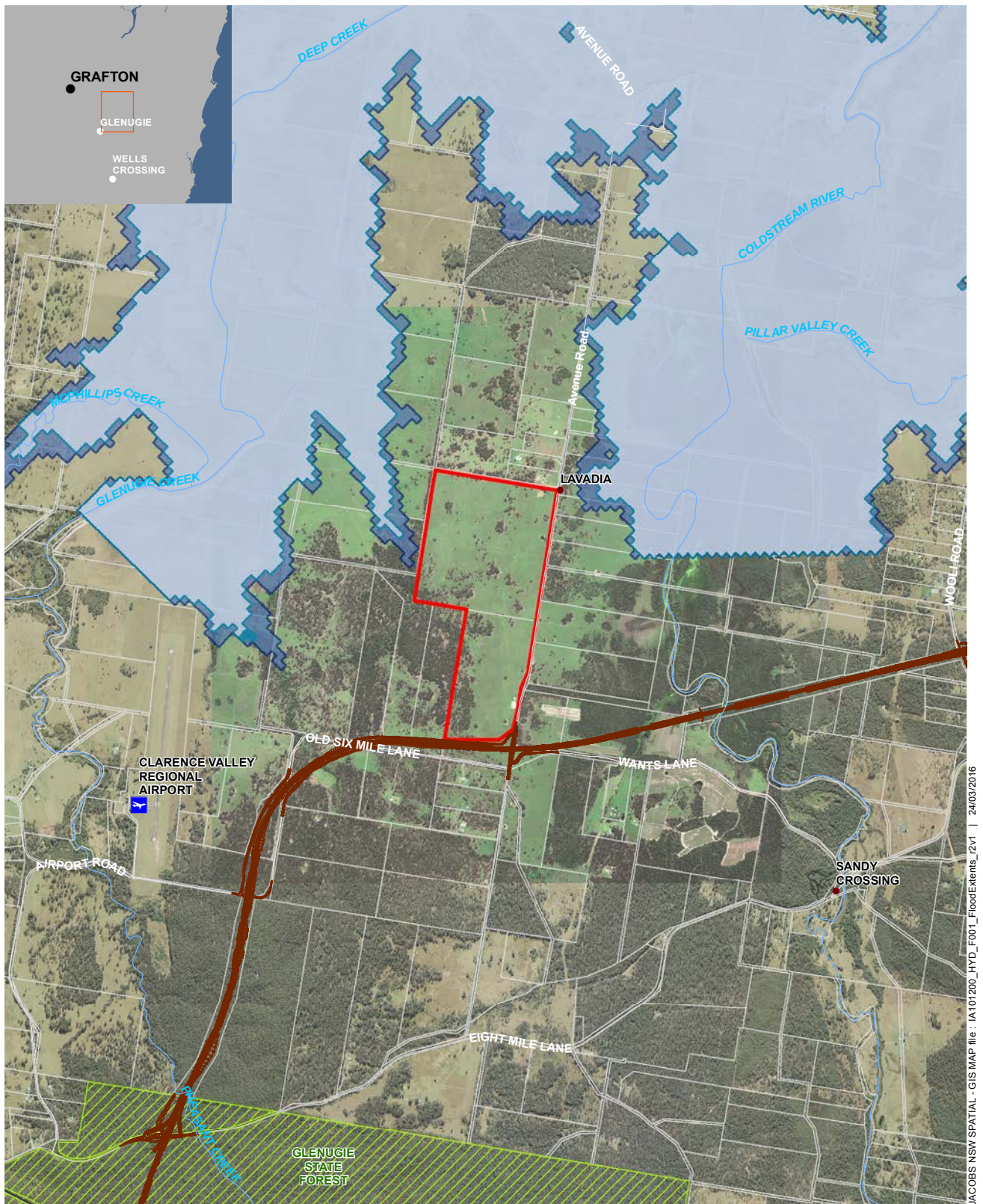
The widely accepted methodology to assess the impact of climate change and increase in rainfall intensity is to assess the impacts to the Project Site for events greater than the flood planning level. Generally the 1:200 AEP (annual exceedance probability) and 1:500 AEP flood events can be used as proxies for the effects of climate change. By assessing events greater than the adopted flood planning level, a complete flood risk profile can be developed for the Project Site.

As defined by the *NSW Floodplain Development Manual*, the probable maximum flood is the largest statistically probable precipitation coupled with the worst flood-producing catchment conditions. By definition, the probable maximum flood cannot not increase in magnitude even under climate change conditions. As the site is located outside the probable maximum flood extent, it is considered that there is no impact to the Project Site or the downstream floodplain due to the effects of climate change and any increase in rainfall intensity.

A rise in sea level has the potential to impact flood behaviour in coastal river systems as a result of higher ocean levels at the river mouth. This would result in higher maximum flood heights for any given flood event in coastal areas. The implication of this is that the Project Site could be affected by the probable maximum flood at some time in the future if sea levels did rise.

The sea level rise estimates for this Project Site were based on the NSW Government's *Sea Level Rise Policy Statement* (DECCW, 2009), which identifies increases of 0.4 metres for 2050 and 0.9 metres for 2100.

The Woolgoolga to Ballina Highway Upgrade EIS prepared for the Roads and Maritime Services determined that a 0.6 metre rise in sea levels would be appropriate for this locality. This rise in sea levels would not impact on the smaller upper catchments rivers and creeks crossed by the Pacific Highway Upgrade (which would be adjacent to the Project Site). As the proposed highway upgrade traverses adjacent the southern border of the Project Site, it is considered that= due to close proximity of the two projects that predicted sea level rises would not impact on the Project Site.



JACOBS NSW SPATIAL - GIS MAP file: IA101200_HYD_F001_FloodExtents_v2v1 | 24/03/2016

Legend

- | | |
|--|--|
| The Project | Flood planning area (1 in 100) |
| Grafton Bypass (proposed) | Flood prone land (extreme) |
| State Forests | |

0 1 2 Km
1:50,000 @ A4



Data sources

JACOBS 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 4-1 | Flood Extent

4.1.3 Compatibility with hydraulic functions

It is important to maintain the hydraulic functions of the floodplain. However, as the Project Site is not located on the floodplain, there are no changes to the hydraulic functions of the floodplain.

4.1.4 Watercourse stability

The Project is located at the top of a catchment which drains to the Coldstream River and associated wetlands (approximately 600 metres to the east) and Glenugie Creek (approximately 1.5 kilometres to the west/north west). On-site there are no established creeks or rivers however there are multiple ephemeral tributaries heading off-site which feed into the Coldstream River to the east and Glenugie Creek to the west (refer to **Figure 1-2**). There are 10 primary discharge locations from the Project Site which have the potential to affect the discharge behaviour from the site. The changes to overland flow behaviour for these primary discharge points are explored in detail in the *Water Cycle Management Plan* (Jacobs, 2016).

4.1.5 Emergency management measures

It is not anticipated that the Project would have any impact on the existing community emergency management arrangements for flooding, since it is not located within the floodplain and, therefore, would not require evacuation. The site is well suited to the development of a sensitive land use, as defined by the *Clarence Valley Local Environmental Plan* (2011), as there is no risk-to-life from flood within the Project Site.

Although the site is not located within the floodplain, some access roads to the Project Site may be impacted by flood events which could hinder access to the site. Warning times for Clarence River flood events are relatively long (in the order of days). Coldstream River flood events have much shorter warning times (in the order of hours).

It is considered that contingency measures for site access during times of flood would need to be included within the operational plan for the Project.

5. Management and mitigation of impacts

5.1 Relevant construction activities

All construction of onsite infrastructure would occur within the Project Site boundary (i.e. within the footprint of Lot 26 DP 751376 and Lot 1 DP 1190399). As this site is not located on flood liable land, there are no impacts on flooding due to construction and hence no management or mitigation requirements are considered necessary.

5.2 Operation of the facility

All operation activities would occur within the Project Site boundary (i.e. within the footprint of Lot 26 DP 751376 and Lot 1 DP 1190399). As the Project Site is not located on flood liable land, there are no impacts on flooding due to operation of the facility and hence no management or mitigation requirements are considered necessary.

As noted in **Section 4.1.5**, some access roads to the Project Site may be impacted by flood events which could hinder access to the Project Site. It is considered that contingency measures for site access during times of flood would need to be included within the operational plan for the Project.

6. Conclusions

This working paper has assessed the potential for flooding-related impacts with respect to the Project associated with climate change, increases to rainfall intensity, compatibility with the hydraulic functions and stability of downstream water courses as well as any changes flood behaviour which may impact on the emergency management measures within the locality.

The *Clarence River Flood Study 2013* (CVC, 2016) has been reviewed and deemed satisfactory in determining the flood risk for the Project Site. Therefore, it is considered that no additional modelling is required to determine the effect and impact of the proposed project on flood behaviour.

As the Project Site is located outside of the probable maximum flood extent determined by the Clarence River Flood Study 2013 (CVC, 2016), it is concluded that the Project has no risk of flooding and would not have any effect on the downstream Clarence River Floodplain.

The Project Site is unlikely to be affected by sea level rises associated with climate change or increases in rainfall intensity.

It is concluded that the Project complies with the requirements of the *NSW Floodplain Development Manual 2005*.

This working paper has considered the SEARs No 15 which was to assess any flood risk on site and to consider any relevant provisions of the *NSW Floodplain Development Manual* (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity. In doing this, this report has met the relevant sections of SEARs No 15 as issued for the Proposal (refer to **Table 1-3**).

7. References

Jacobs, 2016, *New Grafton Correctional Centre Stormwater Management Plan*, Jacobs Australia

Clarence Valley Council, 2016, Online Mapping Information – Flood,
<http://spectrum.clarence.nsw.gov.au/connect/analyst/?mapcfg=CV%20Flood%20Layers> accessed 17th May 2016.

New South Wales State Government, 2005, *NSW Floodplain Development Manual (2005)*, New South Wales State Government.

New South Wales State Government, 2011, *Clarence Valley Local Environmental Plan 2011 under the Environmental Planning and Assessment Act 1979*.