Concept Design Report
Eurobodalla Health Service - Capital Consultants

July 2021
For: NSW Health Infrastructure

NSW Health Southern NSW Local Health District | NSW Health Infrastructure | ROOT PARTNERSHIPS Advisory+ Project Management | Conrad Gargett

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Documentation Control

Version	Date	Issued To	Status	Prepared by	Reviewed by
A	30.06.2021	Root Partnership	DRAFT 01	[redacted]	
B	17.07.2021	Root Partnership	DRAFT 02		
C	26.07.2021	Root Partnership	Final Draft		
D	13.09.2021	Root Partnership	Final		
E	1.10.2021	Root Partnership	Revision 01		
F	6.10.2021	Root Partnership	Revision 02		

We acknowledge the Walbunga people of the Yuin Nation, Traditional Custodians of the land on which the Eurobodalla Health Service will be sited, and pay respects to their Elders past and present.

Conrad Gargett

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Abbreviations/Acronyms

Term	Description
ABW	Activity Based Working
AusHFG	Australasian Health Facility Guidelines
BAL	Bushfire Attack Level
BoH	Back-of-house
CPTED	Crime Prevention through Environmental Design
CSP	Clinical Services Plan
ED	Emergency Department
EHS	Eurobodalla Health Service
ERG	Expert Reference Group
ESD	Environmentally Sustainable Design
FDB	Functional Design Brief
FFDI	Forest Fire Danger Index
FoH	Front-of-house
HINSW	Health Infrastructure New South Wales
HItH	Hospital at in the Home
HLS	Helicopter Landing Site
HS	Hospital Service
ICT	Information and Communication Technology
IPU	Inpatient Unit
LGA	Local Government Area
MoC	Model of Care
MoH	Ministry of Health
MPS	Multipurpose Services
NSW	New South Wales
NZE	Net Zero Emissions
PAS	Project Advisory Service
PMF	Probable Maximum Flood
PPT	Project Planning Team
PUG	Project User Group
PV	Photovoltaic
PWD	Persons with a Disability
SDRP	State Design Review Panel
SNSWLHD	Southern New South Wales Local Health District
SOA	Schedule of Accommodation
WSUD	Water Sensitive Urban Design
ZMP	Zonal Masterplan

1.0 Executive Summary

1.1 Executive Summary

Southern NSW Local Health District (SNSWLHD) currently provides health services across three campuses within the Eurobodalla Shire, including hospitals at Batemans Bay and Moruya. The Eurobodalla Health Service Clinical Services Plan (CSP), endorsed in March 2020, identified a need to consolidate existing services, reduce duplication, and increase the provision of care to meet the needs of the Eurobodalla population.

The Eurobodalla Health Service project aims to create a sustainable, patient and community focused service which is digitally enabled. Planning has maintained a focus on sustainability, both environmentally and operationally, as well as community focused. This is evident in the use of the preferred site at Moruya in providing natural light and views for a majority of the facility, considering the topography to allow the indigenous community to maintain a connection with Country through significant life events, as well as meeting clinical needs through access, co-location and key adjacencies.

As a pilot project for the NSW Government Architect's "Connecting with Country" framework, consultation has been undertaken with members of the Indigenous community both as part of identification of a preferred site as well as development of the Masterplan and now into Concept Design. This consultation is planned to continue through the life of the project to ensure the facility, its staff, and visitors are able to connect with and respond to Country.

Early planning identified a preferred Eurobodalla Health Service site, adjacent to the Princes Highway in Moruya, which can accommodate the health service along with appropriate future proofing. The site also provides immediate access from the highway, as well as alternate vehicular access from the north, if needed. Initial planning responds to the natural topography, supporting northern orientation, as well as providing outlook to vegetation and distant views.

The development of this Concept Design Report has included continuing development of the Masterplan, consultation with a range of stakeholders within SNSWLHD, Community members and the Health Infrastructure Delivery team, Project Advisory Services and Expert Review Group.

Seven workshops were held with the Project Stakeholders (PPT and EUG) to review the opportunities and constraints of the preferred clinical adjacencies and built form. Multiple Bubble diagrams and 9 optinos of blocking and stacking were presented to review and identifiy the best response to the Clinical Services Plan and ongoing functional briefing.

1.2 Purpose of the Concept Design

The Concept Design Report is a summary of the Eurobodalla Health Service design and the process that has been undertaken for the Concept Design Phase.

The report builds on the work of the Masterplan Report, the Functional Design Brief (FDB) and supporting documentation including the Schedule of Accommodation (SoA) and the Concept Design responding to design principles established in these documents.

Concept Design is the first stage of facility planning, and establishes the blocking and stacking of the buildings and the overall interdepartmental relationships. It will assist in establishing the project budget and will also provide a basis for consultation with stakeholders during the next phase of design.

The report aims to provide a comprehensive overview of the project context, outcomes of the Masterplan and concept design. The report is intended to demonstrate to the reader that a robust level of analysis of design and engineering systems has been undertaken in this phase, and to communicate how the intent of the functional design brief and project objectives are being met.

The report is structured to provide an overview of the project framework and to communicate the design development undertaken by the design team including:

- Project background, aims, and objectives;
- Overview of the site considerations impacting on the Concept Design;
- Consolidation of the design team's understanding of the key design drivers;
- Development of the proposed building footprints and department planning in the form of stacking and massing diagrams to reflect the outcomes of the Functional Design Brief;
- Architectural Concept Design Response;
- Exploration of engineering considerations including site wide infrastructure requirements, as well as building specific requirements; and
- Analysis of certification and access considerations impacting on the concept design.

1.3 Development of Concept Design

This report builds on the Masterplanning study dated May 2021 and frames the Eurobodalla Health Service project in further detail. The report considers analysis of options, accommodation needs, regulations and best current practise needs. The Functional Design Brief developed by Root Partnership through May and June 2020 has guided the further developments of the concept development. The Functional Design Brief is currently being developed to reflect the agreed design decisions through the concept design phase.

1.4 Drawings & Information Used

Concept design documentation as reviewed and approved by PUG on the 30 July 2021. Refer to Appendix 1.

Table 1: Concept Design Drawing List

Drawing Title - Concept Design	Drawing Number	Revision
Masterplan - Overall Existing	EHS-HI-AR-DWG-FD-10PW01	
Masterplan - Overall Proposed	EHS-HI-AR-DWG-FD-10PW02	
Site Plan - Existing	EHS-HI-AR-DWG-FD-11PW01	
Site Plan - Proposed	EHS-HI-AR-DWG-FD-11PW02	
Site Sections	EHS-HI-AR-DWG-FD-11PW20	
GA - Lower Ground Floor	EHS-HI-AR-DWG-FD-200L00	
GA - Ground Floor	EHS-HI-AR-DWG-FD-20000	
GA - Level 01	EHS-HI-AR-DWG-FD-200201	
GA - Roof Plan	EHS-HI-AR-DWG-FD-200301	
Elevations	EHS-HI-AR-DWG-FD-30PW01	
Elevations	EHS-HI-AR-DWG-FD-30PW02	
Sections	EHS-HI-AR-DWG-FD-35PW01	

1.5 Masterplan Overview

The essence of the Masterplan remains as is articulated in the Masterplan Report: The Masterplan considers the need and provides flexibility for the Eurobodalla Health Service campus, through provision of a "Day One/Go Live" service as well as opportunities for expansion to the full Clinical Services Plan date of 2031. It is envisioned the facility will support the required change from operating two aged hospitals to one health facility providing efficient and appropriate care to the community, whilst responding to technology advances and emerging clinical requirements in a post-pandemic world. Furthermore, the preferred site provides opportunities for connection to Moruya Township considering various modes of travel as well as a connection to Country for all staff and visitors.

The Connecting with Country Draft Framework seeks to develop connections with Country to inform planning, design and the delivery of projects within New South Wales which was started at Masterplan. By participating and initiating actions within this pilot project we actively commit to supporting the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people, who know that if we care for Country – it will care for us.

2.0 Terms of Reference

2.1 Project Team

Table 2: Project Team

Organisation	Project Team Member	Contact Name
Conrad Gargett	Executive Lead	[redacted]
Conrad Gargett	Project Lead	[redacted]
Conrad Gargett	Project Architect	[redacted]
Conrad Gargett	Director Design Strategy	[redacted]
Conrad Gargett	Project Support	[redacted]
Conrad Gargett	Project Support	[redacted]
Conrad Gargett	Project Support	[redacted]
Conrad Gargett	Landscape Architect	[redacted]
Conrad Gargett (WSP)	Associate – Sustainability	[redacted]
Root Partnerships	Project Lead	[redacted]
Root Partnerships	Project Director	[redacted]
Root Partnerships	Senior Project Manager	[redacted]
Root Partnerships	Project Manager	[redacted]
Root Partnerships	Facility Planner	[redacted]
HI NSW	Project Director	[redacted]
HI NSW	Director Rural and Regional	[redacted]
HI NSW	Executive Director	[redacted]
HI NSW	Associate Project Director	[redacted]
HI NSW	Senior Procurement Advisor	[redacted]
SNSW Local Health District	General Manager, Coastal Network	[redacted]
SNSW Local Health District	Manager, Finance and Business	[redacted]
SNSW Local Health District	District Director Finance & Performance	[redacted]
SNSW Local Health District	Chief Executive	[redacted]
SNSW Local Health District	Executive Director, Clinical Governance	[redacted]
SNSW Local Health District	EHS Site Manager & DONM	[redacted]
SNSW Local Health District	Director, Medical Services	[redacted]
SNSW Local Health District	Development Change Manager	[redacted]
SNSW Local Health District	Development Project Lead	[redacted]
Eurobodalla Council	Director, Infrastructure Services	[redacted]
Eurobodalla Council	Planning and Sustainability Services	[redacted]
Eurobodalla Council	General Manager	[redacted]
Eurobodalla Council	Community, Arts and Recreation	[redacted]
Ministry of Health	A/Executive Director Strategic Reform	[redacted]
Ministry of Health	Principal Planning and Policy Officer	[redacted]
TfNSW	Program Director, Princes Hwy Upgrade	[redacted]
TfNSW	Project Manager, Moruya Bypass	[redacted]
Community Consultative	Community Representative	[redacted]
Community Consultative	Visiting Medical Officer	[redacted]
Consultant Anthropologist	Anthropologist	[redacted]
Genus Advisory – Cost Manager	Director	[redacted]
Genus Advisory – Cost Manager	Associate	[redacted]
Genus Advisory – Cost Manager	Associate Director	[redacted]
Bonacci – Structural/Civil	Structural Lead	[redacted]
Bonacci – Structural/Civil	Civil Lead	[redacted]
Bonacci – Structural/Civil	Civil Designer	[redacted]
Bonacci – Structural/Civil	Director	[redacted]
Steensen Varming – Electrical and Communications	Electrical and Communications Lead	[redacted]
Steensen Varming – Electrical and Communications	Electrical Engineer and Document Control	[redacted]
Steensen Varming – Electrical and Communications	Project Director	[redacted]
Steensen Varming – Electrical and Communications	Electrical Engineer	[redacted]
Steensen Varming – Electrical and Communications	Electrical/BIM Engineer	[redacted]
Stantec – Mechanical and Med Gases	Mechanical and Med Gases Lead	[redacted]
Arup – Hydraulic and Fire Systems	Hydraulic and Fire Systems Lead	[redacted]
Arup – ESD	Sustainability	[redacted]
Arup – ESD	Sustainability	[redacted]
Bitzios Consulting	Manager (Major Projects)	[redacted]
Bitzios Consulting	Senior Traffic Engineer	[redacted]

2.2 Methodology

The Concept Design will provide the basis for completion of the Business Case in conjunction with the Functional Design Brief.

During concept design we have undertaken the following tasks;

- Build on Masterplanning strategies from the May 2021 report
- Collaborative approach between design team, SNSWLHD and HINSW
- Optimise the Clinical Adjacencies
- Confirm Plan and SoA are aligned
- Reflect on further opportunities through workshopping and review
- Rationalise area schedules collaboratively with HINSW
- Acknowledge patient pathways in the design
- Agree standard components for further investigation
- Adopt the Australasian Health Facility Guidelines for the specific agreed scope items
- Prepare concept plans for cost planning development
- Undertake site specific analysis
- Develop statutory approval requirements for the scope of works
- Test fit area layout strategies and footprints for circulation patterns
- Detail and develop plant strategies and layout
- Develop detail for construction options
- Value manage; and
- Development of site constraint detail relative to efficient use of services and site limitations.

2.3 User Engagement

Concept Design studies and options for future expansion have been presented to a representative group of the SNSWLHD at several Planning Workshops. A review by the Expert Reference Group (ERG), Project Advisory Strategy (PAS) at Health Infrastructure, and Government Architect NSW State Design Review Panel (SDRP) was also carried out concurrently, and relevant feedback incorporated into the options. An evaluation of the options was carried out in the final workshop. The preferred option was issued to the primary stakeholders for final review and approval.

Workshop Dates and Attendees

EHS Concept Design Workshop	11th May 2021
EHS Design Session	20th May 2021
EHS Concept Design Workshop 2	31st May 2021
HI Project Advisory Strategy (PAS)	20th May 2021
EHS Masterplan Workshop 3	21st June 2021
Indigenous Consultation	22nd – 24th June 2021
Walk on Country	23rd June 2021
Design Jam	23rd June 2021
EHS Masterplan Workshop 4	5th July 2021
HI Expert Review Group	14th July 2021

2.4 Documentation Review

Clinical Services Plan

The Clinical Services Plan was developed by Southern NSW Local Health District (SNSWLHD) over many years, with endorsement from the Ministry of Health (MoH) in May 2020. The Clinical Service Plan (CSP) provides a comprehensive overview of current and future health service delivery across all care settings, and make recommendation for capital works enhancements and clinical services delivery.

Planning and Prioritisation Report

During Part 0 "Project Initiation", a process of initial scope optimisation was undertaken to ensure a sustainable and appropriately sized service could be provided within the allocated budget. As a result, a Planning and Prioritisation Report was developed. In February 2021 the Value Management was endorsed by ESC and the current value management is transpiring in parallel with Schematic Design.

This report summarises the clinical service prioritisation process undertaken with Eurobodalla Health Service to date. The Planning and Prioritisation report sought to identify a preliminary service configuration for the EHS at day 0 to help inform and guide the detailed planning process. This was done through "transform and optimise" initiatives and a service prioritisation process for the Eurobodalla Health Service (EHS) Redevelopment.

Informing Documents:

- Eurobodalla Masterplan Report – Capital Consultants May 2020
- Eurobodalla Health Service Clinical Service Plan, March 2020
- Australasian Health Facilities Guidelines, February 2021
- Eurobodalla Health Service Site Selection Report
- Eurobodalla HS Site Selection Flood Assessment Report Rev 0
- Moruya (Eurobodalla) Hospital HLS Aviation Feasibility Assessment AviPro V1.1 Final
- Preliminary Town Planning Assessment 30062020 – Site Selection
- Building Code of Australia (BCA)
- Eurobodalla Health Service Redevelopment -Value Management Study
- Site Selection Working Group Brief Final
- EHS Redevelopment - Recommendation Report V1.2
- Review of South East Regional Hospital & Site Visit
- POE Report Operating Theatres and IIOR 2017; and
- 190312 POE IPU Major Findings and Recommendations Presentation.
- The State Infrastructure strategy 2012-2032
- The NSW State Health Plan – Towards 2021
- The NSW Rural Health Plan – Towards 2021
- Oral Health 2020: A Strategic Framework for Dental Health in NSW
- Australian Government Health Mouths, Health Lives: Australia's National Oral Health Plan 2015-2024
- NSW Aboriginal Health Plan 2013-2023
- NSW Integrated Care Strategy
- Healthy, Safe and Well: A Strategic Plan for Children, Young People and Families 2014-2024
- NSW Ageing Strategy 2012
- GL2014_018 Wayfinding for Health Facilities.
- eHealth Strategy for NSW Health 2016-2020
- The National Framework for Universal Child and Family Health Services
- NSW Ministry of Health Office of Kids and Families initiative – Health safe and well
- Protecting People and Property, NSW Health Policy and Standards for Security Risk Management in NSW Health Agencies, October 2018
- NSW Health, PD 2019 060 Workspace Accommodation Policy

The below consultants' reports have informed the Concept Design report:

- Electrical Engineers Report
- Engineers inspection reports (structural & civil)
- Geotechnical Report
- Town Planning
- Arborist Report
- SDRP Review
- Mechanical Engineers Report
- Surveyor plans.

2.5 Staging

The Concept Design is based on a single stage development which will relocate the existing Batemans Bay and Moruya Hospital to a new site. The design team understands reviews of potential staging options (Early Works) are ongoing.

2.6 Health Facility Guidelines

The Australasian Health Facility Guidelines (AusHFG) informed the development of the Functional Design Brief and therefore, the Concept Design. The Guidelines have been used in the manner for which they are intended.

The AusHFG are not intended to restrict innovation that might improve performance or outcomes, or to be prescriptive where clinical service circumstances can validate an alternate configuration.

The aims of the AusHFG are to:

- *assist with the design of safe health facilities that provide privacy and dignity for patients,*
- *support contemporary models of care and the needs of carers, visitors and staff;*
- *maintain public confidence in the standard of health facilities;*
- *achieve affordable solutions for the planning and design of health facilities; and*
- *promote built solutions that minimise recurrent costs and encourage operational efficiencies."*

The guidelines provide a basis for discussion of requirements with users assisting in the establishment of a dialogue that allows for the model of care to inform consideration of the AusHFG to tailor the design solution to the project-specific functional brief and developed user requirements.

2.7 Design Excellence

The New South Wales Government is committed to design excellence, recognising that well-designed buildings, spaces and places contribute to the quality of life and economic success of our state.

Continued engagement with the Office of the Government Architect, Design Champion Wade Sutton, and engagement with the State Design Review Panel has formed part of the development process of this concept design plan report.

The hospital's and HI NSW vision includes embedding sustainability (ESD) as a core principle of the design and operation of the facility. This will create a facility which:

- Creates a healthy campus community
- Protects occupant health, promotes occupant wellness and prevents environmental harm
- Provides secure, safe potable water
- Enhances the civic, urban experience
- Is resilient and ready for the future; and
- Improves natural systems and landscape areas.
- Delivers on the Connecting with Country Framwork.

The precinct will be healthier and underpin good mental health;

- Buildings will be healthier and welcoming – assisting navigation and reducing barriers to access
- Facilities will be healthier and helpful - facilitating ease of access, safety and satisfaction; and
- Technologies and resources promote a healthier and holistic service – including implementing best practice approaches.

3.0 Service Planning Summary

3.1 Service Statement

3.2 NSW Health 20 Year Health Infrastructure Strategy & NSW Health Guidelines for Facility Planning Process

There are several principles that guide the Strategy to shape the future health system.

— The future patient is wellbeing-focused, tech enabled and wants to direct their care
— The future workforce is highly skilled, digitally enabled and flexible, with a culture of leadership and innovation
— Future services will flourish within a market of innovative, networked providers who drive collaboration and sharing across the entire health system; and
— Future health infrastructure will be diverse, agile and sustainable.

The following addresses the Masterplan response and process underway in response to the NSW Health 20 Year Health Infrastructure Strategy & NSW Health Guidelines for Facility Planning Process

1. **Planning for the future:** Identifying and protecting effective locations and ways to deliver social infrastructure to meet future community needs.

— The site selection is in close proximity to the preferred strategic corridor of the new by-pass which will improve vehicular access to the site for the wider community and emergency access, and therefore considers the wider planning objectives and projects. Emergency and general vehicle access has been reviewed and evaluation and reconfigurations of roadways and site entrances proposed to meet public, servicing and emergency access requirements.
— Key transport and infrastructure requirements and facilities are being reviewed and addressed as part of the Masterplanning process to give a considered and holistic approach in Moruya and, to some extent, Eurobodalla Shire wide.
— In recognition of the unique and specific requirements in Eurobodalla and the community it serves, the Masterplan undertook a detailed consideration of: local community issues, local indigenous communities, hospital staff community, and the wider community through a process of consultation, research, and knowledge transfer. The design approach is one that is responsive to place, people and Country.
— investing in the next wave of future healthcare facilities.
— accelerating virtual and digitally enabled care where cyber security and privacy remain foundational.
— making better use of our assets.
— advancing whole of system digitisation.

2. **Exploring the best mix of approaches:** Using combined government, community and private sector management and implementation to deliver the best mix of physical infrastructure and non-physical systems and services.

— The site proposes a mix of uses to deliver private and public partnerships on site, these have been proposed in the masterplan.
— Future thinking trends of health delivery considered at the forefront of thinking at all stages of development planning including emerging technologies, health trends and development for future ready cities.
— Changing trends – being aware of changing service delivery methods and considering these in the planning of the site and concept design of the building.
— Digital hospital thinking and technology is integration intrinsic in the design, balanced against physical elements that support a patient centred approach.
— Develop an understanding of private community services with a relationship to the hospital and how they might interact in the new location.

3. **Locating for access and convenience:** Ensuring access to social infrastructure is convenient, easy and affordable for users.

— The trend growth east of Moruya opens up the opportunity for community growth and renewal in the area, the site is poised to have convenient and easy access.
— The redevelopment of the Eurobodalla Site is a large site and an opportunity to create hub of community services on the site.
— Active transport priorities are supported, noting some geographical constraints.
— The Walawaani (Welcoming) Place on Eurobodalla Health Service Site is an area designed as a focal point of the site, encouraging interaction across the site functions.
— Strong working relationships fostered through co-location of community facilities.
— Mixed use community hub at the project core to encourage families to feel comfortable and welcome on the site.
— Incorporation of reed basins on the site to support mental health a wellbeing and allow a natural place of reflection and relaxation.

4. **Designing for adaptability:** Ensuring social infrastructure is, by design and management, appropriately flexible to grow and adapt to evolving needs.

— The team has a specific future thinking approach throughout the Masterplanning process – forward thinking to technologies in the short-term future such as Bluetooth 5.0, 5G internet; to longer term possibilities such as new check in opportunities, and robotic food services.
— Structures and buildings have been considered with expansion in mind, in their built form scale and placement in the topographical context.
— The Eurobodalla site has a large site area with ample room for expansion on the site of services and therefore considers planning for future needs. The key is planning ahead to allow expansion to happen in a well thought out way. Embedding expansion strategies in the masterplan protects key growth areas for future development

4.0 Functional Briefing Context

4.1 Functional Design Brief

The overarching principles that underpin the Clinical Services Plan objectives were set out in the Functional Design Brief where, in particular, the following were identified as specific requirements. These have informed the Concept Design and the architectural planning principles:

- Efficient patient, team and services flows - easy and efficient navigation point to point
- Privacy and dignity for all patients and visitors
- Avoidance of healthcare associated infection
- Accurate identification of patients, team, equipment, and medications
- Avoidance of medication errors
- Collaborative, efficient, and effective clinical handover
- Timely access of services
- Prevention of falls and adverse events
- Minimised travel time for team
- Pragmatic and efficient
- Overall spatial planning that supports standardisation of the configuration and fit-out of clinical areas
- Integration of ergonomic principles into design
- Clear visual connection between patients and team
- Connectivity to external environment
- Control over natural and artificial light by team and patients
- Design features that facilitate safe and effective care for people with disabilities and behavioural issues
- Design that is salutogenic, that is, is a cause of good health, and maximises use of positive elements related to natural light, colour, images of nature, access to fresh air, visual arts and music, and 'spiritual' spaces; and
- Design which facilitates an integrated approach to care.

The planning acknowledges these principles and is informed by the Functional Design Brief developed through initial consultation with user groups. This work will form the basis of further consultation in the next phases of the development of the design.

To assist in the assessment of departmental relationships, the design team has collaborated with a software developer to produce tools assisting in department placement and assessing the proximity of department adjacencies. In addition, the team have programmed an assessment tool to assess and illustrate travel time between departments and across multiple levels. This will be discussed with users throughout schematic development.

4.2 Design drivers for the Full Clinical Service Plan

- Simple circulation patterns within the new building with discrete pathways for public and staff / service
- Centralised Imaging
- Horizontal relationships between some departments such as Birthing and Operating, or Critical Care
- A model for Women's and Children's to have access to Country
- Restricting the height of the building to no greater than 25m
- A grounded, external helipad
- A comfortable distance between building wings for good daylight amenity and pleasant outdoor views
- Separate acute, ambulatory, and emergency facilities, providing distinct patient flows, expandability and a capacity for 12/24-hour zones
- Central staff workspaces, supported by Activity Based Working (ABW)
- Future development space being available on multiple sides of the development for allied activities such as education, accommodation, and private provider
- Responding to pre-prioritised interdepartmental relationships
- Close vehicular drop-off to various functions (i.e. a road network and separate entries, especially high traffic areas such as ambulatory clinics) to reduce travel distance for lesser mobility patients
- Close relationship of sub-acute patients to central amenities; and
- Utilising topography for accessing outdoor spaces from a variety of functions.

4.3 Schedule of Accommodation

The assumed Day 1 Schedule of Accommodation (SoA) is listed below:

Eurobodalla Health Service	TSA
SOA based on CSP V3.0	V2.7 Preferred Option
Service / Unit	
Main Entry / Café	296
Emergency Dept	835
Intensive Care	646
Operating Theatres	1169
Sterilising Unit	
IPU 1 - Medical	1118
IPU 2 - Medical/Surgical	1044
Women's & Paediatric Unit	542
IPU 3 - Rehabilitation IPU	
IPU 3 - Rehabilitation / GEM	1155
Medical Imaging	523
Pathology	399
Pharmacy	221
Ambulatory Care / Chemo / Renal / Oral Health / Allied Health/Virtual Care	2164
Executive/ Administration / Education	393
Mortuary	100
Health Information Unit	140
Back of House (inc. Kitchen/Engineering/Linen/Environmental/Dock)	775
Staff Accommodation	
SOA SUB TOTAL	**11520**
T&E (23%)	
T&E (28%)	3259
Planning Contingency 5%	576
TOTAL SQM WITH T&E	**15356**

Note: all areas in m^2.

Figure 1: EHS SoA V3 Option 2.7 (Day One)

4.4 AusHFG Variations

At this stage of the project no AusHFG variations have been identified.

5.0 Masterplan Context

5.1 Summary of Masterplan Options

5.1.1 Option 1 Hospital Street Summary

The Option 1 masterplan is designed around the narrative of a Hospital Street; a linear space that provides clear delineation and wayfinding to different departments. The Hospital Street provides a clear identification spine for wayfinding and also a communal area for people to gather. The street has connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 2: Option 1 Zonal Masterplan

5.1.2 Option 2 Hospital Street (Linkways) Summary

The Option 2 masterplan is designed around the narrative of a Hospital Street; a linear space that provides clear delineation and wayfinding to different departments through a series of link ways. The Hospital Street provides a clear identification spine for wayfinding and also a communal area for people to gather. The linkways that connect the 3 different zones of the buildings provide connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 3: Option 2 Zonal Masterplan

5.1.3 Option 3 Town Square (West) Summary

The Option 3 masterplan is designed around the narrative of a Town Square; a central communal space that provides clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit on the highest point of the site. The siting of this options provides challenges with arrival sequences and the levels of the site. Opportunities for under croft spaces and connections to the land from lower levels are limited and do not create as good of a connection as other options.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 4: Option 3 Zonal Masterplan

5.1.4 Option 4 Town Square (East) Summary

The Option 4 masterplan is designed around the narrative of a Town Square; a central communal space that provides clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed Hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 5: Option 4 Zonal Masterplan

5.1.5 Option 4b Town Square (East Flipped) Summary

The Option 4b masterplan is designed as an alternative option of 4 Town Square. A flipped format that provides a central communal space with clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed Hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land. The arrival sequence to emergency appears to be secondary and may pose challenges.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 6: Option 4b Zonal Masterplan

5.2 Site Masterplan

Through four (4) rounds of user group meetings with key stakeholders, an endorsed zonal masterplan was nominated, below. The planning of the building itself is has been progressed and tested in the next phases of the project.

The endorsed plan champions the hospital building in a key location along the ridge of the site, stretching out towards the lower areas and back towards the town and ranges. The areas closer to the PMF line have been prioritised as community parklands. The proximity of the future expansion sites, identified on the endorsed plan, allows for both efficient access to the hospital, as well as quick exit from the site. The other future expansion areas, being education, private provider, and accommodation, also maintain key connections to the central green, as well as appropriate proximity to the hospital building

Figure 7: Endorsed Zonal Masterplan

The education building, which is likely to be utilised more frequently by hospital staff, is located closest to the main hospital, adjacent to the central green. Providing a greater sense of personal identity, the future private provider has been nominated on the far side of the future education building. This location allows the future provider a more personalised identity, whilst still retaining its location within the main 'hub' zone of the site. The future accommodation building has been located in the north-east corner, providing privacy and a sense of disconnect from the clinical setting of the hospital. The view out to the east of the site also provides a unique outlook for the accommodation building, further differentiating it from the main hospital. This building also sits in close proximity to the residential area to the north of the site, emphasising the domestic nature of this future building.

6.0 Strategic Context

6.1 Location

The proposed health service campus is approximately 2km South East of the Moruya town centre (refer Figure 8), predominantly on a clear sloping site which forms a parkland setting. Links into the town centre rely mainly on motorised road transport but the local authority does encourage bicycle routes and public transport, currently servicing the neighbouring TAFE campus and residential neighbourhood.

6.2 Indigenous People and Eurobodalla

6.2.1 First Nations Diversity

Eurobodalla Shire recognises Aboriginal people as the original inhabitants and custodians of all land and water in Eurobodalla and respects their enduring cultural and spiritual connections. Eurobodalla Shire acknowledges the Traditional Owners of the land in which we live.

The people of the Yuin Nation are the traditional custodians of the land we now know as Eurobodalla Shire. Yuin people have lived in the area for thousands of years and have an enduring custodianship and connection over the land and waterways of Eurobodalla.

The dispossession of Aboriginal people from their lands across Narooma, Batemans Bay and in other towns on the far south coast began in the nineteenth century. The combination of introduced diseases, violence and forced removals significantly affected the Aboriginal population across the wider region.

Today, the Indigenous population generally is disadvantaged across a range of measures including health, education and income. The Eurobodalla Shire has the largest Aboriginal population in SNSWLHD, with an estimated 6.8% of the Shire's population identifying as Aboriginal or Torres Strait Islanders, double the state average of 3.4%. This population is young, with 46% aged 0-19 years. Cultural recognition and identity are important to the health and wellbeing of the growing number of Indigenous people who use or work in health services. This information has been extracted from the Clinical Services Plan (CSP). Additional information is provided in section 6.17 of this report.

6.3 Site Plan

The site is mostly safe from the town's known flood area, with the western portion of the site within the flood plan (refer flooding Eurobodalla HS Site Selection Flood Assessment Report Rev0); the town itself sits alongside the river. The river and the Princes Highway should be considered in access planning and stocking, during disasters.

The site is outside a fire hazard zoning and currently is listed as posing no undue risk for spread of fire (refer Eurobodalla HS Site Selection Report).

The site has a large expansion area but is limited by the topography. Any form of development will need to be closely positioned to the existing plateau in order to prevent extensive elevation above the hillside

6.4 Helipad

The new Eurobodalla Health Service may also have a helipad located on the site, although the number of retrievals is expected to decrease in response to a higher Role Delineation Level. An Aviation Consultant has advised the flight path on approach to the hospital is best from a North-East or South-West direction. Approaches and departures to and from the east, west and south-west, which are largely dictated by surrounding terrain and hospital design, will still accord reasonably well with average prevailing winds in Moruya. The positions of associated buildings, light poles, fences, car parks and gardens will require close coordination to ensure that they do not become obstructions to the chosen approach and departure paths.

Some existing trees are likely to be obstructions to the chosen approach and departure paths and will need to be removed. Exact details of which trees would be sentenced to removal will not be known until deeper into the design phase. Being on-grade, the HLS level will be below the Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation Services – Operations (PANS-OPS) surfaces for Moruya Airport operations. There will be no impact on ATC communications, navigation and surveillance (radar) systems. As this is an on-grade HLS, approvals from CASA and AsA will not be required. A formal VFR approach and departure path and transitional surface survey would need to be completed as part of HLS commissioning to meet Performance Class 1 requirements prior to operations from a new HLS. This needs to be costed and included in the builder's Scope of Work. The survey must also incorporate a DDO for the purposes of protecting the airspace from future development below the VFR approach and departure paths and transitional surfaces (which do not impact future development considerations

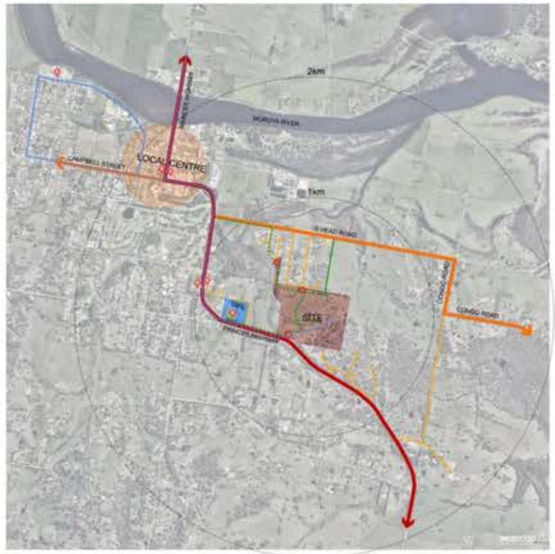

Figure 8: Site Hierarchy

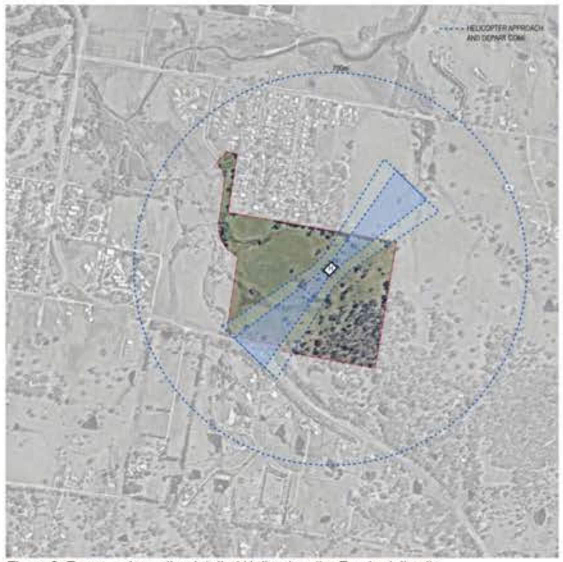

Figure 9: Zones – shows the detailed Helipad on the Eurobodalla site.

6.5 Solar Analysis

The sun path diagram confirms optimised orientation of proposed buildings should be sited with long axis orientated East-West.

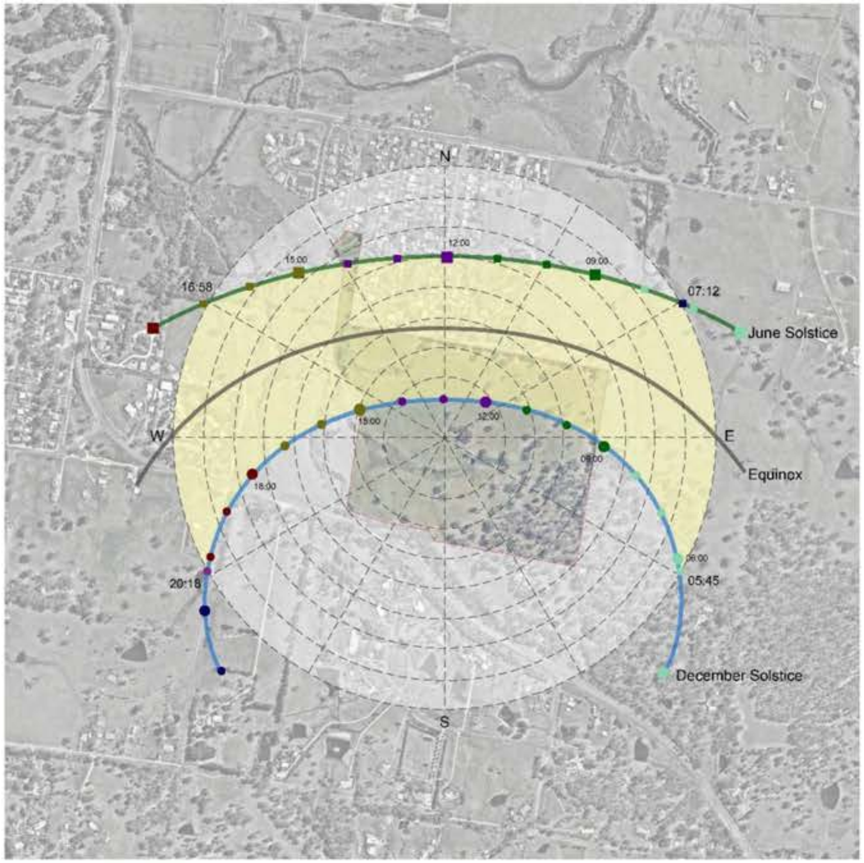

Figure 10: Sun Path Diagram

6.6 Wind Analysis

Figure 11: Wind Analysis – Wind Impact on site, demonstrates how the prevailing winds impact on the Eurobodalla site.

The raised topography to the North-East & South-East will assist in buffering the wind for the central zone of the site. As the Southerly winds are less desirable, the preferred zone for the hospital is positioned to the North of the large sloping hill to the South East.

6.6.1 Wind Rose

The wind rose provides a basis for designing for comfort conditions. It also informs consideration for the location of a helipad, determining the most likely approach and departure flightpaths.

Data for the four seasons of the year indicates that:

— Summer breezes are primarily from North East
— Winter winds are from West, South East and East.

Therefore, it is recommended that:

— Sheltering from West and South East is required
— Flexible sheltering from West and South East side is required to protect from winter winds but allow for summer breezes.

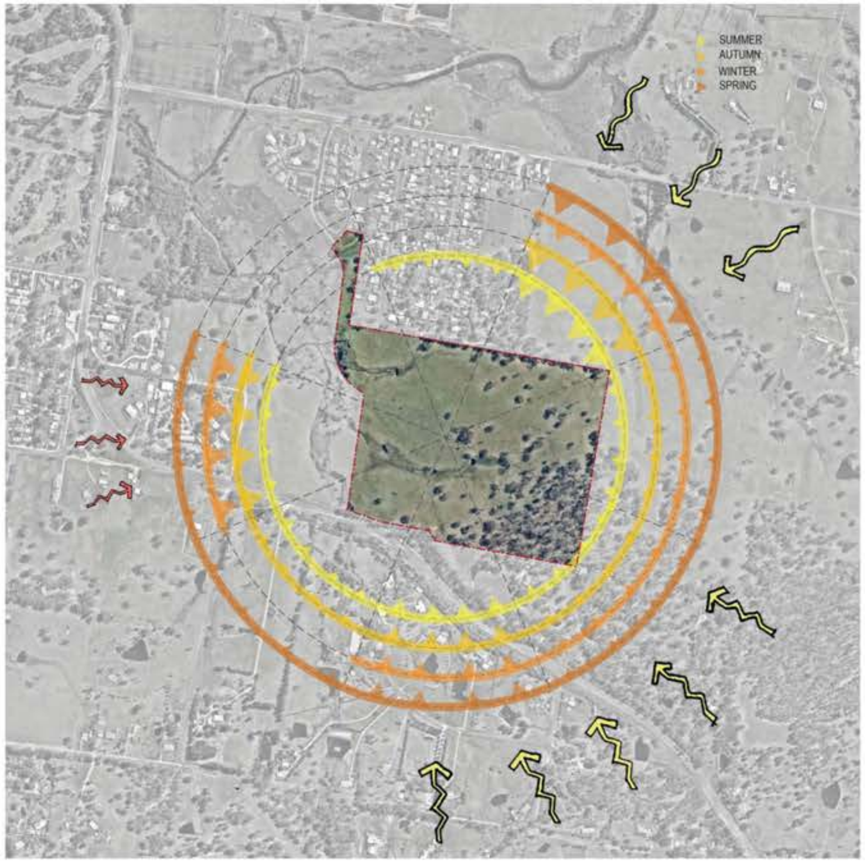

Figure 11: Wind Analysis – Wind Impact on site

6.7 Flooding

The site is mostly safe from the town's known flood area, with the western edge of the site within Probably Maximum flood plan (refer flooding Eurobodalla HS Site Selection Flood Assessment Report Rev0). Considerations have been made when looking at preferable zones for the building to be well above the Probable Maximum Flood (PMF) line, and for the main access road to also be well above the PMF.

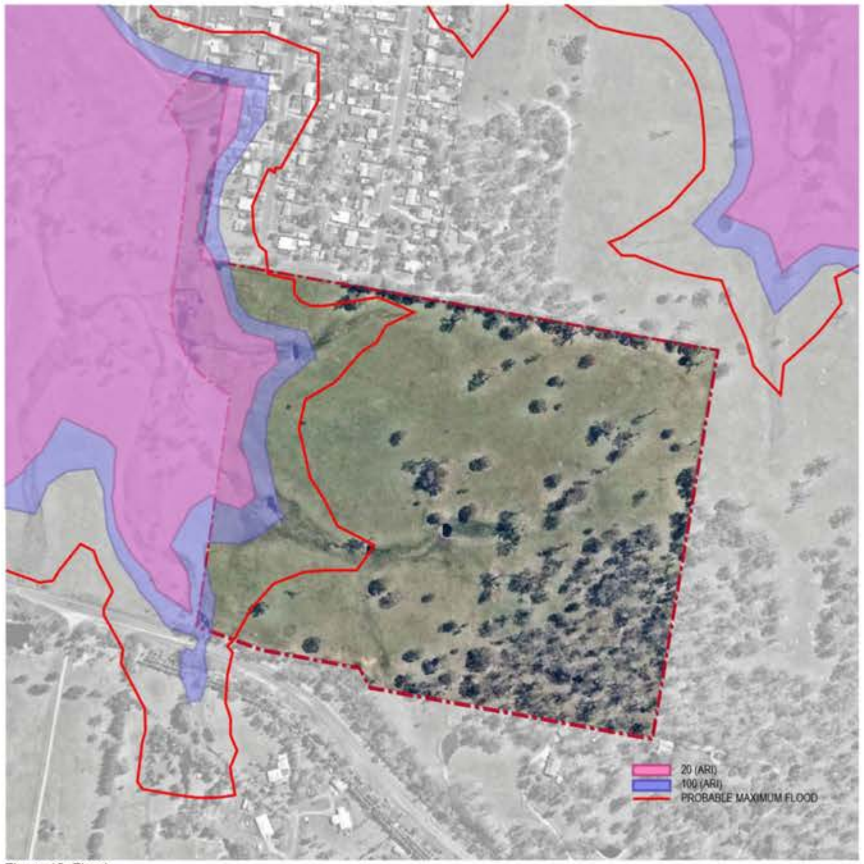

Figure 12: Flood

6.8 Topography/ Vegetation

The proposed Eurobodalla site is a large allotment comprising of primarily flat vacant land. A large portion of the site is cleared with some existing natural vegetation on the sloping portion to the south east of the site. The site is located circa 2.2km south of Moruya town centre.

Figure 13 shows the topography of the Eurobodalla site.

The topography of the site extends from a lowest point of approximately RL-1.5 at the north-west up to approximately RL-55 at the south-east ridge. This constitutes a total change in level of more than 50m. The area identified as usable and appropriate for development is to the north-east corner of the site. This zone contains a ridge point at around RL 22 which is intended to be used as a prominent green space and entry zone for the hospital building. The building is to be located to the west of this ridge over a zone which falls at a gradient of 3-5% towards to west.

A significant gully feature extends from east to west on the site and acts as a natural watercourse through the site. The high point is at the base of the south-east ridge at RL 19 and the gully extends to west into the flood zone. The low point of the gully on the western boundary is approximately RL 2.0.

Figure 13: Topography / Vegetation

6.9 Roads, Access and Parking

The following figure demonstrates the existing roadways and access routes to the Eurobodalla site.

6.9.1 Primary Vehicular Circulation and External Entries

Opportunities to establish multiple entries into the Eurobodalla precinct has been examined to ensure that the precinct does not operate as an island, with one northern entry and one southern entry. This is to ensure future provision for relieving emergency and/or peak conditions by more than two primary sources if preferred.

The future Princes Highway bypass for Moruya is mooted to occur in the near future, with a preferred strategic corridor to the east of the site announced in May 2021. Any potential effects on existing surrounding site services infrastructure are noted within the consultants' reports and will be further developed in the next stages of the project. The project is being designed based on current known information only.

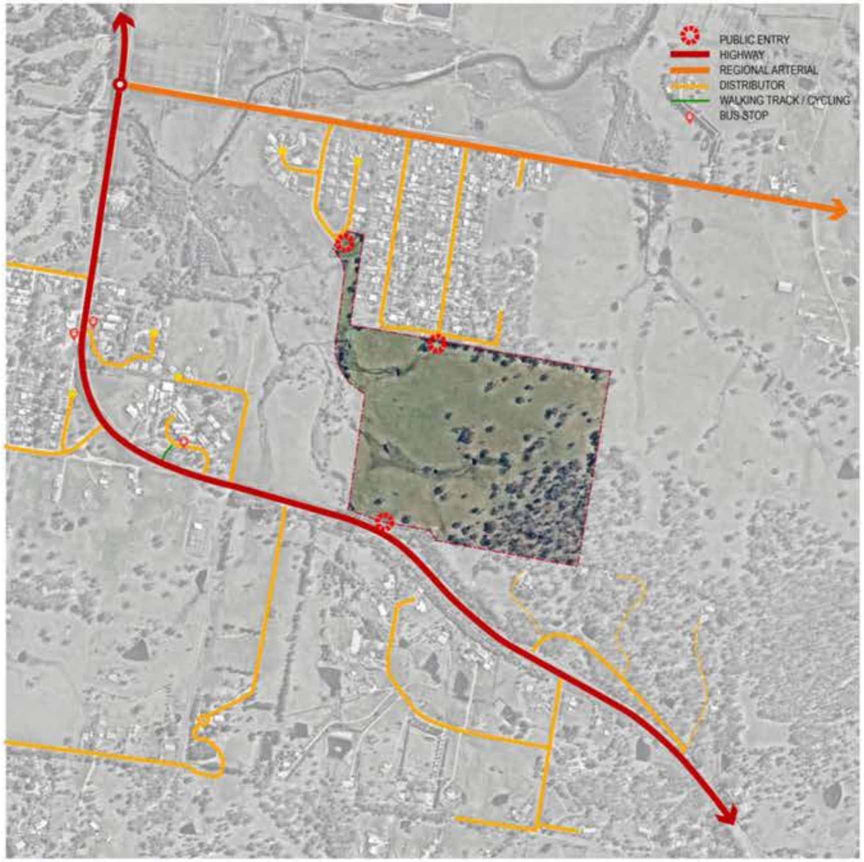

Figure 14: Site Road Hierarchy

6.10 Bushfire

Figure 15: Asset Protection Zone and Offsets

The site is not mapped as bushfire prone land; however, there is evidence of a past bushfire having occurred on the site. With the publication of the Planning for Bushfire Protection 2019 document, the existing bushfire prone land map will be updated. This map is expected to show the land as being bushfire prone. The areas likely to be a bushfire hazard are the stand of trees to the east part of the site and open grassland. Open grassland that is unmanaged, and unmown, also poses a wildfire hazard.

Initial assessment of the site was conducted using survey methods in accordance with assessment methodology set in Appendix 2/1 of Planning for Bushfire Protection 2019, for Special Fire Protection Purpose, being a hospital development. A specific asset protection zone of 67 metres is required for the eastern intact forest. Bushfire Attack Level (BAL) 12.5 construction measures are required for bushfire protection for buildings within 100 metres of the forest or unmanaged grassland.

A formal bushfire assessment is to be prepared to guide both architectural design and emergency vehicle access within the site. For Bushfire Assessment purposes the Eurobodalla Shire is in the Far South Coast Region with a Forest Fire Danger index (FFDI) = 100. The requirement for this assessment will likely be triggered under the Environmental Planning and Assessment Act 1979.

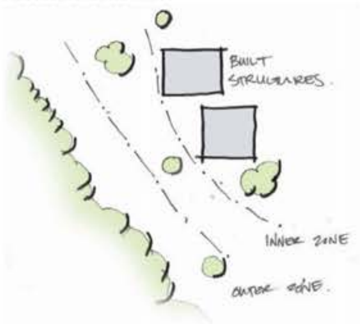

Figure 16 : Setbacks and landscape buffers for bushfire planning

6.11 Town Planning Parameters

6.11.1 Zoning

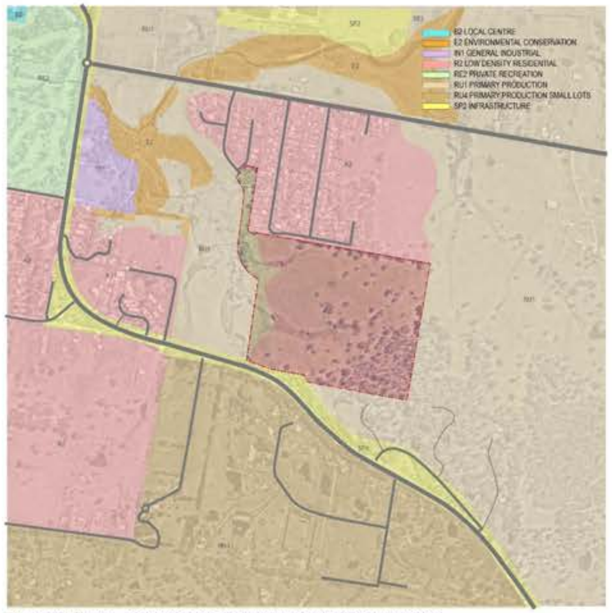

Figure 17: Zones – shows the detailed zoning on the Eurobodalla site.

Zoning categories include:

- Local Centre
- Environmental Conservation
- General Industrial
- Low density residential
- Private recreation
- Primary Production
- Primary Production Small Lots; and
- Infrastructure.

6.11.2 Title / Ownership / Site lots

The site is located 2 kilometres to the south east of Moruya town centre on the Princes Highway in the Eurobodalla Local Government Area. The property is approximately 40 hectares in area and is zoned variously R2 Low Density Residential (90%), and RU1 Primary Production (10%). The northern half of the site is also within the Coastal Zone as determined by State Environmental Planning Policy No 71 Coastal Protection.

Lot 6/DP1212271, Princes Highway, Moruya (Southeast of the township).

6.11.3 Neighbouring Service Providers on the Site

- Essential Energy have no assets affected on the Site
- Optus does not have any fibre optic cables on the Site, although a major fibre optic cable is present along the Princes Highway, in proximity to the Sites south west border
- A trench containing in-service/constructed NBN (Copper/ RF/Fibre) cables runs by the Princes Highway
- Telstra has not provided information on its asset

6.12 Environment

While the hospital is located near generous areas of green-space and planting along the Princes Highway, most landscape within the hospital site itself function as buffers and promote health and wellbeing.

The proposed community park is a large open space with strands of mature trees at the southern and northern edges. The landscaping is generally degraded with little maintenance being undertaken.

6.13 Adjoining Properties

Surrounding development includes a residential subdivision immediately adjacent to the north (known as Mynora) and a TAFE college immediately adjacent to the south west. The Princes Highway arcs around to the west and south of the site and South Head Road runs along some of its northern boundary. Other than the adjacent residential land at Mynora and the TAFE College, the surrounding lands are rural, principally used for grazing.

6.14 Local Health Services

The Southern NSW Local Health District (SNSWLHD) occupies the south-eastern corner of NSW; in the 2016 Census there were 200,176 people in SNSWLHD. The LHD is made up of seven Local Government Areas (LGAs), covering an area of 44,534 square kilometres. The most populated LGA is Queanbeyan Palerang with about 56,000 people, with Upper Lachlan LGA having the least number of people (about 7,700).

Eurobodalla Shire has a population of approximately 38,000 people. Much of the local industry is related to agriculture, government administration, hospitality and tourism. SNSWLHD contributes to communities, employing around 2,000 full time equivalent staff. Southern NSW LHD adjoins the Western NSW LHD to the north-west, Victoria to the south, South Western Sydney to the north, Illawarra/Shoalhaven LHDs to the north-east, the South Pacific Ocean to the east and Murrumbidgee LHD to the west.

SNSWLHD almost completely surrounds the Australian Capital Territory (ACT). The proximity to the ACT has a major impact on the planning of health care services for LHD residents.

There are eleven public hospitals and three Multipurpose Services (MPS) in SNSWLHD. Community health services are provided across the District. The District Hospitals, MPSs and community health services provide a range of services including emergency, intensive care, coronary care, maternity, acute medical and surgical services, sub-acute and primary and community services.

Mental health services include acute, non-acute, child and adolescent and specialist mental health services for older people. Multipurpose Services provide integrated acute and sub-acute inpatient services, and residential aged care, along with a range of community health services.

6.15 Site Investigations

A number of reports were undertaken as preliminary site investigations to inform the Masterplan and design, including contamination investigations, bushfire and ecology investigations, geotechnical, groundwater and surface water and survey reports. The site investigations were undertaken from January – June 2021 and assessed the masterplan options for the Eurobodalla Health Service. Further critical site investigations such as extra detailed feature survey, geotechnical testing and environmental consultancies and Heritage will been commissioned for the Schematic Design stages of the project.

6.16 Eurobodalla Significant Sites

6.16.1 Yuin People

The Yuin people are the traditional owners of the Eurobodalla region. This Country spans between Ulladulla to Eden north-south, and from the coast to Cooma in the west. The Yuin traditional territory is larger than that of Eurobodalla, covering parts of neighbouring shires. The Yuin hold a strong connection to the land, as well as to the coastline and ocean that borders their country, which holds their significant sites both through Dreaming stories and important sacred sites.

The Yuin lived in balance with their environment, treating the land with respect and helping to cultivate and maintain their abundance of natural resources and food. The social structure of the Yuin people embraced prescribed rules of behaviours to help maintain social order. These rules were told and passed down through stories and Dreamings. The original Dreaming story depicts Daramulun and his mother Ngalalbal living on earth;

"Originally the earth was bare and like the sky, as hard as stone, and the land extended far out where the sea is now. There were no men or women, but only animals, birds, and reptiles. He placed trees on the earth. After Koboka, the thrush, had caused a great flood on the earth, which covered all the coast country, there were no people left, excepting some who crawled out of the water on to Mount Dromedary (Gulaga).

'Then Daramulun went up to the sky, where he lives and watches the actions of men… He told the Yuin what to do, and he gave them the laws which the old people have handed down from father to son to this time. When a man dies and his Tulugal (spirit) goes away it is Daramulun who meets it and takes care of it.'

\- Recounted by A W Howitt, 1904

Figure 18: Yuin Country
(Resource: Adapted from *'Illawarra and South Coast language boundaries (Map: Brenda Thornley, based on Eades, 1976)'*)

The Yuin people encapsulates many smaller groups within the region, including the Wandiwandian, Dhurga, Bidewal, Walbanja and the Djiringanj. All these groups are connected through the Dreaming of Gulaga, the mother mountain.

6.16.2 Gulaga (Mt Dromedary)

Gulaga is considered the place of ancestral origin for all Yuin people. The mountain is also retold as the Mother Mountain during the Dreaming, who had two sons and seven daughters. Gulaga represents the lesson of "always doing as you are told". This story depicts Gulaga's two sons, Najanuka and Baranguba, who live with their mother. Baranguba decided to move away from his mother and live alone, but not after long, he was separated from his mother by water and could not return home. Baranguba remains separated from Gulaga, and is what is now known as Montague Island. After Baranguba was unable to return home, Gulaga kept her second son, Najanuka, close, embodied by Little Dromedary.

Aside from the spiritual significance of Gulaga, the mountain is part of numerous songlines and significant sites for the local Yuin people. The mountain hosts both women's and men's places, characterised by the form of the mountain. The mountain also historically provided the main route for the Ngarigo people to the west (Cooma) to travel towards the coast for the winter, in order to avoid the colder inland temperatures. The local people also used Gulaga as a "weather clock", able to determine changes in the weather and seasonal patterns through the fauna and flora of the mountain. Resources for making tools and weapons were also harvested from the mountain, including "Garrara" tree stems and "Mingo" grass (Kangaroo Grass) for use in fashioning spears.

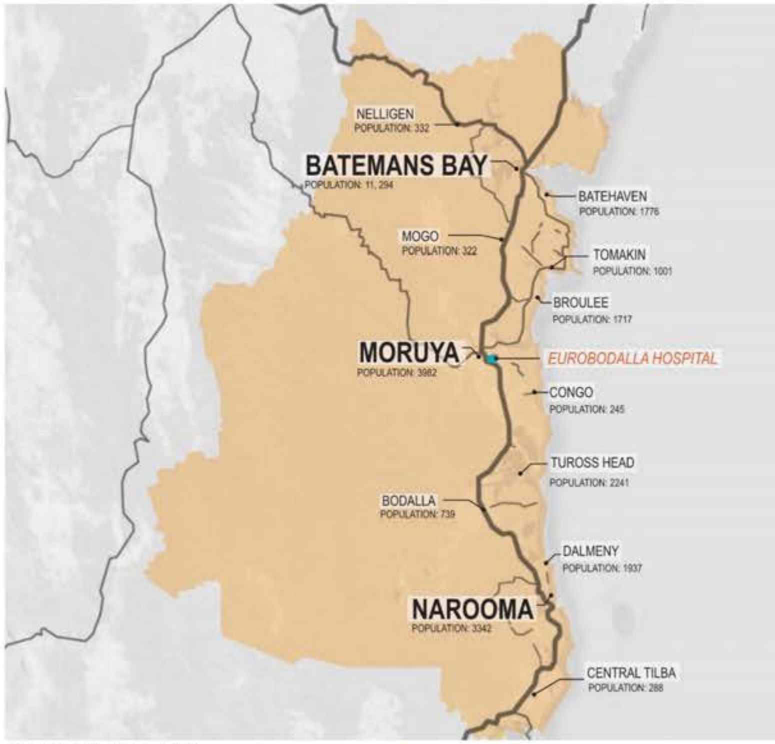

Figure 19: Eurobodalla Region
(Resource: Eurobodolla Region, https://google.com/maps/place/Eurobodalla)

6.16.3 Moruya and Deua River

Alongside Gulaga's two sons, the Mother Mountain also had seven daughters. Before Baranguba left his mother, the sisters headed north together, towards what is now known as Batemans Bay. As they travelled north they looked back to see their mother and brothers, and continued to travel onwards. At one point (near Hanging Mountain) when they turned back, they could no longer see their mother. They continued to the north, crying as they walked, creating the seven rock pools along the Deua River. These rock pools are considered highly significant places, and are believed to host both healing and fertility powers.

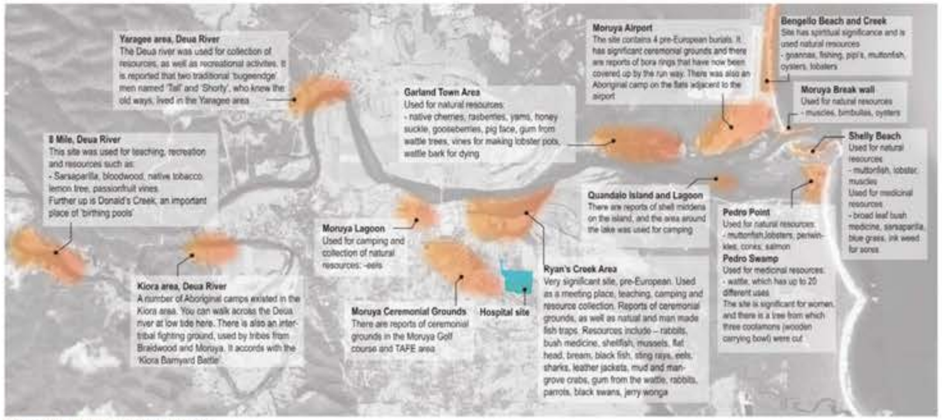

Figure 20: Moruya & Deua River
(Resource: Moruya & Deua River, https://www.google.com/maps/place/Deua+River)

The physical history of both the Deua and Moruya Rivers show these locations as educational landscapes; places to pass down knowledge through generations. There are numerous oral recollections within the local community of these rivers being utilised as training grounds for gathering and hunting, as well as reading and protecting the land. The Moruya River also holds significance as a black swan gathering ground. Black swans are generally regarded as the totem animal of the Yuin people (separate from the individual totems given to each person), and as such holds importance as an area to be protected. Part of the Indigenous connection to land is protection and conservation, both to the fauna and flora. With totemic animals, each community or group would be responsible for protecting both their totem and its habitat.

6.16.4 Catalina (Hanging Rock Creek)

Located within the Batemans Bay area, Hanging Rock Creek, specifically the site of the original ironstone pillar, was a significant meeting place for local groups and travellers. There was a rich social life surrounding this site, and fishing and fresh water were abundant. In 1997-98, the local council removed the rock due to seeing the monolith as dangerous due to its proximity to the road. The removal had a lasting impact on the local Indigenous community, having destroyed the physical marker of a significant place within their social history.

Figure 21: Hanging Rock Creek
(Resource: Hanging Rock Creek, https://www.google.com/maps/place/Hanging+Rock+Creek)

6.16.5 Songlines and connections

Many of the significant places within the Eurobodalla region are connected by pathways or "songlines". Songlines have proved difficult to interpret from an outside perspective, but are described as the way in which the landscape of the country was formed. Songlines describe the movements of the creator gods as they made their way through the country, and have strong ties to Dreaming stories and sacred sites. These passages are present both physically, as well as metaphysically, meaning they are unable to be physically seen, but are equally important to landscape and Indigenous Culture.

Within the Eurobodalla region there are songlines present surrounding Gulaga and her children, but the more identifiable connections through the land have been worn by historic movement between sacred sites, ceremonial grounds, and seasonal movement. Links described, to a surface level to preserve significant sites and pathways for the local community, by local Yuin people include travelling from Wallaga Lake to Ulladulla, Wallaga Lake to Pebbly Beach, and Potato Point to Brou Lake. These connections were frequently travelled, and followed the landscape to provide abundant food, water, and shelter during travel,

Another link is the Corn Trail; the shortest route down Clyde Mountain. This route followed traditional walkways used for generations, as well as Dreaming paths and natural resources, allowing the landscape to guide and provide. This track also provided a social link between the coastal groups and the inland groups within Yuin country, providing an important social link.

6.17 Connecting with Country

Connecting with Country is an initiative by the NSW Government's Architect Office, and is a draft framework intended to help form, design, and deliver government infrastructure that will undergo 12 months of testing and piloting alongside Aboriginal Communities to find the best method for implementing a finalised framework, looking at all projects state-wide.

The framework is to be utilised by community, local government, government agencies, industry, and developers. The intention is to have all groups involved in delivering government projects adopt the following long-term commitment:

Through our projects, we commit to helping support the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people, who know that if we care for Country – it will care for us.

This commitment expects the attempts to realise three (3) strategic goals:

- Reduce the impacts of natural events such as fire, drought, and flooding through sustainable land and water use practices
- Value and respect Aboriginal cultural knowledge with Aboriginal people co-leading design and development of all NSW infrastructure projects; and
- Ensure Country is cared for appropriately and sensitive sites are protected by Aboriginal people having access to their homelands to continue their cultural practices.

Connecting with Country will support the design and planning industry in engagement with Aboriginal culture and heritage to help produce projects that:

- Protect the health and wellbeing of Country and therefore of Aboriginal communities, and by extension all communities; and
- Embed Aboriginal knowledge into the design and planning of our built environment to make NSW a better place for all its citizens.

The people's connection to Country has produced a large database of Aboriginal wisdom and knowledge that future projects are looking to embrace and embed within planning and design. A project is enhanced by incorporating this knowledge, not only benefitting the community, as well as Country, but, in addition, these cultural lessons are preserved in a tactile and immediate form.

The human centred design method has limitations and if people are the first priority then the land and nature become secondary. When this happens, people are affected negatively as they are immediately influenced by nature. Taking a traditional Aboriginal world view, designing with nature at the centre and considering people as a part of nature, we can create a more holistic and sustainable future.

Our Approach

- Identifying the Aboriginal knowledge holders and Contributors early in the project to have a comprehensive Aboriginal influence throughout the project
- Drawing upon available research to gain understanding of local history and culture, which reveals traditional ways of recording knowledge and builds relationships within the Aboriginal community
- Including appropriate space or facilities for cultural proceedings that the community requires. Projects may require the inclusion of culturally specific facilities, or the project site may have significant cultural history that requires an appropriate design alteration.
- Creating an opportunity for outside interaction. Many people (Indigenous and non-Indigenous) do not have access to the world of Aboriginal culture and knowledge, and often have a thirst for learning more about the First Peoples
- Building a database to identify people in the project that influence and guide the project and determine who benefits from the project success and how
- Creating an ongoing line of communication for the project user group and design consultants to provide feedback on successful practice that can be carried into future projects
- Incorporating traditional local land and water management techniques into design – ESD.
- Considering the original use of the site and community needs, the project will dedicate space for traditional Custodians to continue their cultural practice on Country
- Including cultural practices in the process of a project and including all participants to connect the people of the Country's past with the people in control of its future use; and
- Seeking local Aboriginal-owned businesses to partner with throughout the project and after. Design Consultancy, Construction, Material Provision, and Tenancy are possibilities – Wayfinding, Placemaking and Graphic Design.

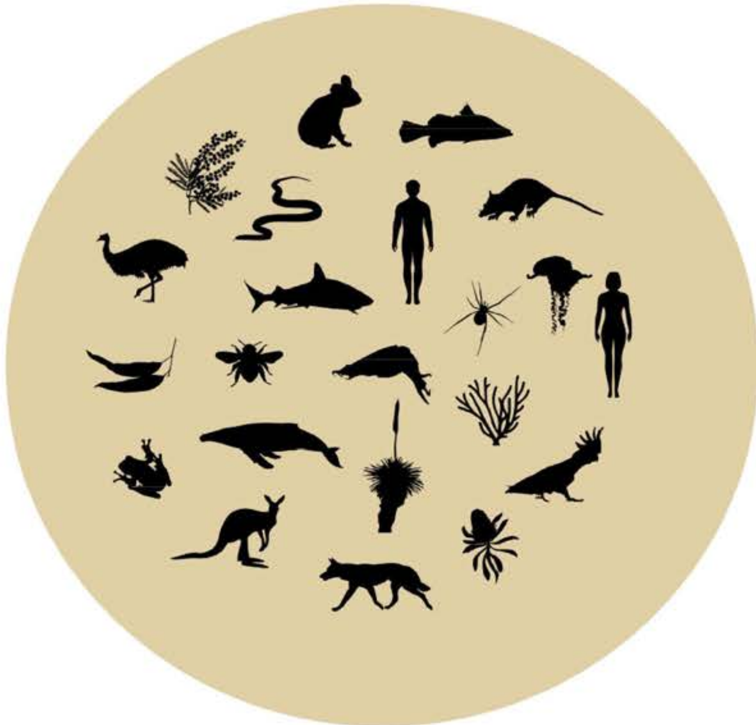

Figure 22: Country Centred Design

Connecting with Country - Our Approach

Figure 23: Connecting with Country – Our Approach

6.18 Indigenous Design Thinking for Collaborative Solutions

Conrad Gargett and Yerrabingin worked in collaboration with Aboriginal community members and organisations and project teams, to create a Human-centred design approach, focussed on the development of Indigenous design narratives and design principles. Rather than traditional consultation or engagement, in Human-centred design, the community are active co-designers of the project and a shared collective voice is presented, instead of individual representations.

Ideation and design were explored through the lens of design thinking, using collaborative events including Design Jams. The key first step was identifying needs, desires and apprehensions, whilst discussing the opportunities for meaningful engagement for the precinct programs. While not all discussions could occur on site, the cultural landscape context of the site was maintained at front of mind during the Design Jams.

The Human-centred design approach commenced at the beginning of the design process, ensuring that Yuin culture is at the core and foundation of the project. The collaboration with the local Aboriginal community and a multi-disciplinary design team brought a diversity of knowledge and perception to the design thinking process.

Our approach incorporates Aboriginal Cultural Heritage as a living memory in the landscape and architectural response and how it will be represented through the design. Including endemic ecology, cultural resources, land management practices, local language, site features and way-finding.

6.18.1 Design Jam

The Project team worked to integrate outcomes of community Co-Design and research and Local Aboriginal design narratives into the final design concepts, this happened during the Design Jam. The Design Jam produced a design approach/intent that incorporates Aboriginal cultural heritage as a living memory in the landscape and architectural response and how it will be made evident throughout the design.

The key ideas from the Design Jam are as follows:

Connection to Country:

- 'Wallawanni' welcome sign at entry
- Totem poles along road
- 'Rainbow Serpent Drive' name of the road
- Aboriginal and Torres Strait Islander flags flying 24/7 outside hospital entrance. When someone has passed on lowering these to half mask as a sign of respect. (TBC with MOH)
- Local Aboriginal artists to create artworks / murals
- Healing garden

Landscape:

- Central meeting place south of carpark: educational area
- Medicinal plants providing spiritual energy onto hospital: don't block energy.
- Endemic vegetation within landscape
- Bush Tucker planting
- Accessible to the wider public
- Water is a safety hazard
- Exercise track connecting the site to the broader community
- Kids play area away from palliative care patient space.
- Calming trail and walkways
- Identify active and calm zones

Building elements:

- Shelter over carpark for people walking to hospital
- View to the west for end of life
- Connecting babies to Country earlier on: having a room on ground floor with direct access to the outside gardens. Aboriginal birthing place
- Names of buildings relating to shape: Boomerang & Bogong moth
- Facilities needed in bush area so people don't need to rely on hospital for toilets etc.
- Large family meeting place for 'sorry business', bedroom for bereavement (privacy after death)

6.18.2 Indigenous Narrative

I am not tense arriving at the site, I feel welcome and connected…

- From first entry off highway → cultural elements to soften entry
- Visiting patient or non-care related attendance
- Flag poles at same height as others

My family can come and support my wellbeing in a safe space…

- Indoor and outdoor
- Accessible
- All weather

The space feels like it will deliver relevant care to me…

- Navigating to the relevant space is easy – Physio, outpatient, maternity, oncology, etc.…

My wellbeing is supported through access to relevant cultural elements…

- Resources (plants)
- I can come when I am well not just unwell
- I leave feeling connected culturally
- Dedicated amenity, parking etc. for cultural space. HEALING space

Discrete space is provided both inside and outside…

- Very important for large families that come to support each other
- Separate area that feels like its integrated into the landscape.

I can connect with physical environment during and after birth…

- Birthing on Country elements included in design
- Encourages family in an inviting space
- My child connects very early on with Country.

Throughout my visit I am remembered of the strength of culture in my wellbeing needs…

- Dedications to significant elders or places

If I am at the end of my journey, I feel like I am still connected…

- Outdoor spaces
- Family areas so my mob are welcome and can meet their care obligations
- View to the west.

When I leave the site I feel safe and my visit ends on a positive note regardless of what I was there for…

- Especially important if sorry business or receiving bad news
- Remind people of the strength around them

Figure 24: Yerrabingin Conceptual Design Board

7.0 Development Proposal

7.1 Design Principles

To optimise outcomes, stakeholder engagement and an open design process is utilised. A broad range of stakeholders make creative contributions and help to deliver significant benefits including: generating better ideas with a high degree of user value, improved knowledge of the LHD's needs, rapid validation of ideas or concepts, and more efficient decision making. Giving stakeholders design options is critical in robust analysis, achieving the best design outcome, and ensuring stakeholder support.

7.1.1 Site information; analysis of existing information.

The site analysis captures: topography, existing buildings, environmental issues, potential contamination, infrastructure services, flooding and overland flow, heritage (indigenous and non-indigenous), and acoustic considerations. This also includes feedback from stakeholders to capture pedestrian networks, traffic, and logistics networks.

The functional design brief enables the establishment of a footprint which is representative of the project requirements. This includes a suggested building envelope and access requirements.

The outcome of the Masterplan workshop consultations resulted in the identification of a clearly defined zonal masterplan, with further design work to finalise the 'Hospital Street' or 'Town Square' options. The comments received from the workshop were addressed and a final recommended zonal masterplan was established. These include:

- Developing a design approach that leverages urban design, architecture, and interior design to transform the hospital into a significant community asset that expresses wellness;
- Using the NSW Health Facility Planning Process Guideline, prioritising intuitive way finding with reference points to circulation such as views, colours, materials and functional elements; and
- Benchmarking travel and engineering ratios to ensure design proposals have inbuilt optimisation prior to being costed by the project cost planner.

Hospital and health projects, as part of public service delivery, have the opportunity to look beyond organisational boundaries with renewed aspiration and intent. This transformative ambition can build upon people and places and underpin visions in a radical and innovative way, and to add value to projects on a macro and micro scale. Place-based transformation can be delivered for communities at a grass roots level and must be underpinned by key architectural principles and activities in the Masterplanning process.

The following principles and activities have been undertaken to assist HINSW, SNSWLHD, and the wider design and project teams, in supporting a collaborative Masterplanning process:

- Making strategic choices based on fundamental characteristics underpinning places, people, and communities so that the outcome is rooted in a deep understanding of the core values of the place
- Clearly identifying the issues and opportunities that matter to local people, including local indigenous communities, and the interdependencies between them, keeping these aspects at the forefront of thinking
- Understanding the needs of the community, including First Nations people, and facility now and looking into the future as far as practicable
- Developing a set of shared objectives and project vision which define the project intent
- Addressing the commercial potential of publicly held assets to deliver investment offset where appropriate
- Common estate strategies
- Exploring opportunities to standardise and simplify common administrative processes, reducing duplication and fragmentation; and
- Being socially responsible and future-thinking.

7.2 Planning Principles

Respect for:

- The history of the site by telling the story of the place
- The indigenous stories of the site and wider region
- The dignified and safe workplace
- The global markets, Eurobodalla, and neighbouring community
- The desires of the occupants within the precincts; and
- The human as the centre of the hospital.

Respond to:

- The natural context
- The challenges and opportunities of the site topography
- Opportunity of views and aspects
- The wider region developments of infrastructure and urban planning
- The functional and operational requirements
- Current and future demands to avoid duplicity
- 'Connected Care' model – ambulatory models and 'hospital avoidance' strategies
- Flexible community needs, industry and education drivers; and
- Cultural protocols and customs
- Child-friendly, ageing-friendly, disability-friendly.

Rejuvenate the:

- Healing environment by quality design and integration of landscape elements
- Quality of life for consumers, staff, students, and general public by evidenced-based, innovative and integrated model of care
- People's health and wellness through people-centred design and wellness-focused environment
- Physical environment through passive design strategies and indoor/outdoor spaces
- Health services by embracing digital opportunities
- Public spaces with art and community activities
- Precinct as a conduit or a destination with coherent planning; and
- Collaborative environment with activated edges as part of the local community;

7.2.1 Context informing the Architectural Design

Key learnings from the context have informed the decision-making process of the architectural design for the site Masterplan.

The following list summaries the mapping aspects considered in the feasibility to optimise the Eurobodalla site:

- Public Transportation
- Education – TAFE & Tertiary Education
- Future residential developments to the north of our site
- Emergency Response locations – Ambulance
- Retail
- Community and Cultural
- Medical Services, including Private Hospitals; and
- Parks and Parkland

This has culminated into the following opportunities for use:

- Transport hub
- Emergency Response Centre - proximity to emergency department, helipad response and access to Princes Highway
- Private Provider; and
- Accommodation.

7.3 Enhancing Patient Experience

Building on the attributes of the site and the natural beauty of the environment, the design seeks to create a patient-centred approach with a built environment, which is at once welcoming and nurturing while being functional and efficient. These include:

- Provision of safe, patient-centred environment to enable provision of high-quality care
- Equity of access
- Provision of efficient and effective care
- A spatial environment that is contemporary, salutogenic, flexible and adaptable; and
- Soundly based in the tenets of evidence-based design (EBD), providing access to light and view, connection to nature and external space and adopting the use of materials and finishes which exemplify the value of such connections, the design aims to provide an environment which is, regular rather than institutional, stimulating and engaging of the senses and promotes healing and recuperation.

Figure 25: St Stephen's Private Hospital by Conrad Gargett

7.4 Promoting the Storytelling of the Site

The Masterplan and indigenous consultation has acknowledged the history of the site, which reflected the changing patterns of concern for patient treatment and welfare as well as the physical development of the site.

The concept design reflects the importance of the physical environment responding to the landscape and "Connecting with Country". It also reflects the ongoing concern for the patient experience with a focus on wellness and well-being, informed by the acknowledged impact of the quality of the environment on the well-being of both patients and staff.

7.5 Responsive to Climate and Environment.

The approach to architectural design embodies best practice in the response to climate and environment, creating places and spaces, which promote the well-being of patients, their families, and the clinical and non-clinical team by:

- Providing indoor and outdoor spaces, interacting with the surrounding natural environment
- Establishing strong connections with the local context visually and/or physically by creating an integrated architecture within landscape of the local context and natural and built environment, mitigating the feeling of an institutional building for the sick with heavy clinical atmosphere
- Ensuring sufficient daylight to internal spaces for patients and staff especially for long-stay patients. Communal areas for public, patients, and staff should be well lit. Daylight can be provided to clinical spaces where appropriate; and
- Considering natural ventilation where suitable. This strategy can be further investigated in public spaces with minimum clinical service requirements. A mixed mode scenario can be considered.

Figure 26: Rooftop Garden at Queensland Children Hospital by Conrad Gargett Lyons

To better respond to the climate and environment, pursuing a sustainable development is key to achieving appropriate outcomes in terms of material and systems selection in new buildings, careful energy and water management practices and preservation and enhancement of existing landscape.

Figure 27: PV panels and Rooftop garden at Austin Public Library by Lake/Flato Architects

7.6 Ensuring Access to Light and View

Access to daylight and view from occupied spaces is a foundation of the concept design. This informs planning including the orientation of the buildings and the locations of occupied spaces.

As a prelude to the thermal performance analysis of the buildings, the following diagrams illustrate the expected daylight access for the volume of the building. IPU wings are oriented to maximise East-West aspect, while minimising exposure to low level eastern sun. Further thermal analysis will take into consideration physical building materials and immediate site context.

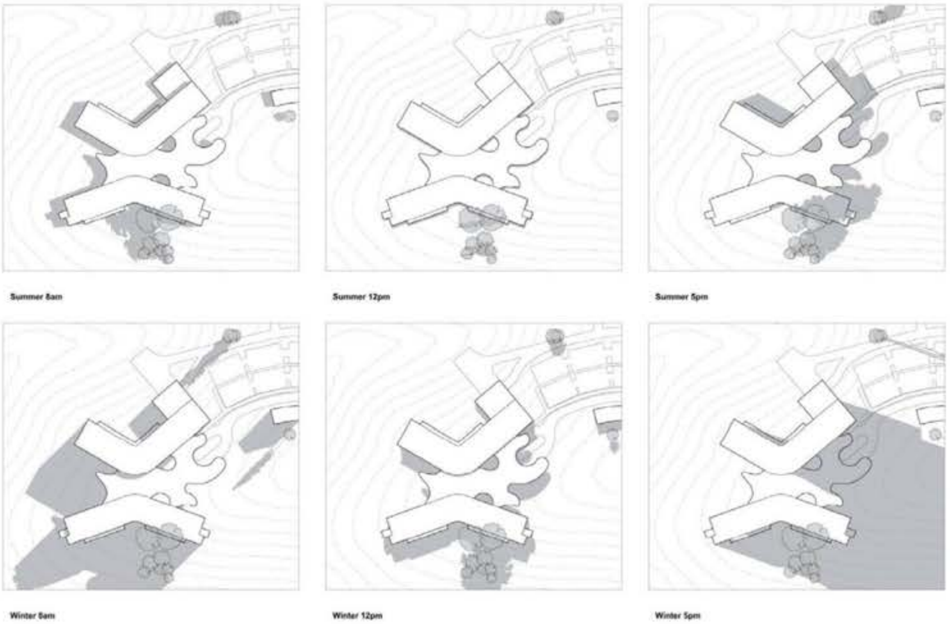

Figure 28: Diagrammatic representation of daylight access analysis to the building model

7.7 View Analysis

The following diagrams illustrate the exposure to views and attempt to assess the quality of the outlook.

Views are assessed based on numerous target points nominated around the site. It is anticipated that target points of interest will be added as they are identified however the current diagrams are based on views towards the Deua ranges and the Eurobodalla Significant sites.

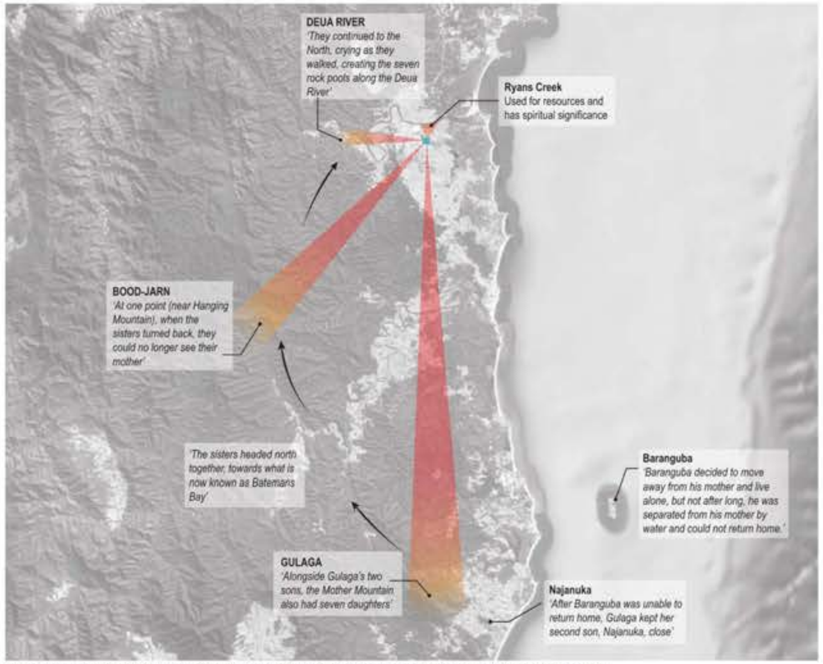

Figure 29: Diagrammatic representation of the quality of natural outlook from the building model

7.8 Responsive Building Form and Fabric

7.8.1 Responsive and Flexible Building Form

The importance of the planning considerations and building expression includes access to outdoor green spaces both at lower and ground levels. The building is designed around the central courtyard and inpatient spaces distributed across multiple levels which allows for Rehab and Maternity and Paediatrics to have direct access to landscaped areas.

The building fabric is intended to further reflect this approach in scale and detail as the design develops, providing shelter and shade, and adopting appropriate screening where sun-control and privacy are required.

7.8.2 Flexible Facade Design

At the concept stage, the investigation of potential facade types is underway. The flexibility of the facade systems will help respond to the orientations, local aspects and internal functionality.

Given the requirements for thermal and acoustic performances, and the need to seal the building, prefabricated facade systems are most likely to be adopted. This will contribute to quality of finish, efficiency in construction and allow performance to be consistent and readily testable. Other benefits will include a single source of responsibility and therefore warranty for the facade systems.

7.9 Optimising Operational and Clinical Performances

Primary objectives in the planning and design of this project is that it should facilitate health service delivery which is safe, of high quality and patient-centred.

The overarching principles that underpin these objectives were set out in the Functional Design Brief where, in particular, the following were identified as specific requirements. These have informed the Concept Design:

— Evidence based separation of flows
— Efficient patient, team and services flows - easy and efficient navigation point to point
— Privacy and dignity for all patients
— Avoidance of healthcare associated infection
— Accurate identification of patients, team, equipment and medications
— Avoidance of medication errors
— Collaborative efficient and effective clinical handover
— Timely access of services
— Prevention of falls and adverse events
— Minimised travel time for team
— Patient safety, and ensure high indoor environment and safe water quality
— Pragmatic and efficient
— Overall spatial planning that supports standardisation of the configuration and fit-out of clinical areas
— Integration of ergonomic principles into design
— Clear visual connection between patients and team
— Connectivity to external environment
— Control over natural and artificial light by team and patients
— Design features that facilitate safe and effective care for people with disabilities and behavioural issues
— Design that is salutogenic, that is, is a cause of good health, and maximises use of positive elements related to natural light, colour, images of nature, access to fresh air, visual arts and music, and 'spiritual' spaces; and
— Design which facilitates an integrated approach to care.

The planning acknowledges these principles and is informed by the Functional Design Brief developed through initial consultation with user groups. This work will form the basis of further consultation in the next phases of the development of the design.

7.10 Wayfinding

The Masterplan described a series of key principles which had been considered in its development. The following are particularly relevant to the concept design:

— Pedestrian circulation
— Vehicular navigation
— Public transport integration
— Key entry points
— Key focal points
— Legibility and visibility of messages and information; and
— Equity / Accessible health care.

The design of the wayfinding system for the Eurobodalla Health Service will reflect a legible environment and spatial organisation.

The foundation of the design approach is to provide clear and logical planning; create buildings which communicate or explain themselves. Throughout the Concept Design phase, the foundations have been laid for an approach which embraces passive wayfinding.

The design of the buildings and external spaces will assist wayfinding by providing cues that define pathways, arrival points, and gathering spaces. The appearance of entries and all arrival points will be clear and inviting. The locations of entries and receptions will be intuitive and naturally follow the pedestrian flow.

This approach limits the reliance on signage, although necessary, should function to confirm direction rather be the primary wayfinding element.

7.10.1 Passive Wayfinding

The architecture and built environment can assist wayfinding by providing cues that define pathways, arrival points and gathering spaces. The appearance of entries and all arrival points should be inviting. The location of entries and receptions should be intuitive and naturally follow the pedestrian flow.

Sites and buildings that provide intuitive wayfinding purely by the design of the spaces requires less signs. If a building fails to express to the user how the spaces work and how they connect with each other, then a higher level of signage is required to assist and direct these users.

Successful wayfinding involves many underlying elements and factors which users consider while making decisions at a conscious and subconscious level, these include:

— The surrounding environment and how easy it is to ready and evaluate. While navigating unfamiliar environments, one of the most effective strategies that people use subconsciously is forming a mental map of the space they are confronted with.
— Successful communication at each level, includes information provided on the website, letter sent out, conversation over the phones, text messages, and digital tools as well as verbal and written instructions provided on site.
— Understand of the facility processes that are user-focused, but also align with the hospital's operational needs
— Support volunteers to assist with wayfinding

7.10.2 Navigational Aids

Good wayfinding is natural and instinctive. It is knowing where you are, knowing where you are going, and comprehending how to get there easily. As a preference wayfinding should occur without using signage. We understand the types of people requiring wayfinding - not just for wellness or planned visits but also unpanned visits in times of distress - providing wayfinding that doesn't add to stress in times of stress

Navigational aids may include:

— Placement of built form, structures, buildings, landmarks
— Landscape placement: hard and soft
— Urban form, topography
— Visual signage
— Braille and tactile signage

- Pathways, walkways, roof cover
- Look and Feel Aspects: Materials, Finishes, Colour, Texture
- Identity: theme, branding, visual character
- Vista, view creation, sightlines
- Access to technology to assist in wayfinding
- Audible cues
- Communication and marketing
- Artwork placement; and
- Lighting placements and directional.

7.10.3 Equitable and accessible wayfinding

Wayfinding must be accessible and equitable, considering a variety of ability, physical and psychological.

7.10.4 Experience Design in Place Making

The following are key principles that have been considered in the development of the masterplan options:

- Memory association of the place
- Interpreting community through public art and urban design
- Integration of campus planning with First Nations diversity and non-English speaking people; and
- Existing and significant green infrastructure on the site in mature trees and waterway.

7.11 Pursuing Flexibility and Adaptability

The design is underpinned by a concept of flexibility and adaptability which is intended to extend the functional life of the buildings. There are different strategies that can be considered to enhance flexibility of the building and design by:

- Leaving expansion zones adjacent to the building especially to the areas with a high chance of having expanding requirements in the future.
- Providing "soft spaces" adjacent to clinical areas that will be potentially under spatial pressure. These "soft spaces" can be stores, general support areas, or staff areas that can be easily relocated in the future when the adjacent clinical spaces need to be expanded.
- Providing shelled spaces in the areas that are predicted to expand in the near future. Concepts of 'cold shell' and 'warm shell' should be investigated in specific areas depending on the quantity of shelled spaces required and the services requirement of these spaces in the context of overall building strategies.
- Investigating flexible structural grids and floor to floor height so that the spaces can be easily adapted into different functions in the future. More flexible column layout will improve flexibility such as less columns with bigger spans, more columns at the perimeters, and avoiding transfer structures as far as possible.
- Considering provision of more universal rooms that can be used for different functions / activities / patient requirements.
- Pursuing a coherent building planning and design to give opportunities for modular construction and fabrication by aligning corridors, stacking service risers/stairs, minimising structural transfers, etc.

7.12 Pursuing Design Efficiency and Future Proofing

A key principle articulated in the Masterplan was to provide for future expansion. This was dealt with initially at the level of site planning.

The design team have focused on the configuration of the spaces to allow expansion to take place without disruption to service delivery.

At the finer grain of building planning, the Masterplan proposed the adoption of structural systems of regular grids with defined service zones and circulation spines to allow for the logical expansion and provide the ability for the adaptation of uses over time.

Planning is based on an efficient structural system which is based on the use of an 8.4 x 8.4m grid, which is widely acknowledged for its economy and efficiency.

Service zones in plan are defined by circulation zones. The planning allows the use of corridors wherever possible allows for the accommodation of major services runs affording the opportunity for alteration without impact on clinical space.

7.12.1 Exploring modular Opportunities

The Eurobodalla Hospital lends itself to the design freedom of conventional construction, however repetition of fit-out and service equipment may yield economies of modular pre-manufacture. With areas such as ensuites, bathrooms and inpatient bedrooms benefiting from pre-manufacture. Pre-manufacture provides construction efficiencies and opens up the potential for off-site manufacture of major elements potentially yielding further time and cost efficiencies. It also provides safety and efficiencies in operation, where functional spaces are consistent in layout.

Figure 30: Patient Care Areas

7.13 Clinical Key Planning and Characters

Two (2) significant considerations in terms of space planning are efficiency and amenity. These together impact on the character of the various spaces.

Efficiency deals directly with addressing the required functions and critical adjacencies of spaces, the connections between them and the segregation of patient, staff, and service flows from each other and from public spaces and routes. Considerations of patient safety, security, and dignity are key considerations.

Analysis of planning strategies has been undertaken to confirm the accommodation of critical adjacencies and the modelling of travel routes, time and distances, has confirmed efficiencies.

Planning response addresses risks to clinical and non-clinical team members in high risk areas and develop solutions which provide protection including passive surveillance of entry points, while maintaining accessibility and a welcoming environment.

The quality and amenity of space is important to the Eurobodalla team and customer well-being. Emphasis is placed on the customer experience and customer-centred design. The quality of the environment has a direct relationship with patient recovery rates and also with productivity. Planning has considered the important aspects relative to this such as access to natural light and views of and connection with nature.

The character and personality of individual spaces will be influenced by these considerations with major contributions made by interior architecture and landscape design.

Ambulatory and Allied Health Spaces

Ambulatory and Allied Health spaces will cater predominantly to day patients, many of whom will be accompanied by family members / carers. Therefore, waiting areas become important for the consumer experience. The design and character of waiting spaces will promote comfort and support consumer dignity and privacy, by offering a range of options including access to external space. Therefore, connectivity with outdoor spaces, fresh air and landscape is of great significance.

Clinical Support Spaces

Major clinical support spaces are located relative to demand centres.

Imaging is located adjacent to the Emergency Department.

Pharmacy and Pathology require ready back-of-house access for the delivery of drugs.

Patient Care Spaces

Patient care spaces including Inpatient Units and Intensive Care Unit are sited to optimise amenity by access to daylight and distant views. Lighting design and acoustic treatment in these areas is of major importance to ensure calm and comfortable conditions.

For patients who spend extended periods of time in inpatient units, the bedroom is critical. While it needs to accommodate the required equipment and services to support care, the design will seek to create a "normal home-like" rather than an institutional environment.

Inpatient units also need to provide for visiting family members. Day or Family lounges are especially required where patients are accommodated in multi–bed rooms.

Considerations of patient privacy and dignity are balanced with the need for nursing supervision. Care is also taken to ensure appropriate sight lines throughout the units to afford visual communication between staff.

Non-clinical Areas

Front of House

Front-of-house (FoH) spaces are the initial public interface for the hospital providing orientation and information as well as a range of services including admissions, and accounts. Key considerations for planning and character of these areas is to ensure a welcoming and legible environment. Choice of materials and access to light and view are again emphasised.

Intuitive way finding strategies are to be engaged throughout these spaces with intent to reduce the scale of the buildings, embed them into the existing landscape and break the barriers between the users - patients and visitors, and clinical functions that these buildings provide.

Connectivity to outdoor areas for both visual and physical access opportunities and wayfinding will be developed during detailed design phases.

Back of House

Back-of-house (BoH) spaces, such as Logistics – loading docks and distribution areas, and the Kitchen are focused on efficiency and connectivity. They are also workplaces so it is important that a level of amenity for staff is maintained.

Helipad

Eurobodalla Health Service will include a helipad and helipad access within the design. The LHD and HI NSW are committed to designing hospital facilities to guarantee the best access for patients transported by helicopter and also facilities consistent with leading helipad and the development of new and improved pathways.

Planning

As a summary, the endorsed departmental arrangement of the Building is as follows (also refer to Figure 30):

Table 3: Department Planning - Levels

Lower Ground Floor:	IPU 3, Maternity and Pediatrics, Operating Theatre, Back of House, Mortuary, Plant and Engineering.
Ground Floor:	Emergency Department, Intensive Care Unit, Medical Imaging, Ambulatory Care, IPU Medical
First Floor	Ambulatory, IPU Surgical, Pathology, Pharmacy, Executive

7.14 Functional Design Relationships

Functional design relationships have been rigorously analysed to ensure efficiency and patient safety.

As noted earlier, planning strategy adopted in areas likely to expand in future, such as Imaging has been adopted to include 'soft' space, administration, and storage to allow future contiguous expansion of the primary function.

While patient flows have been considered, avoiding crossovers of patients and staff, traffic on the site has also been considered, to separate public and service traffic and importantly, to provide dedicated routes for emergency vehicles accessing the Emergency Department.

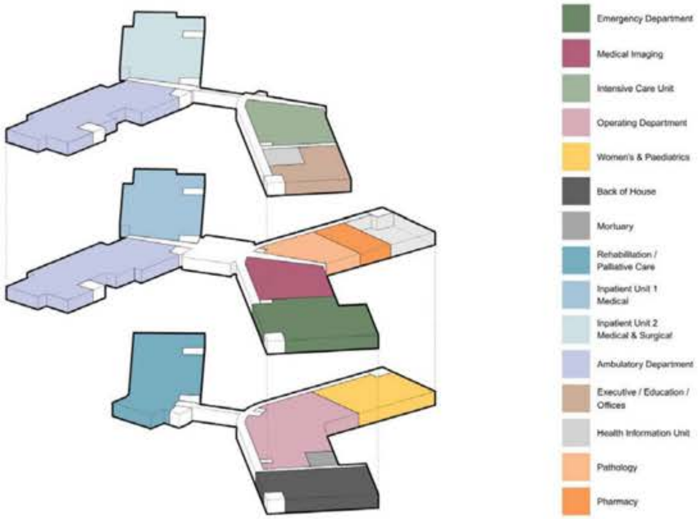

Figure 31: Overall Departmental Stacking

Functional design relationships are also impacted by the internal layout. In order to inform the blocking and stacking we have produced bubble planning diagrams which has helped inform the decision process.

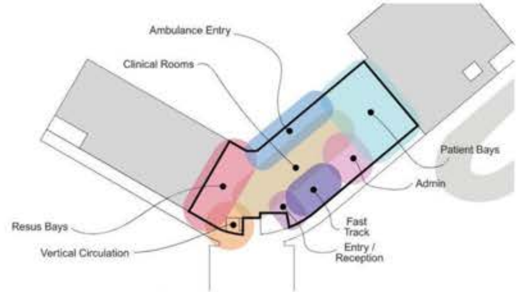

Figure 32: Emergency – Central Located

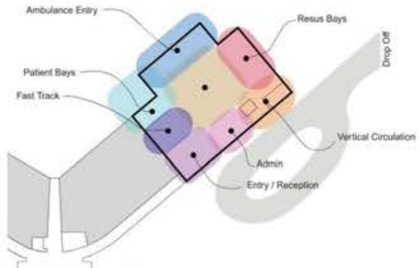

Figure 33: Emergency - End

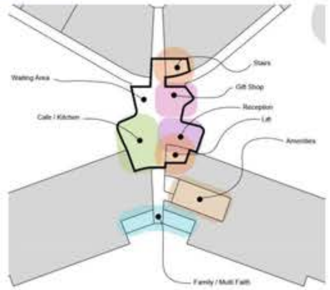

Figure 34: Main Entry

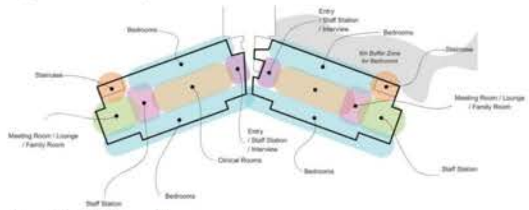

Figure 35: IPU Ground Floor

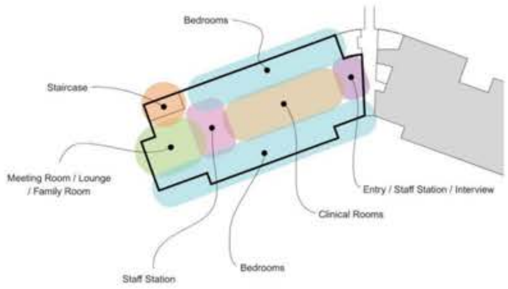

Figure 36: IPU Stacked

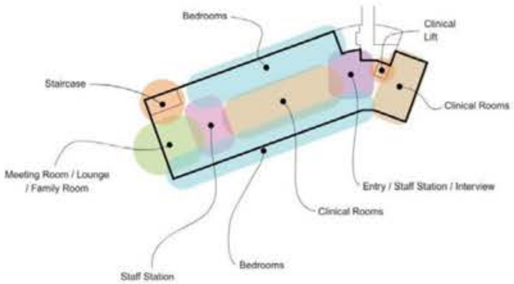

Figure 37: IPU Rehab

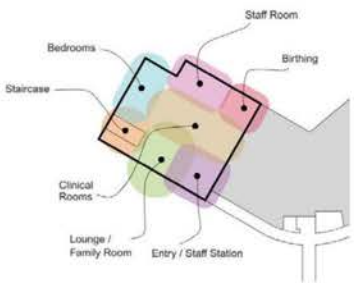

Figure 38: Women's and Pead's

Travel Distance Proximity Assessment

To test the department relationships identified in the adjacencies diagram an analysis tool was developed to diagrammatically show the departmental layout and illustrate the computer-generated shortest path analysis between them.

Utilising the architectural model, distances are calculated from the centre of the modelled department volume to the nominated connected department volume. The software tests the shortest path network via the nearest adjacent corridor and circulation risers. The resulting data is intended to influence the locations of corridors and vertical circulation shafts.

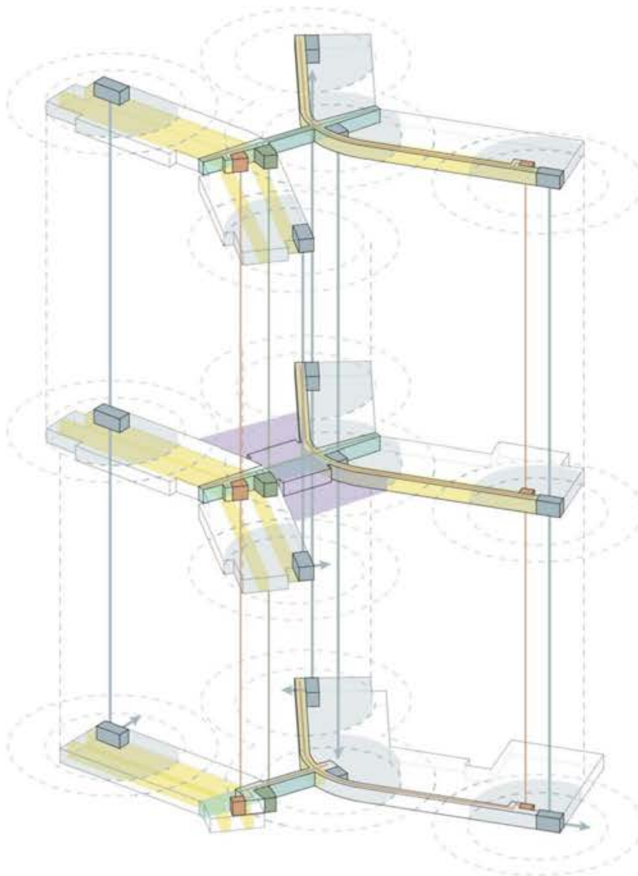

Figure 39: Exploded Overall Departmental Stacking

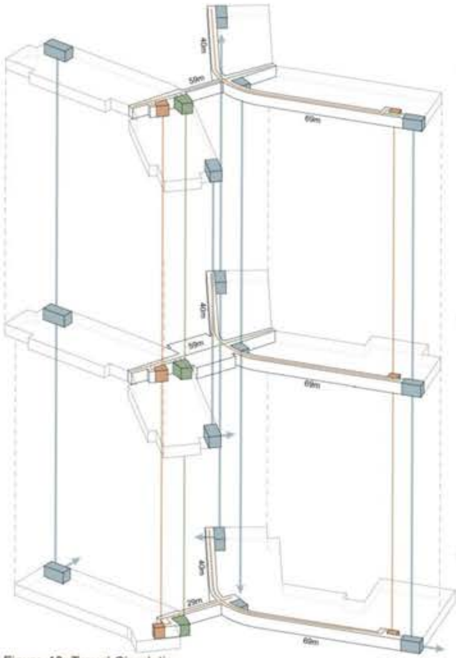

Figure 40: Travel Circulation

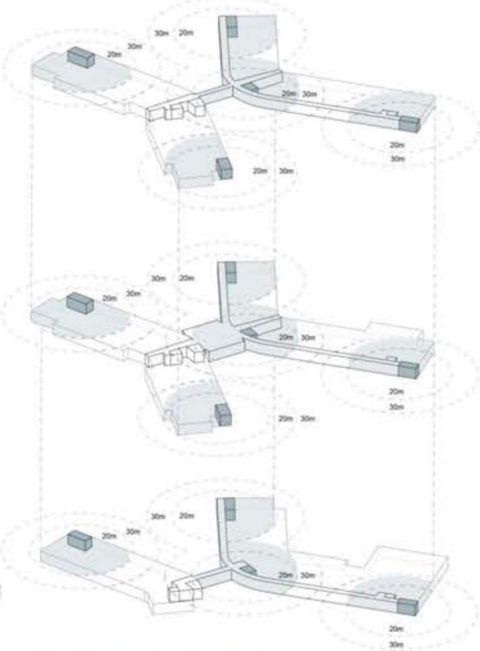

Figure 41: Travel Circulation - Stairs

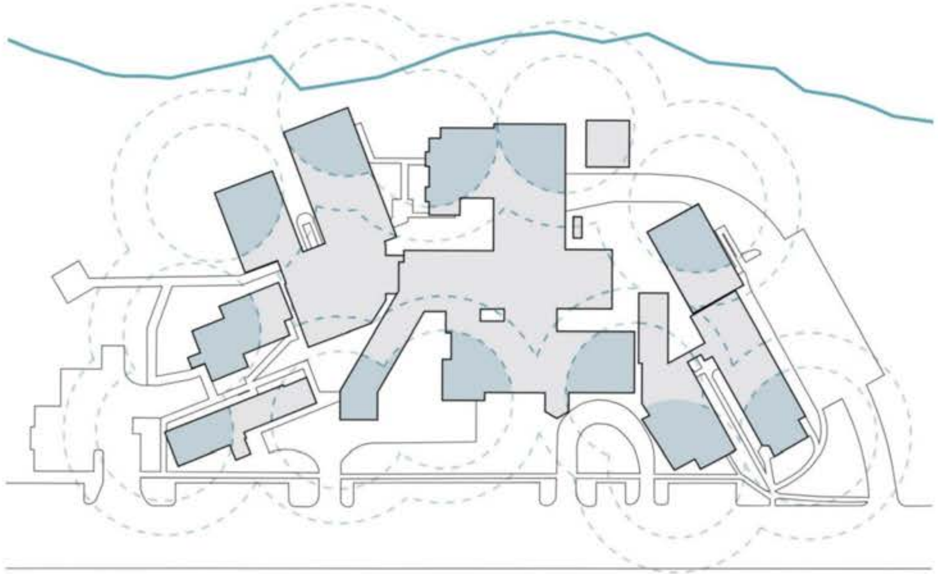

Figure 42: Existing Moruya Hospital – Travel Circulation comparison

8.0 Option Development

8.1 Stacking & Blocking - Option 1

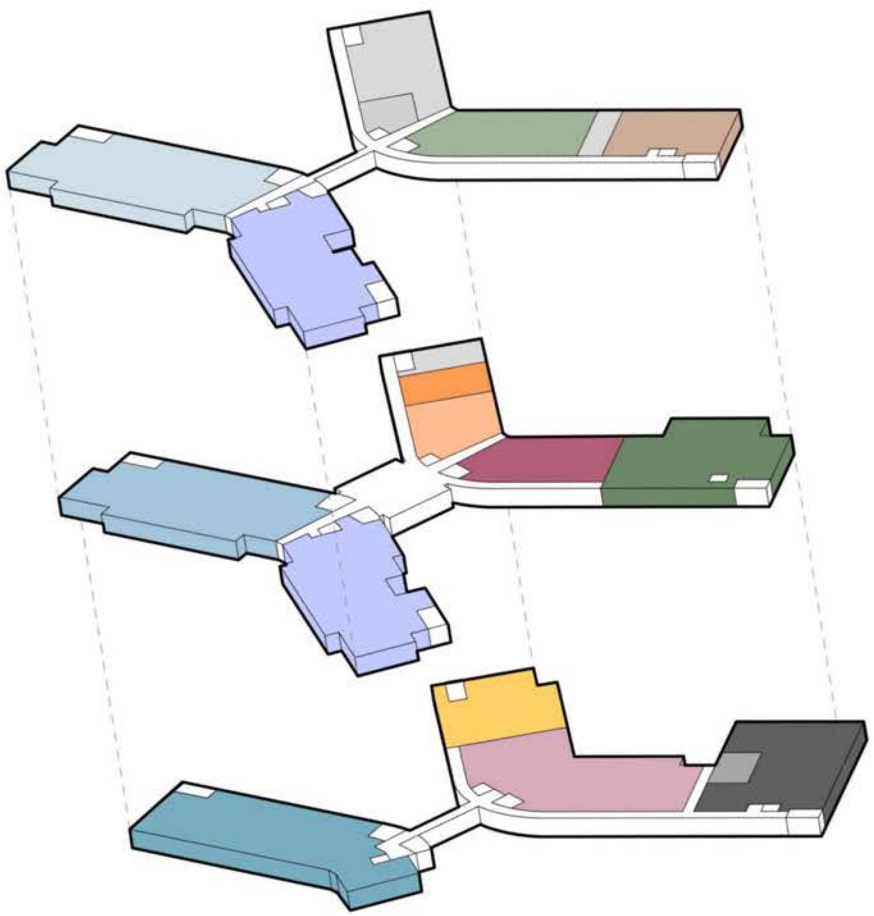

Figure 43: Option 1 Departments

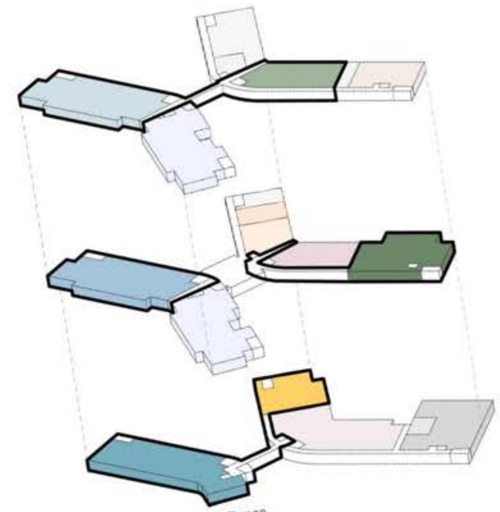

Figure 44: Option 1 24 Hour Zones

Level 01
- Inpatient Unit 2 Surgical
- Ambulatory Department
- Health Information Unit
- Intensive Care Unit
- Executive / Education / Offices

Ground Floor
- Ambulatory Department
- Inpatient Unit 1 Medical
- Pathology
- Pharmacy
- Medical Imaging
- Emergency Department

Lower Ground
- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

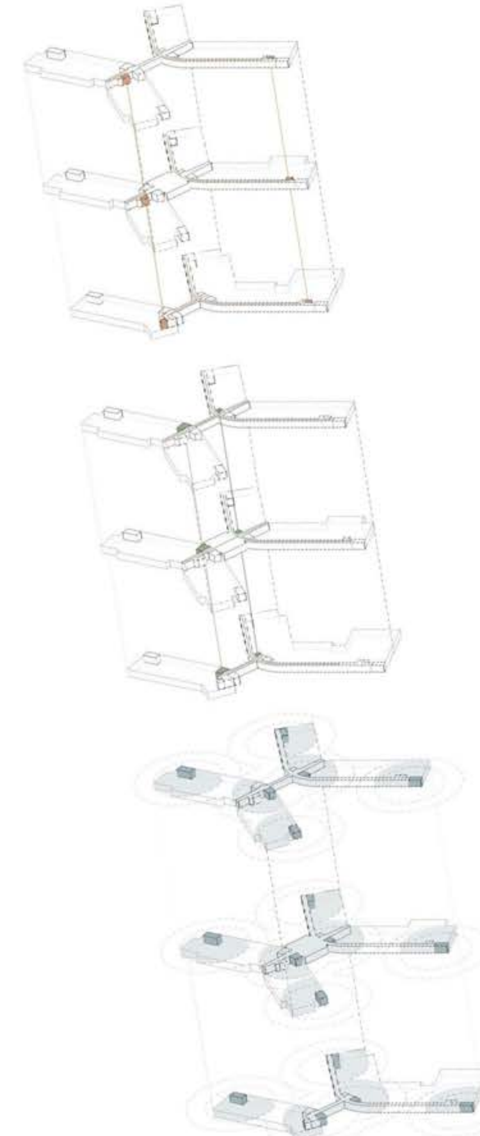

Figure 45: Option 1 Circulation (Public / Clinical / Stairs)

Conrad Gargett

8.2 Stacking & Blocking - Option 2

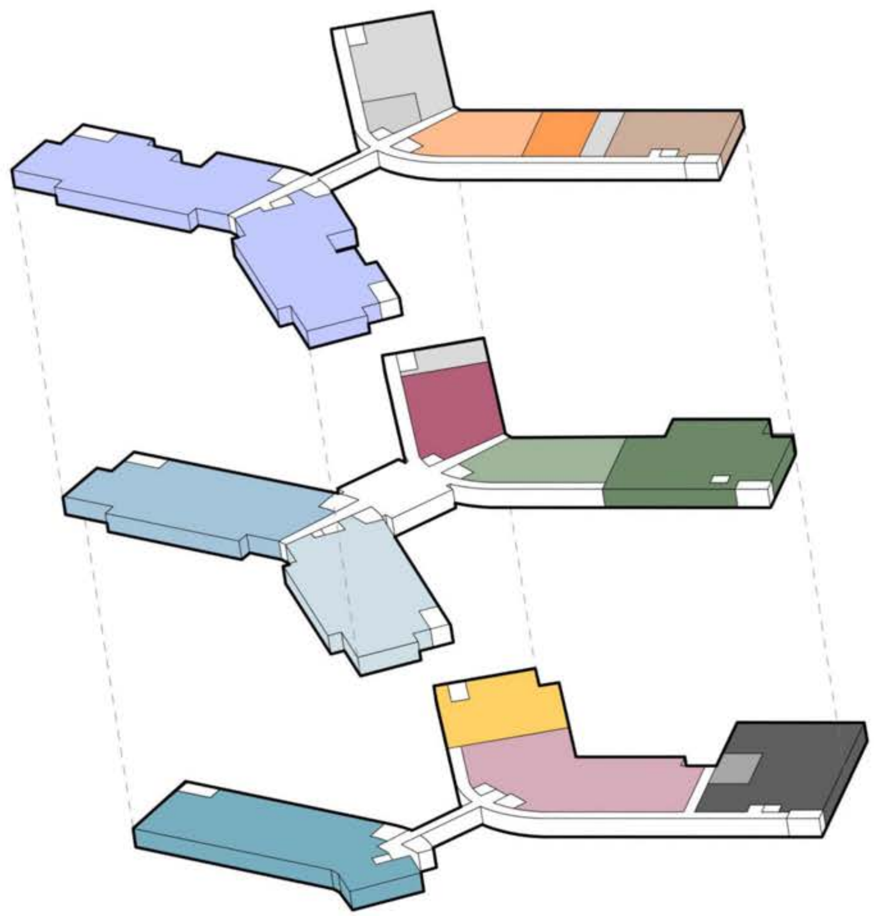

Figure 46: Option 2 Departments

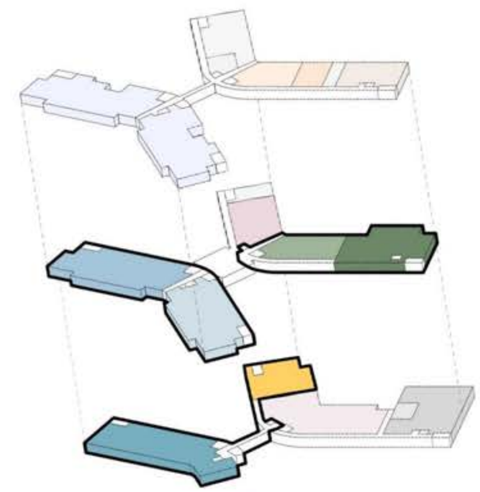

Figure 47: Option 2 24 Hour Zones

Level 01
- Ambulatory Department
- Health Information Unit
- Pathology
- Pharmacy
- Executive / Education / Offices

Ground Floor
- Inpatient Unit 2 Surgical
- Inpatient Unit 1 Medical
- Medical Imaging
- Intensive Care Unit
- Emergency Department

Lower Ground
- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

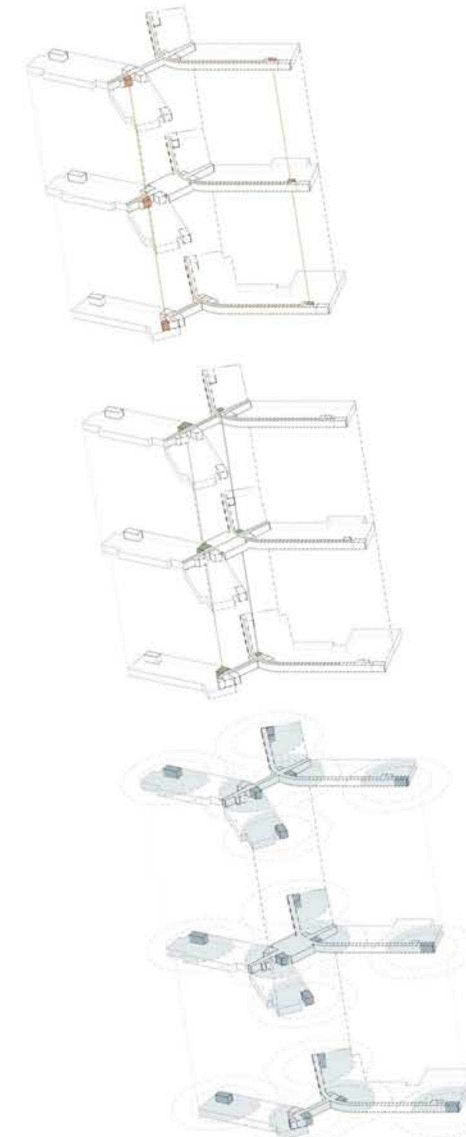

Figure 48: Option 2 Circulation (Public / Clinical / Stairs)

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8.3 Stacking & Blocking - Option 3

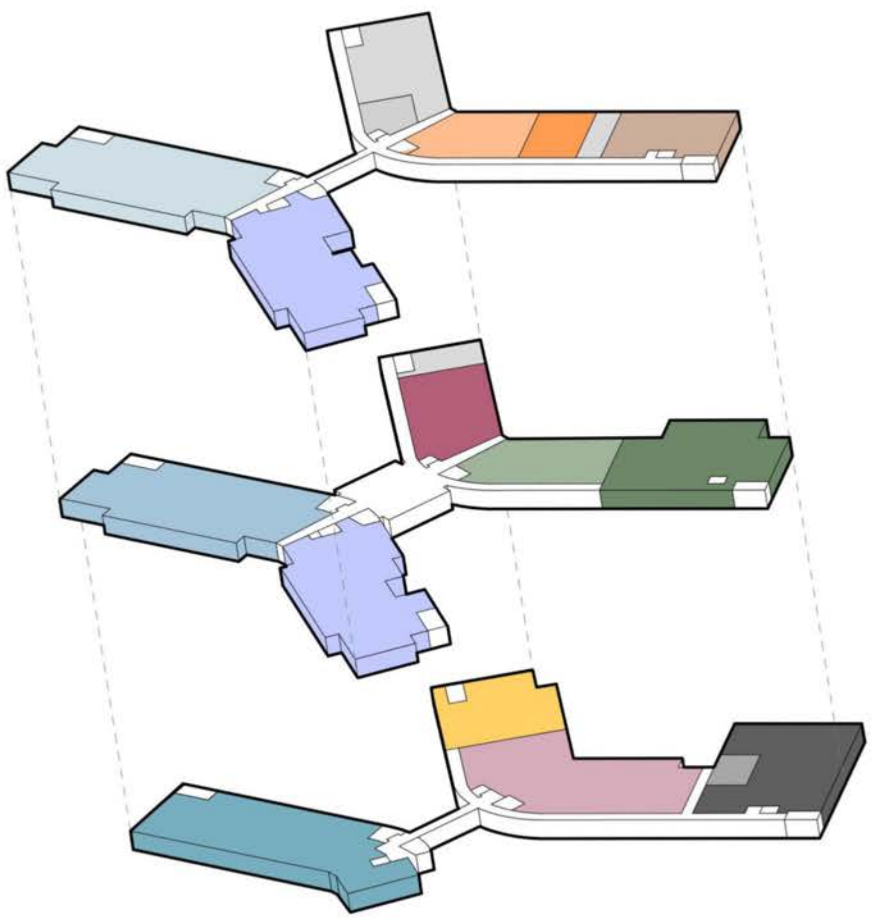

Figure 49: Option 3 Departments

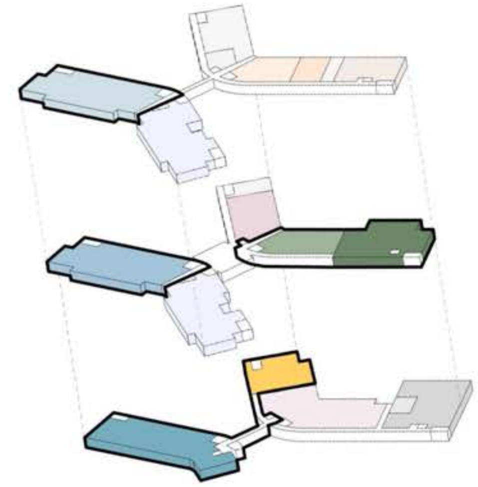

Figure 50: Option 3 24 Hour Zones

Level 01

- Inpatient Unit 2 Surgical
- Ambulatory Department
- Health Information Unit
- Pharmacy
- Pathology
- Executive / Education / Offices

Ground Floor

- Ambulatory Department
- Inpatient Unit 1 Medical
- Medical Imaging
- Intensive Care Unit
- Emergency Department

Lower Ground

- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

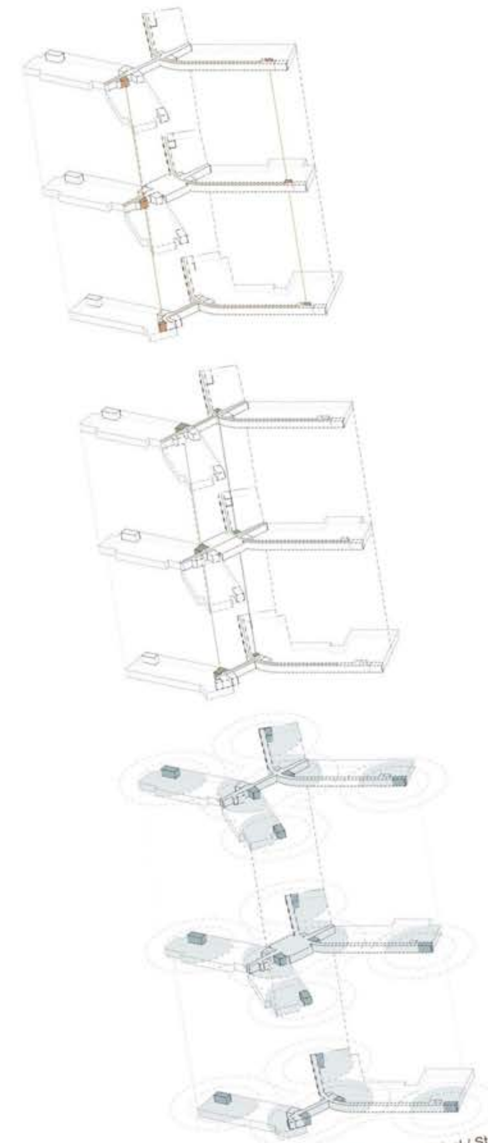

Figure 51: Option 3 Circulation (Public / Clinical / Stairs)

8.4 Stacking & Blocking - Option 4

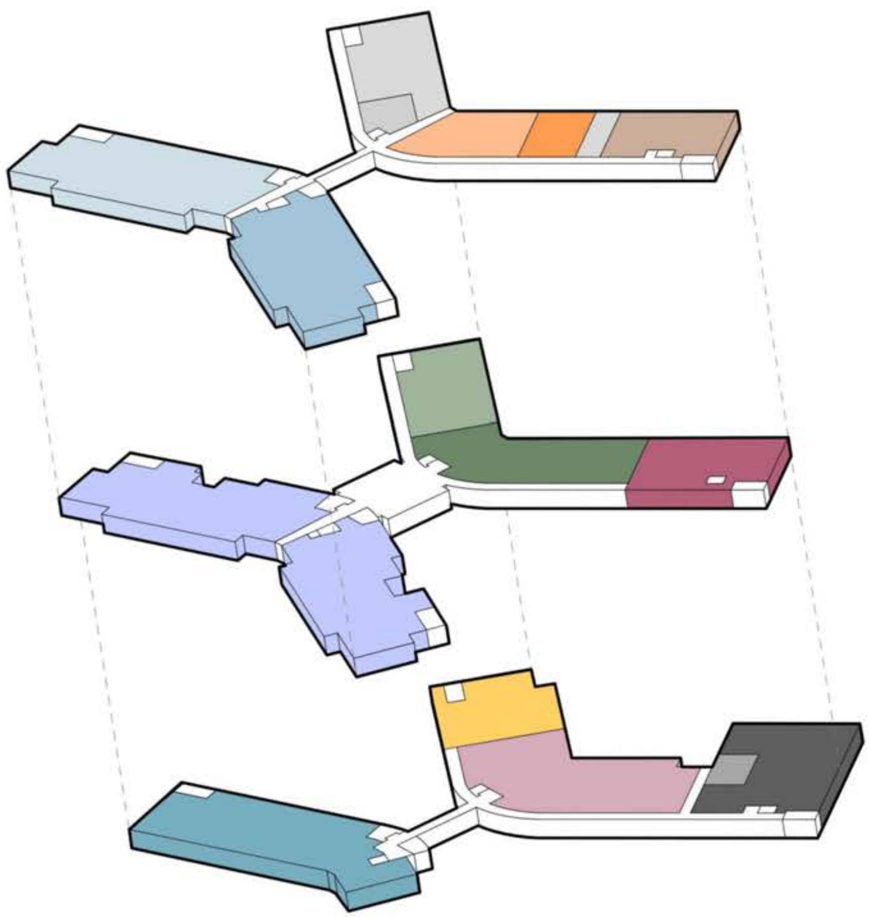

Figure 52: Option 4 Departments

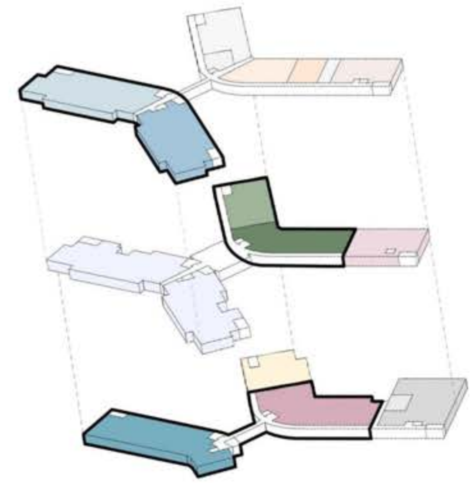

Figure 53: Option 4 24 Hour Zones

Level 01
- Inpatient Unit 2 Surgical
- Inpatient Unit 1 Medical
- Health Information Unit
- Pathology
- Pharmacy
- Executive / Education / Offices

Ground Floor
- Ambulatory Department
- Intensive Care Unit
- Emergency Department
- Medical Imaging

Lower Ground
- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

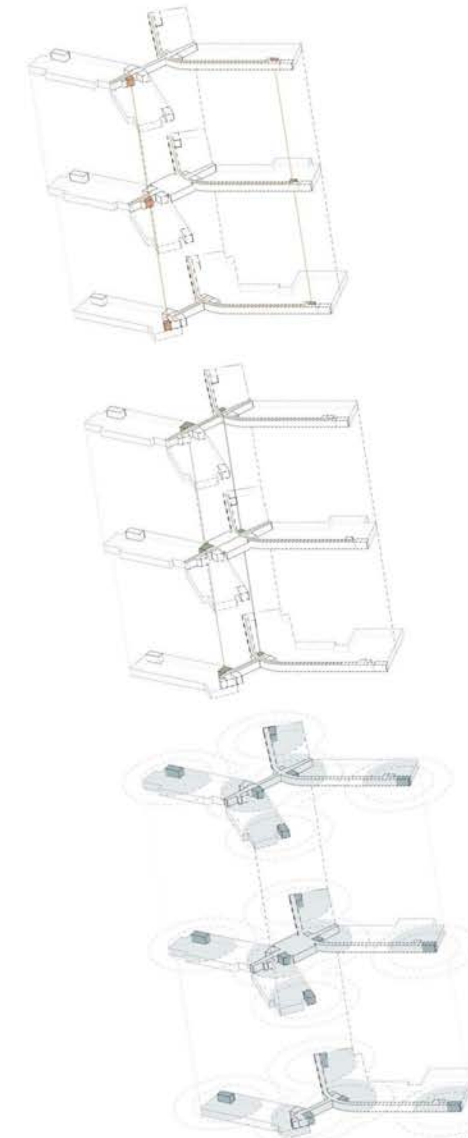

Figure 54: Option 4 Circulation (Public / Clinical / Stairs)

8.5 Stacking & Blocking - Option 5

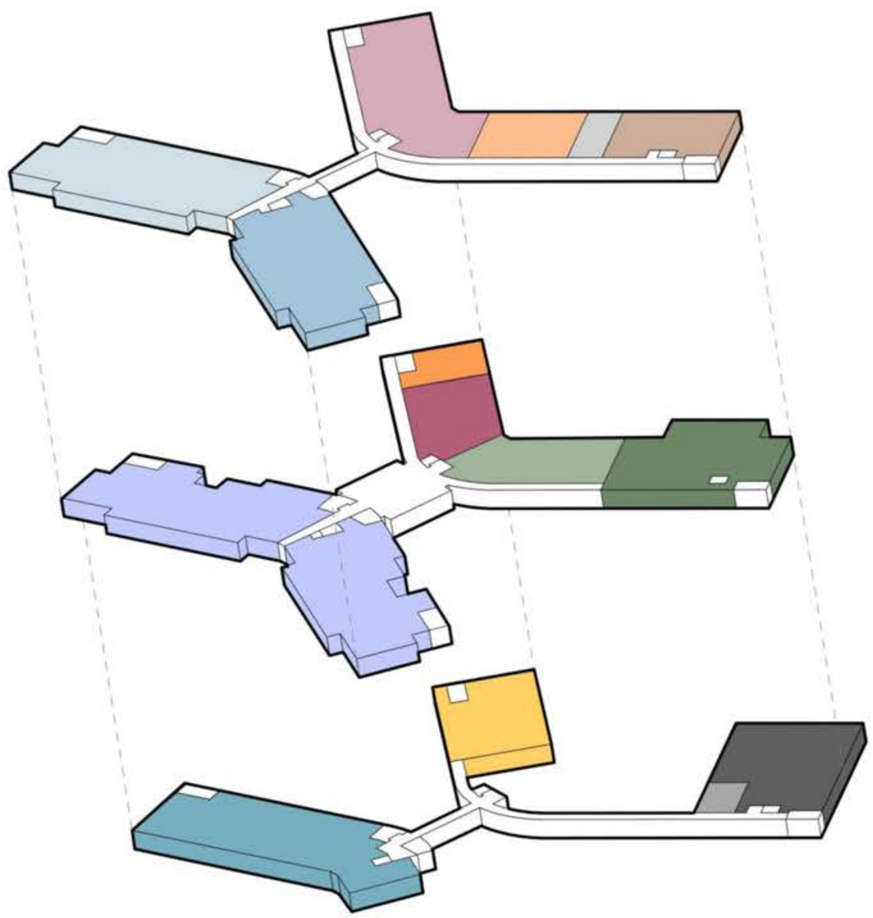

Figure 55: Option 5 Departments

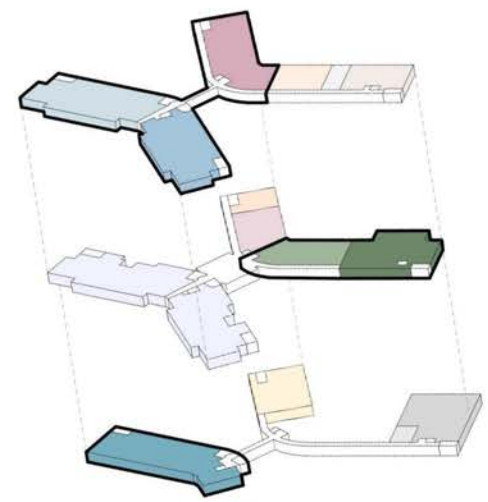

Figure 56: Option 5 24 Hour Zones

Level 01
- Inpatient Unit 2 Surgical
- Ambulatory Department
- Operating Theatres
- Pathology
- Health Information Unit
- Admin / Education / Offices

Ground Floor
- Ambulatory Department
- Pharmacy
- Intensive Care Unit
- Emergency Department
- Medical Imaging

Lower Ground
- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Back of House
- Mortuary

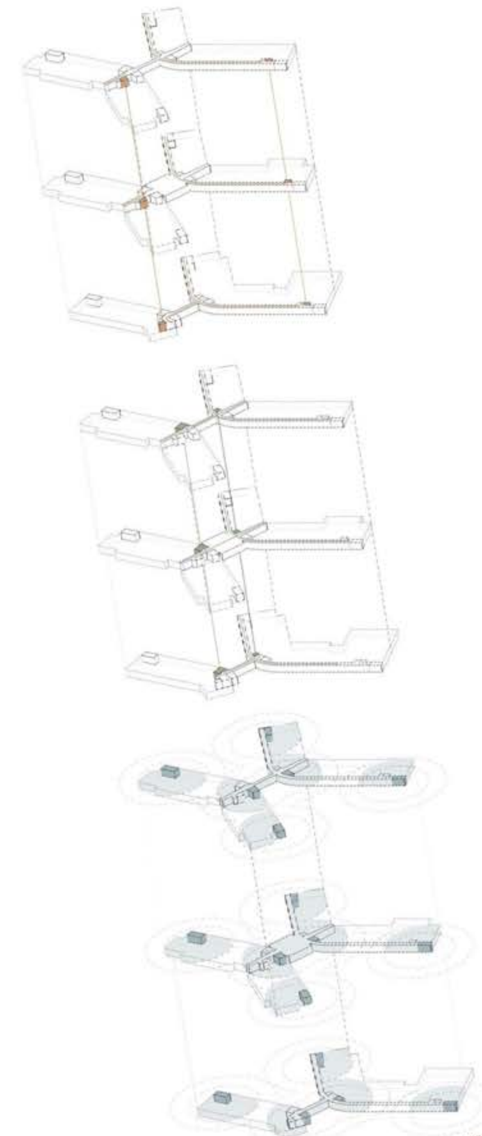

Figure 57: Option 5 Circulation (Public / Clinical / Stairs)

8.6 Stacking & Blocking - Option 6

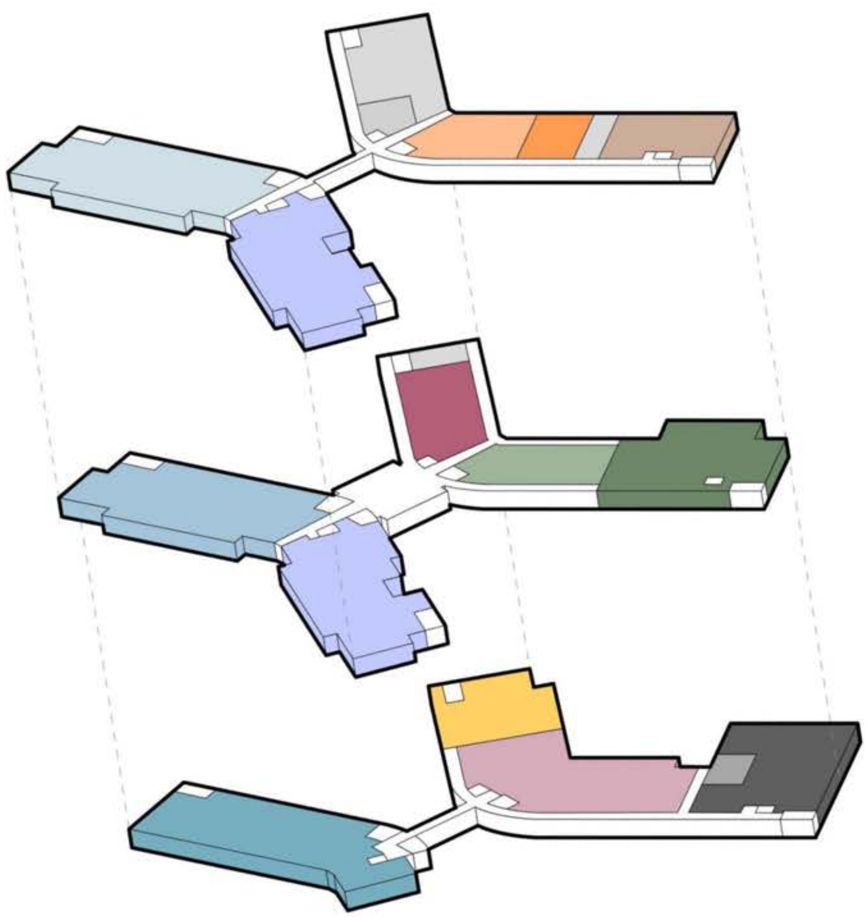

Figure 58: Option 6 Departments

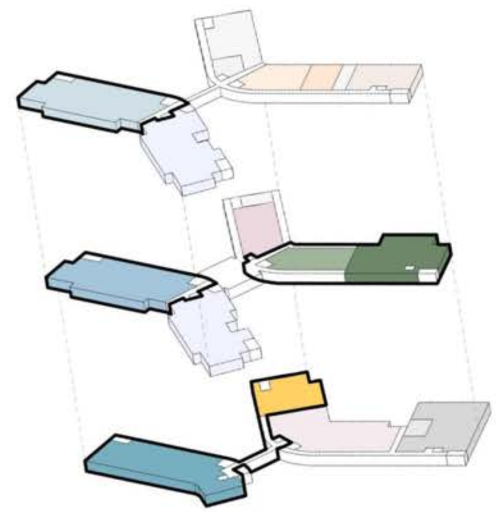

Figure 59: Option 6 24 Hour Zones

Level 01

- Inpatient Unit 2 Surgical
- Ambulatory Department
- Health Information Unit
- Pathology
- Pharmacy
- Executive / Education / Offices

Ground Floor

- Ambulatory Department
- Inpatient Unit 1 Medical
- Medical Imaging
- Intensive Care Unit
- Emergency Department

Lower Ground

- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

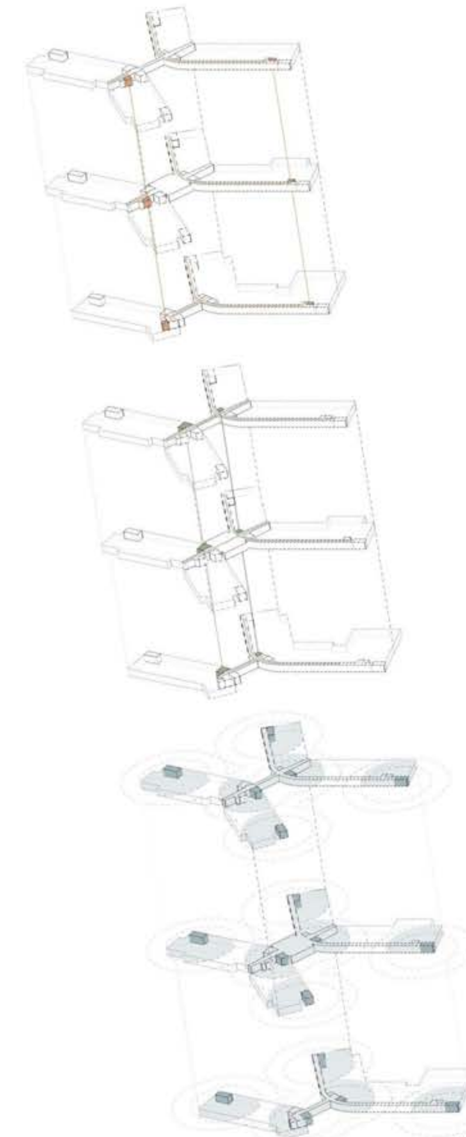

Figure 60: Option 6 Circulation (Public / Clinical / Stairs)

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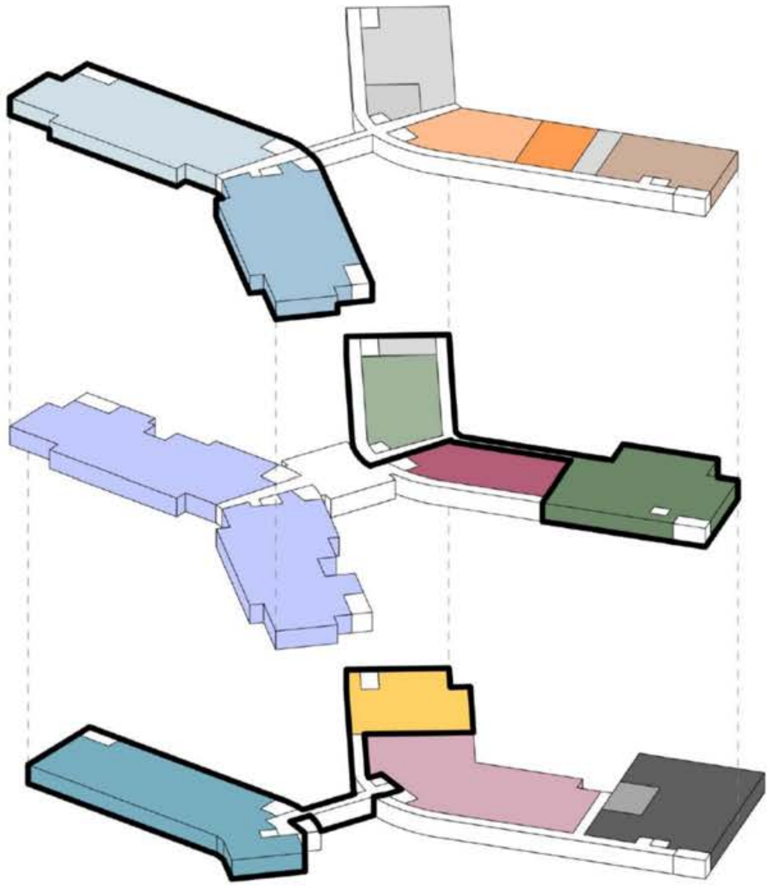
8.7 Stacking & Blocking - Option 7



Level 01

- Inpatient Unit 1 Medical
- Inpatient Unit 2 Surgical
- Health Information Unit
- Pathology
- Pharmacy
- Executive / Education / Offices

Ground Floor

- Ambulatory Department
- Intensive Care Unit
- Emergency Department
- Medical Imaging

Lower Ground

- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

Figure 61: Option 7 Departments and 24-Hour Zones

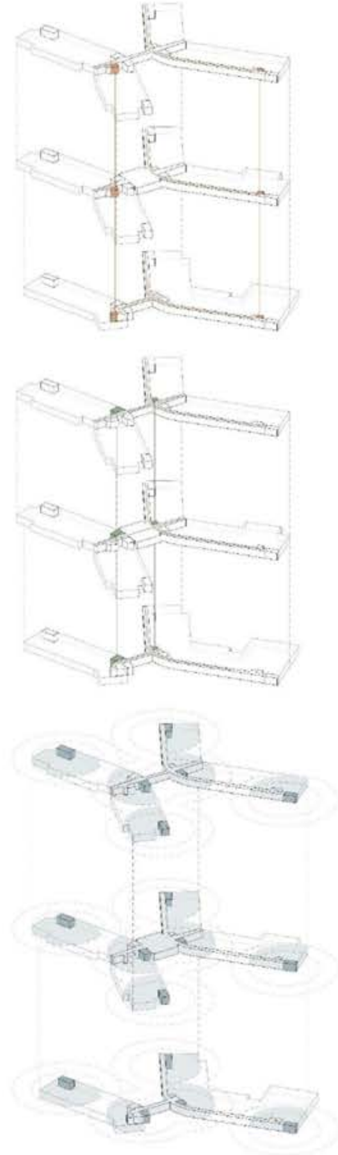


Figure 62: Option 7 Circulation (Public / Clinical / Stairs)

8.8 Stacking & Blocking - Option 8

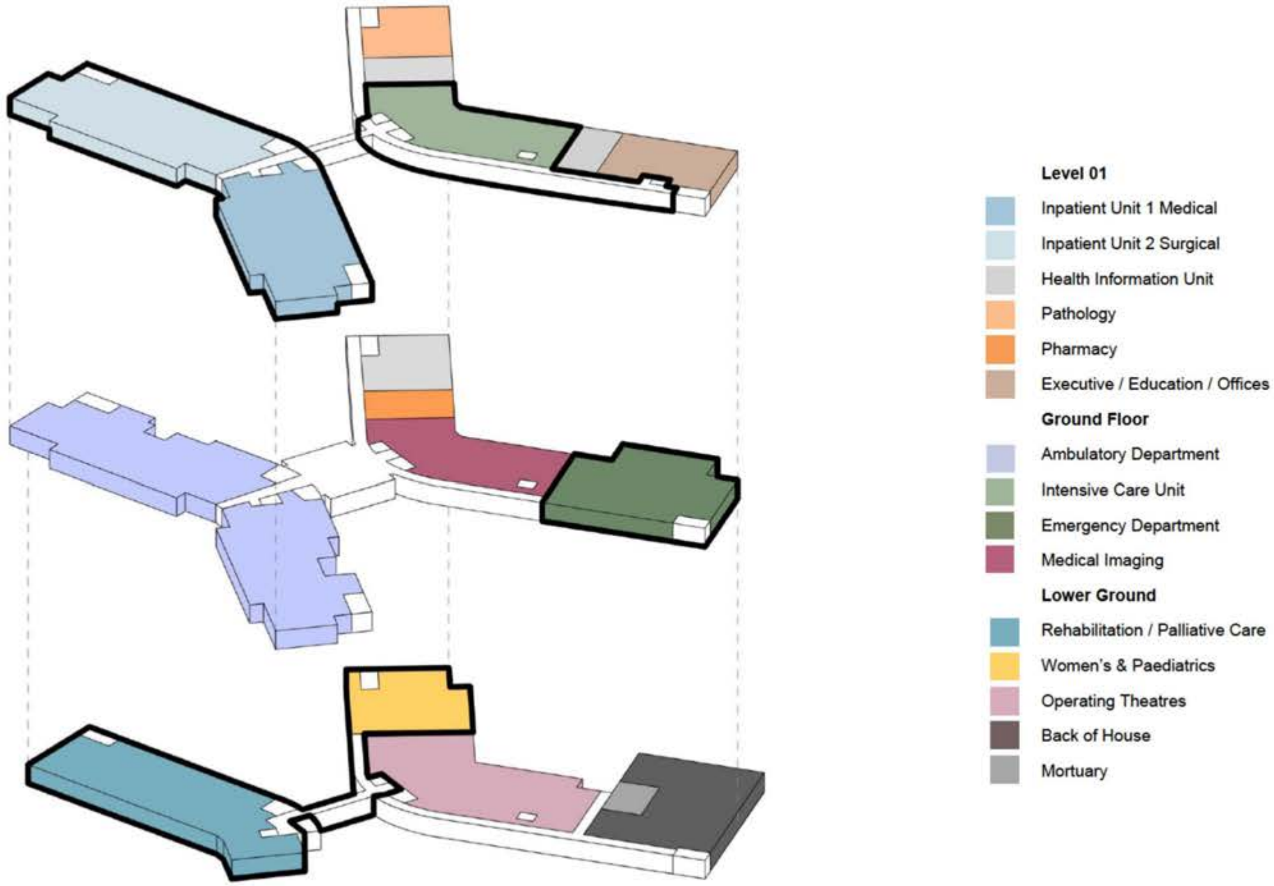


Figure 63: Option 8 Departments and 24-Hour Zones

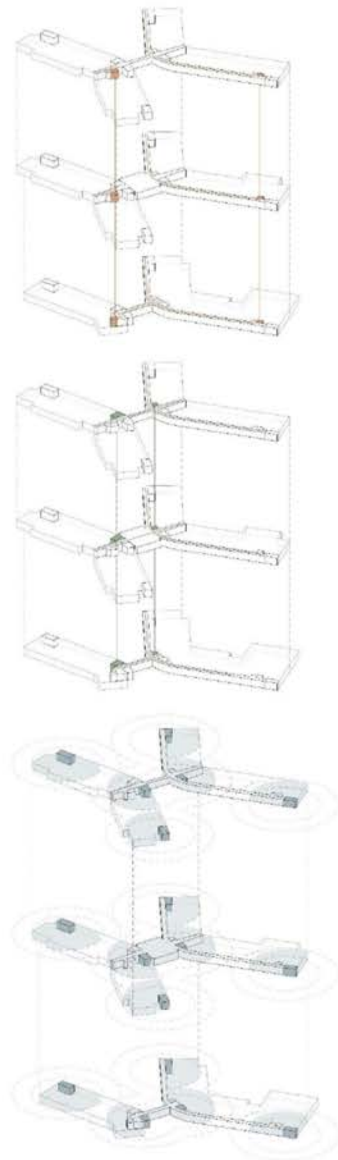


Figure 64: Option 9 Circulation (Public / Clinical / Stairs)

8.9 Stacking & Blocking - Option 9

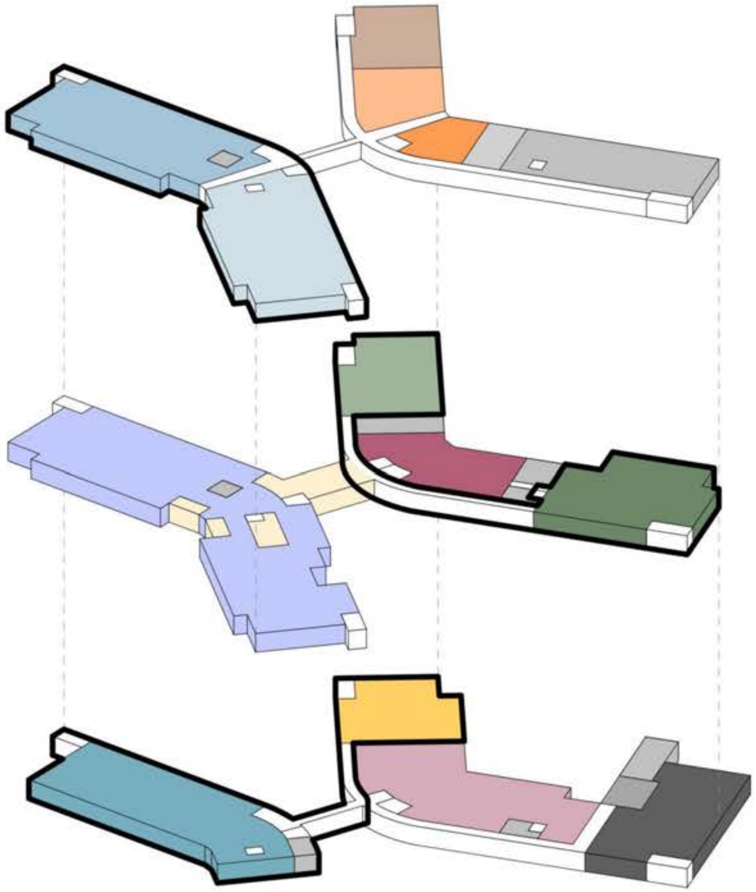


Figure 65: Option 9 Departments and 24-Hour Zones

Level 01

- Inpatient Unit 1 Medical
- Inpatient Unit 2 Surgical
- Health Information Unit
- Pathology
- Pharmacy
- Executive / Education / Offices

Ground Floor

- Ambulatory Department
- Intensive Care Unit
- Emergency Department
- Medical Imaging

Lower Ground

- Rehabilitation / Palliative Care
- Women's & Paediatrics
- Operating Theatres
- Back of House
- Mortuary

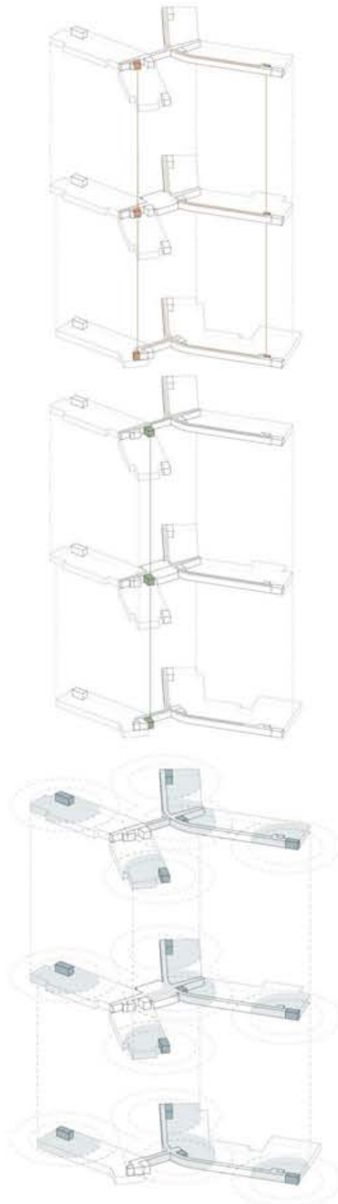


Figure 66: Option 9 Circulation (Public / Clinical / Stairs)

8.10 Endorsed Option – Concept Design

Option 7

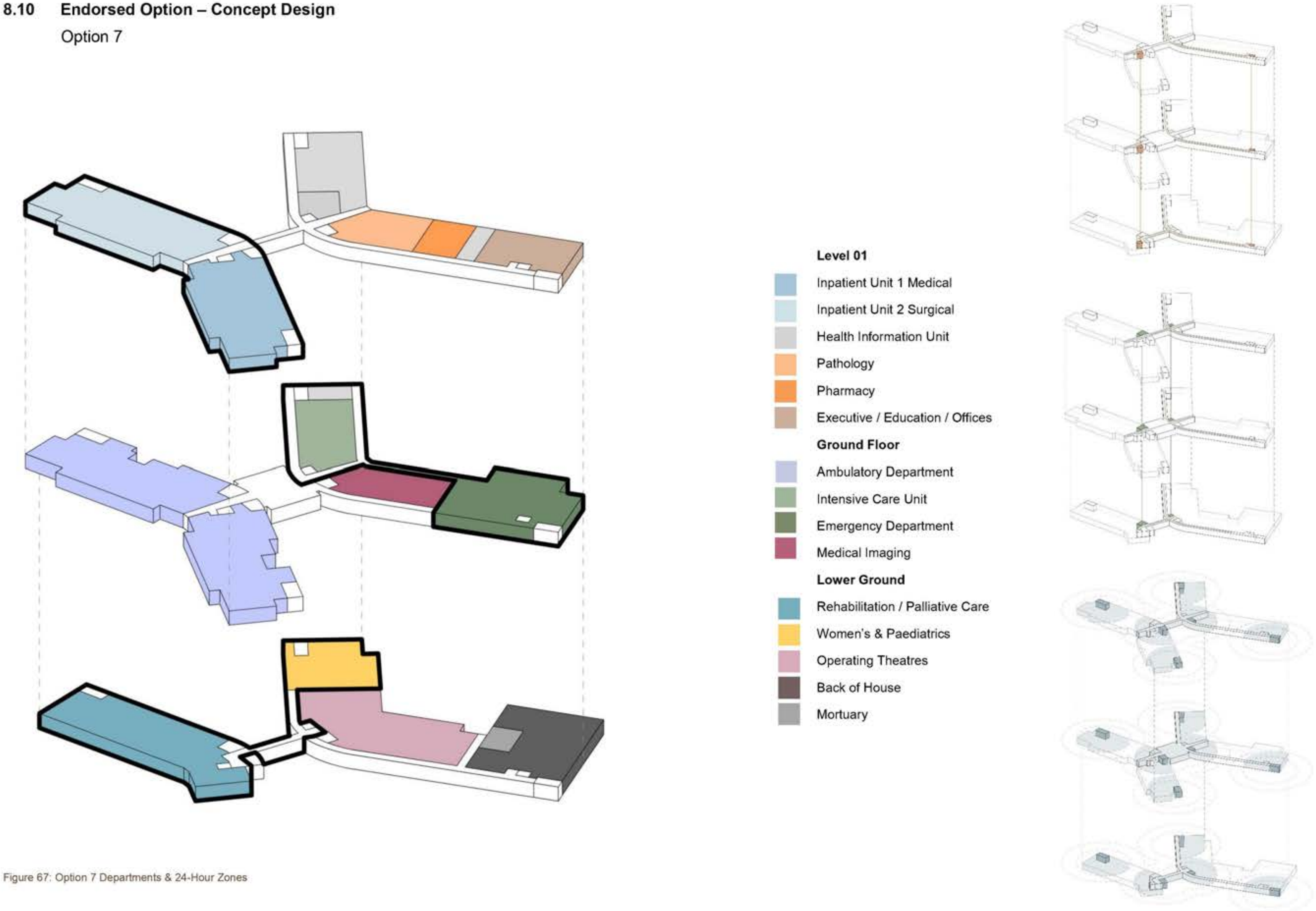


Figure 67: Option 7 Departments & 24-Hour Zones

9.0 Architectural Design

9.1 Architectural Intent

The Eurobodalla Hospital is developed as a direct expression of health, community and sustainability. Creating a hospital for the Eurobodalla community and the specific cultural characteristics and social networks it contains is at the forefront of the design approach. Being on a green field site the project also offers opportunities to respond to landscape in unique and creative ways. The architecture is considered as a whole of precinct opportunity with spaces and parkland throughout the site interplaying with the built form and also providing connection and recreation opportunities for Moruya town and the broader community. Combining social, cultural and spatial expression with the requirements of clinical program develops an exceptional outcome for the Eurobodalla community and broader coastal network.

The idea of 'welcoming' is an integral theme of the public spaces and the architectural expression. Connection to landscape and to Country is a focus throughout the architecture – visually, spatially and experientially. Layering of local indigenous cultural knowledge into public, accessible gathering space allows the whole community to experience the hospital in an environment which supports and validates all facets of the Eurobodalla community.

The building is embedded in the landscape and is a considered part of the natural environment. The building is sited within the northern quadrant of the site away from the Princes Highway which enables quiet and repose. On a building scale, façade treatments respond to the natural qualities of the surrounding landscape. At the scale of patients and staff the façade creates a considered experience of the site landscape.

Experience of the landscape is to begin at the entry to the site from Princes Highway. The unique landscape qualities of the site are experienced as part of a journey into the site and through to the hospital building proper. This journey culminates in landscape spaces which fold into gathering spaces and form the entry to the hospital building. The main entry space is at the heart of this journey and has direct continuous connection with the land and also celebrates views to the western ranges. As part of a living journey the building acts as a threshold for experiencing Country and health.

Four key planning strategies have been prepared to understand opportunities where place-based transformation will optimise benefits from the Masterplan – Assets, Programs, Wellness and Design Attributes:

9.2 Conceptual Framework

The Functional Design Brief has been established by the Project Team, in consultation with SNSWLHD. This document as well as budget and site conditions have informed the design approach as well as incorporating standards and governing policies with close alignment of the AusHFG (8th June 2021), noting that updates to these standards are not pursued regarding any changes made past this date.

Examples informing the design include:

There are limited configurations of bed arrangements in the inpatient unit: for example, where the 2 bed rooms are located is fixed by restricting the locations of the reasonable topography on the site. This design layout framework is to control the building footprint to an economical layout which does not exceed 5 metres over natural ground lines.

Figure 68 - Concept Design

01 Assets	02 Programs
- Tell story of the Place - Avoid duplicity - Wellness focused environment - Design with views in mind - Invest in public space / art / activities - Opportunity to create critical mass - Precinct as conduit or a destination - Buildings to promote collaboration within precincts and beyond	- Live / work new housing forms - Local micro retailers - Research & Development - Cultural and Social Influencer - Responsive & flexible to community needs, industry and education drivers - Food / Market - Hospital / Research as part of the local community rather than a fortress - Activated edges
03 Wellness	**04 Design Criteria**
- Dignified & safe workplace - Evidenced based & innovative MoC - Integrated Care Model - Health services complimentary and embrace digital opportunity - 'Connected Care' – ambulatory models and 'hospital avoidance' strategies - People-centred design (not just patients, but staff, researchers, students, visitors, etc.) - Indoor - Outdoor spaces - Well-being in planning, not just building design (for example: good orientation better than good sun shading strategies)	- Child-friendly / Ageing-friendly / Disability-friendly - Walkable / Accessible - Green Infrastructure - Value-added journeys improve healing & wellbeing - Hospital / Research as a civic precinct (maximising public realm where possible) - Reinforce a sense of place through intuitive way-finding - Improved access, wayfinding (concierge and ICT-enabled) - Design for the future – 'flexible fit policy' flexibility and adaptability and scalability; human-scaled

9.3 Site Setting

The Concept Design has extended upon the Masterplan strategies for the development by exploring multiple options for siting, orientation, connectivity and accessibility. Multiple siting options for the project have been considered in detail which culminated in the preferred site area. The highest point of preferred site area is in the North East quadrant and sits 22m above sea level. A proposed preferred site area was determined in relation to this level when considering this highest level of the site, and subsequent building levels for entering the building. This site also considered lower levels that could take advantage of the slope of the land to reduce excessive costs in earth works. The remaining area of site appears to have opportunity for future development and sites have been identified within the masterplan options

9.4 Building Form

The concept design maintains the single storey appearance from the front of the hospital. This scale does not dominate or distract from any sight line.

The building is structured so that there is no vertical expansion which would disrespect the existing buildings and the scale of the building. Based on demographic projections, there is no short- or medium-term requirement to facilitate expansion.

9.5 Building Materiality

9.5.1 Meeting Place

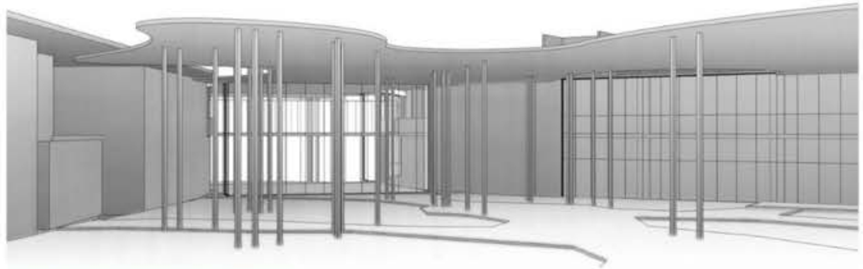


Figure 69: Central Garden Concept Perspective

Granite boulders

- Granite boulders reused from site and placed around central garden

Landscape pathway

- Organic and free form
- Focused zones for gathering and entry

Feature soffit

- Warm, welcoming material i.e. timber, textured CFC panel

Feature column finish

- Shou Sugi Ban timber finish
- Indicating the use of natural burning processes to protect timber

Pathway material

- Feature stone or concrete
- Integrating with landscape

9.5.2 Walawaani (Welcome) Space

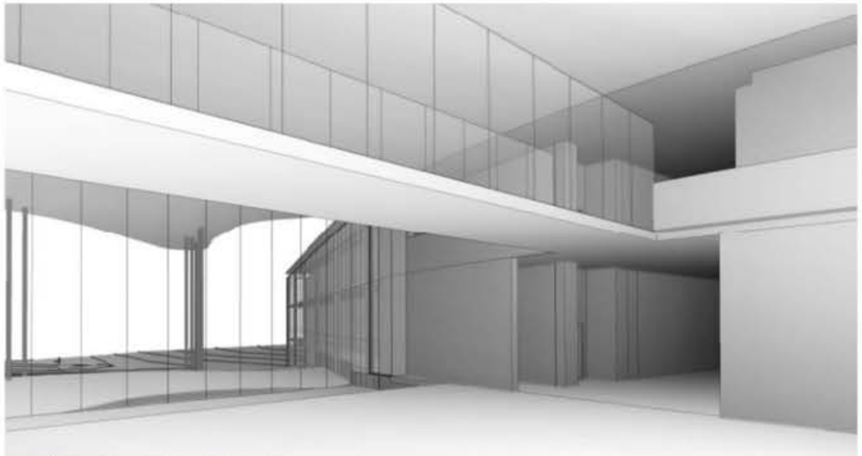


Figure 70: Town Square Concept Perspective

Connections through space
- Elevated walkway with glass balustrade
- Visual connections

Relationship to outside
- Direct connection to garden
- Open and naturally ventilated

Floor finish
- Feature concrete or stone tile
- Aesthetic connection to granite

9.5.3 The Healing Garden

Figure 71: Western Garden Concept Perspective

Planting
- Native planting
- Concrete terraced gardens
- Seating and places for pause on terraces

Tiered seating
- Gabion seating with crushed granite re-used from the site

Feature soffit
- Warm, welcoming material i.e. timber, textured CFC panel

Feature column finish
- Shou Sugi Ban timber finish
- Using natural burning processes to protect materials

Accessible pathways
- Both ramp and stair journey through terraced gardens

9.5.4 Walls

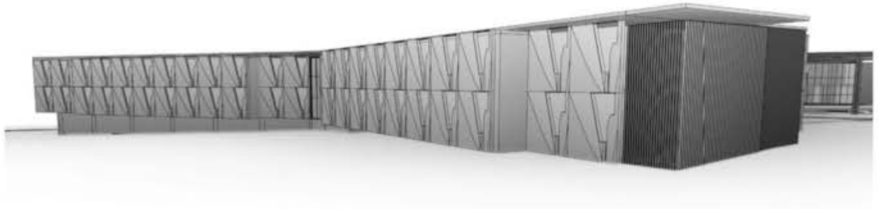


Figure 72: Exterior Walls Concept Perspective

Façade pattern

- Fine grain pattern in façade treatment

Finishes

- Fine grain texture in compressed fibre cement i.e. gloss, matt, textured
- Possible concrete element evocative of granite

Windows

- Modular glazing elements
- Windows to respond to the user/patient experience

Modular façade

- Modular façade panel treatments i.e. compressed fibre cement, possible feature concrete
- Integrated with modular glazing elements

Feature textures

- Combination of smooth and textured panels

9.5.5 Walls

Figure 73: Exterior Courtyard Walls Concept Perspective

Windows

- Modular glazing elements
- Windows to respond to the user/patient experience

Façade materiality

- Activated edges
- Integrated solid and glazed façade elements
- Simple treatments to glazing i.e. modular patterns, selected feature glass

Glazing and façade

- Fine grain pattern in façade treatment
- Integrated with glazing elements

9.5.6 Ends

Figure 74: Wing Ends Concept Perspective

Feature screens
- Lightweight and permeable
- Stainless steel mesh

Screen material
- Secure enclosure
- Timber battens, aluminium battens

Accented ends
- Articulated expression at the ends of the wings

9.6 Environmentally Sustainable Design (ESD)

The new Eurobodalla Hospital presents a significant opportunity for NSW HI and the LHD to evolve the definition of sustainability in the healthcare sector. This project has responded with an ambitious and holistic approach to sustainability that seeks to deliver a resilient, resource efficient asset that enhances health outcomes for the Eurobodalla community through bespoke site-specific, patient-centric design.

The project's approach to sustainability, its aspirations, initiatives and processes are summarised by the ESD consultant's report. This section of the report serves to highlight the sustainability principles and features that have been embedded in to the architectural design that has been developed to date.

The design has progressed its siting, massing, orientation and space arrangements with sustainability considerations at front of mind. The primary orientations of the building are predominantly North or South, thereby minimising the due east and due west exposures that can make solar management challenging. This characteristic is critical for managing indoor environment quality issues such as glare, daylight and thermal comfort as well as peak load of mechanical cooling systems. Consequently, façade design and mechanical design can more readily integrate strategies that harness passive design opportunities and efficient heating and cooling systems. The inner façade orientations are also subtly oriented away from each other to embrace the attractive views and protect the privacy of patients. The feasibility of rooftop PV renewable energy systems is also improved by the building's North orientation.

In addition to the feasibility of natural ventilation to patient rooms being enhanced by the orientation, the building shape presents a natural ventilation opportunity, as part of a mixed mode ventilation strategy, for the public entry area. Not only providing a transition space from outside to inside, the natural ventilation will serve to save conditioning energy for the space and enhance indoor air quality. The extensive shading to the west and east orientations of this space help to extend the serviceable number of hours for this strategy. Investigations into optimised locations of openings for efficient airflow, as well as the potential for skylights, will leverage the value of passive design in this public area.

During the next stage, sustainability will be further embedded into the architectural design through considered approaches to orientation specific façade design (shading, glazing, natural ventilation openings), climate change risk adaptation (future weather analysis) and renewable energy integration (roof, car park, bus shelters). Design opportunities for reducing embodied carbon will be explored, including the possibility of timber structure, as well as optimised material quantities.

The globe's declining biological diversity is a critical challenge for humanity, increasingly considered more urgent than climate change for the health and future of our planet. As a component of the Eurobodalla Sustainability Strategy (captured under the 'Local Focus' category) identified in the Masterplan, biodiversity is an integral part of the project's sustainability success. It is important to recognize the environmental impact of a new building on a greenfield site, and in doing so, attempt to tread softly by adopting a regenerative and restorative approach to site habitats that can support local flora and fauna. In addition to blending the project into the topography of the site, the landscaped areas will be curated to not only provide delight to patients and staff alike, but also mimic native plant species found on the existing site and in the surrounding region. An approach that encourages a diverse range of endemic plants and animals, that represent a complete ecosystem and can remain resilient to the threat of invasive species and future climate, is central to Eurobodalla Hospital's design ethos and aspirations, and our contribution to reversing the trend of declining global biodiversity.

9.7 Car parking

The carpark provides on grade carparking which aligns with the natural contours of the site and provides green, code compliant access to the main entry of the hospital. 366 hardstand carparks are provided based on an average demand as identified in the traffic engineering report. Space for possible future parking is identified which would allow for up to 460 cars – a figure identified as peak demand in the traffic engineering report.

The carparking consists of 3 tiers of parking which fall to the north east of the site with the topography of the land. The uppermost tier sits at approx. RL 19500, the middle tier at approx. RL 17500 and the northern-most tier at an RL of approximately 16000. The tiers of carparking curve with the natural curve of the land and combined with the falls, integrate with the landscape to minimise earthworks.

An access pathway sits at the uppermost edge of the carpark and provides pedestrian access to the main hospital entry. Parallel parking is provided to the south of main entry road adjacent the large external green space. Compliant pedestrian access is provided through the level changes of the carpark via walkways. Walkways are placed between banks of carparks and occur every 35m.

The access road for ambulance and servicing winds with the topography and also provides access to the loading dock. A swale sits adjacent the access road to collect water run-off which forms part of the water sensitive treatment strategy on the site.

The car parking strategy aims to:

- Provide car parking on site to meet the needs of the Hospital operations and allow for future expansion.
- Position of car parking on the site is to minimise vehicle conflicts and queueing around the Hospital entry or Emergency Department.
- Locate the designated staff parking to allow for safe and secure pedestrian movement for staff to and from the Hospital entrance at all times.
- Position parking for persons with a disability (PWD) in close proximity to the Hospital entrance with appropriate pathway connections and crossing facilities.

9.8 Retail Strategy

Retail outlets are currently concentrated in Moruya Town Centre, in various small to medium scale stores. On the Eurobodalla Health Service site, space has been allocated that can be used for amenity retail (cafes, groceries, etc). This will be reviewed and confirmed during the next stages of the project. The below is an example of how this strategy can be achieved within the current foyer.

A variety of retail functions will be included within the new project with the intent to provide various prospects for increased amenity for all users, through convenient and accessible opportunities to access services outside of the clinical based services.

Such facilities will provide activation of public space and assist in making spaces more welcoming and vibrant for users. Commercial and retail offerings can provide a source of revenue through tenancy leases as well as increase safety through activation and CPTED (crime prevention through environmental design). Activation is created by people who inhabit the foyer and "Walawaani", therefore the retail offering needs to be integrated and configured in a way that enables life to exist.

Principles through which commercial interests will be planned for include:

- Activity – Intensity and diversity of uses;
- Movement – Connectivity and walkability; and
- Character and Environment

SNSWLHD will develop strategies for the project that work toward successful place-making, including:

- Place Management – place branding and PR activities, ongoing revenue streams, events and programming, and Hospital Auxiliary pop-ups.
- Amenity – entry statements and wayfinding, intimate and useable public spaces, shade, lighting, shelter, street furnishings and public art, walkable areas.

Final inclusion and type of these services will be subject to further investigation.

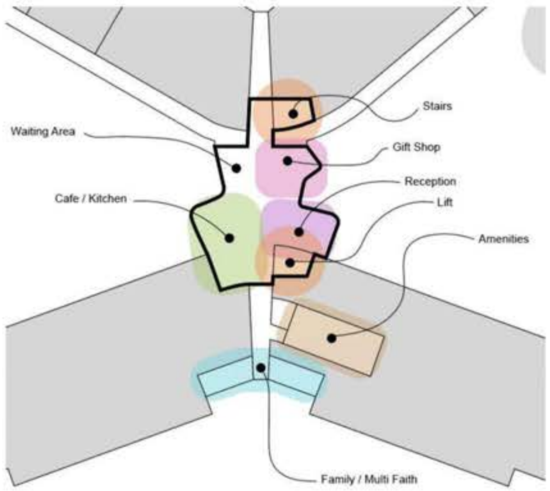


Figure 75: Retail Strategy Example

9.9 Landscape Architecture

9.9.1 Design Philosophy

The design philosophy behind the landscape architecture concept is to respect and embrace the existing site parameters, enhance the existing natural environment, integrate the hospital architecture and functionality, and overlay design elements that reflect the local cultural heritage. The hospital is located on a large and undulating site, currently used for grazing.

The landscape design will aim to embrace and enhance the natural setting, provide external amenities and facilities, and create functional solutions for necessary hospital services and utilities. Landscape strategies and opportunities build on green infrastructure, landscape principles, design approach and mapping of significant landscape settings and elements identified in the Masterplan report.

What is the story of the place?

What are the indicators for success?

What is the history of the site?

What are the needs of the place?

What is the purpose of this place?

This will in turn inform the development of the landscape design in the ensuing stages of design work embracing opportunities to reinforce and consolidate the existing landscape while developing an external environment which will enhance the experience of patients, visitors, and staff.

Figure 76: Quality landscape in public space

[SOURCE: Adapted from NSW Greener Places Establishing an urban Green infrastructure policy for New South Wales (2017).]

9.9.2 Key Objectives

Figure 77: Key Objectives

9.9.3 Strategies

- Visual outlook from hospital
  - Retain existing trees
  - Maximise view and sight lines
  - Buffer and screening planting
  - Borrowed landscapes
- Room for physical activity
  - Playgrounds
  - Walking tracks
  - Stairs and ramps for physiotherapy
- Create spaces of various sizes for different uses
  - Intimate spaces for quiet contemplation
  - Small family groups
  - Grief and counselling
  - Meetings
  - Staff lunches
  - Bigger fundraising events
- Stimulate the senses
  - Provide seasonal interest
  - Bush Tucker plants
  - Plants with texture
  - Scented flowers and bark
  - Soothing sound of running water and wildlife
- Design for comfort outdoors
  - Microclimates
  - Shade and wind protection
  - Prospect and refuge
  - Comfortable seating
  - Wayfinding and easy navigation
  - Crime Prevention through Environmental Design (CPTED)
- Design for the local environment
  - Native and endemic plants
  - Biodiversity corridors
  - Riparian and water catchment
  - Rehabilitation strategies
  - Green infrastructure initiatives WSUD
  - Natural and locally sourced materials
  - Permeable surfaces
- Walking and cycling connections
  - Accessible for all
  - Destinations and wayfinding
  - Wider pathway connections
- Function spaces
  - Inclusive and accessible
  - Multiple of uses and sizes
  - Seasonal and annual events
- Destination and recreation uses
  - Hospital and Community uses

9.9.4 Therapeutic Landscapes

Therapeutic landscapes are an integral contribution to patient health outcomes and staff satisfaction alongside staff satisfaction and functional requisites of the hospital campus. Therapeutic landscapes provide for the health needs (wellness, healing and distraction) of visitors, staff and the general community. It supports the hospital program by designing with and for nature to maximise the wellbeing and healing outcomes for patients, their families and staff.

Health as a journey:

- Journey of wellbeing
- Journey of recovery
- Journey of connection
- Journey of caring
- Journey of mindfulness

9.9.5 Vision

To foster a landscape that connects with Country and the surrounding local identity and environment whilst providing a positive health experience.

> *"Well-designed and maintained parks, streets and landscapes are integral features of a liveable urban environment, improving the wellbeing of local communities through engagement with enriching, diverse and stimulating public spaces."*

Ben Willsmore, Chapter President, The Australian Institute of Landscape Architects (South Australian Chapter)

[SOURCE: Creating Greener Places for Healthy and Sustainable Communities]

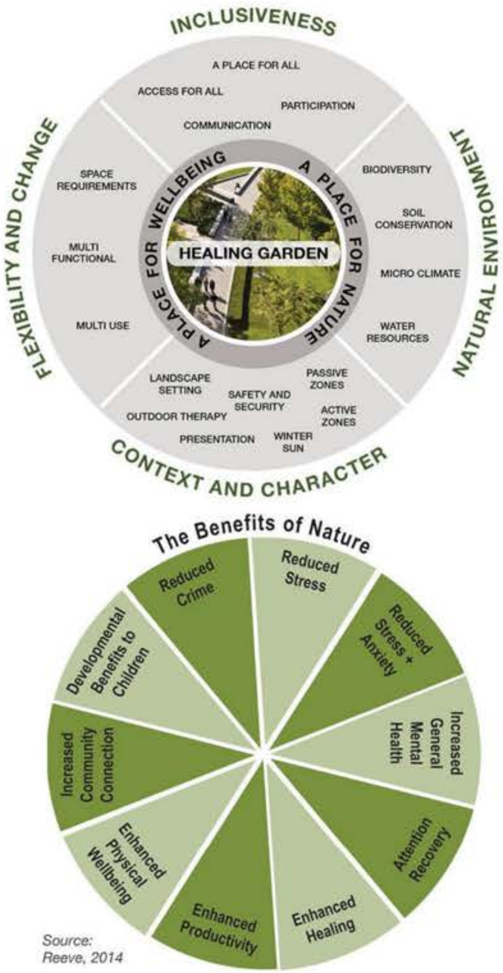


Figure 78: Therapeutic landscapes

9.9.6 Cultural Storylines in the Landscape

The report has identified known key local storylines and many of these have a connection near or along the Moruya River. The lower section of the hospital site is within a flood plane and overland flow paths fall to this catchment. By collecting these stories and analysing them through key words and themes a common thread is able to be identified. In doing so, the landscape design intent is to create a meaningful landscape canvas for layering of cultural storylines through art, form and function within the hospital landscape setting. Below are the key words that reappeared throughout the recollections and storylines.

Figure 79: Yuin Stories Word Map

Through collaboration with the local community and artists the integration of cultural and symbolic design elements and references are woven into the everyday landscape.

Figure 80: Local community collaboration

- Learning from first languages and placenames
- Developing mutually beneficial relationships with country
- Reawakening memories of cultural landscapes
- Finding common ground

Figure 81: Seven "Rock Pools"

Figure 82: Proposed Built Form

9.9.7 Landscape Site Analysis

Eurobodalla hospital is sited on a large undulating site with many established trees and natural features. The site is currently used for grazing and has residential to the north and highway to the south. Acid sulphate soils, biodiversity and other physical environmental factors of the site were previously documented in the masterplan report.

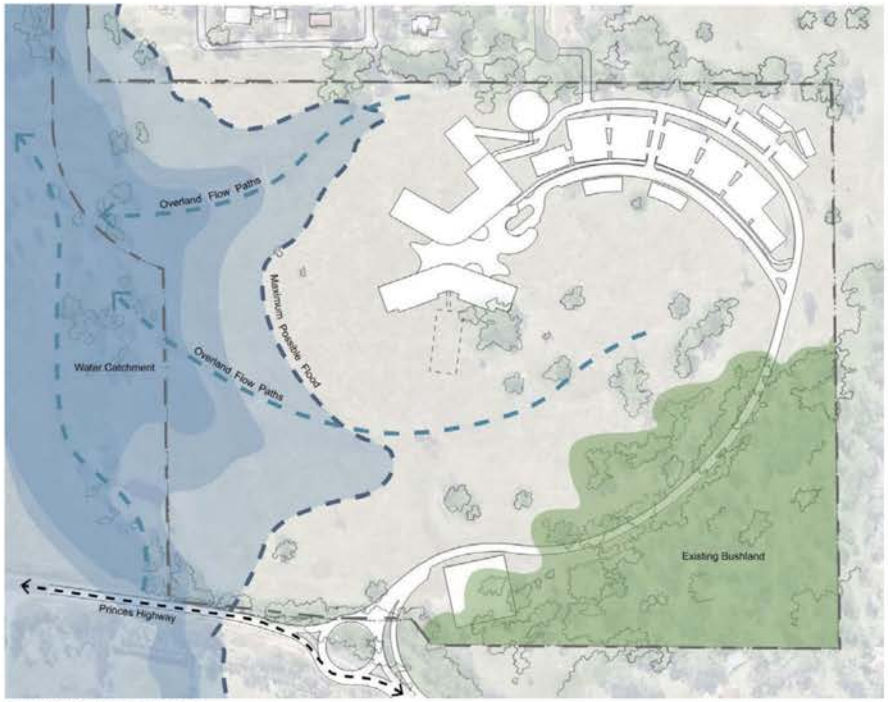


Figure 83: Landscape Analysis

9.9.8 Landscape zone diagram

Using the site analysis information, combined with the physical attributes and limitations of the site in conjunction with the functional requirements and layout of the hospital the following character zones were designated. These zones serve different functional and aesthetic purposes and the character of each zone changes to meet these needs. Each zone is expanded upon further in the report.

Figure 84: Proposed Landscape Zones

9.9.9 Key Landscape Zones and Storyline Layering

The previous zoning diagram illustrated the importance of the below three main hospital landscape zones, the community space, the central hospital hub and the arrival to the hospital. These three zones will be pivotal in providing external spaces for healing and wellbeing as well as community gathering and integration.

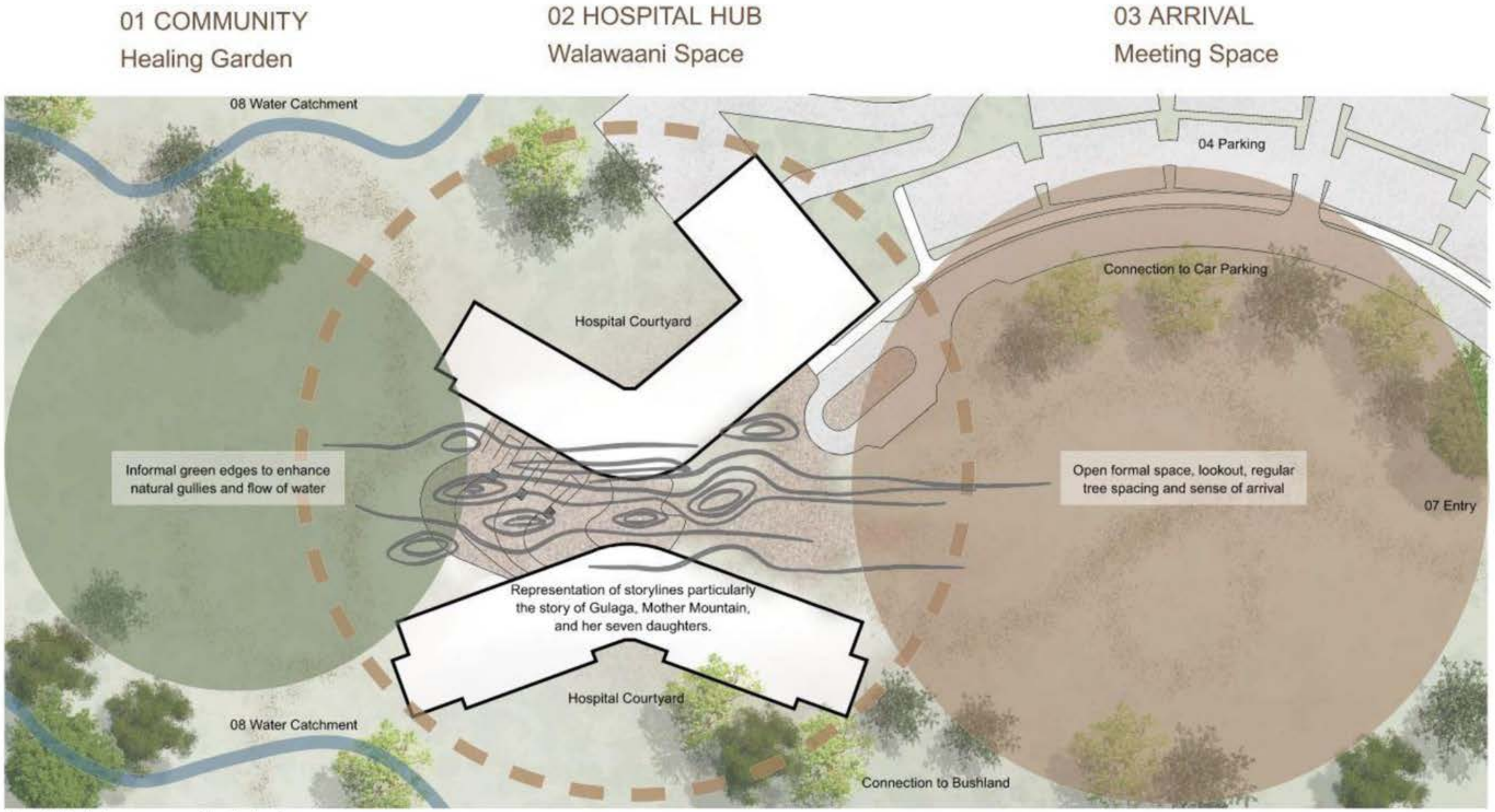


Figure 85: Key landscape zones and storyline layering

9.9.10 Landscape zones – Community

Key Design Elements

- Tree lined edges
- Views
- Implemented in stages
- Community uses
- Nature based play
- Physiotherapy
- Engaged with surroundings
- Community garden
- Bush Tucker planting
- Spaces for gathering
- Fundraising events
- Informal amphitheatre
- Patients, Staff, Visitors and Family
- Broader community
- Endemic Planting
- Improved environmental outcomes
- Shelter and picnic facilities

Figure 86: Landscape zones – community

Figure 88: Landscape zones – community imagery

9.9.11 Landscape zones – Hospital Hub

Key Design Elements

- Tree lined edges
- Views
- Implemented in stages
- Community uses
- Nature based play
- Physiotherapy
- Engaged with surroundings
- Community garden
- Bush Tucker planting
- Spaces for gathering
- Fundraising events
- Informal amphitheatre
- Patients, Staff, Visitors and Family
- Broader community
- Endemic Planting
- Improved environmental outcomes
- Shelter and picnic facilities

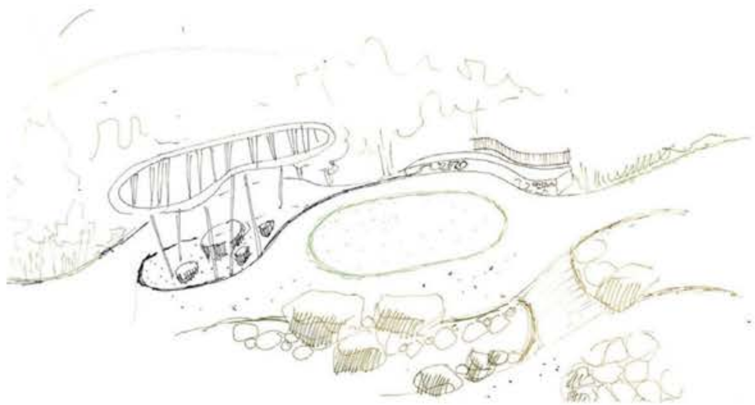


Figure 87: Landscape zones – hospital hub

Figure 89: Landscape zones – hospital hub imagery

9.9.12 Landscape zones – Arrival

Key Design Elements
- Multi-functional
- Framing the hospital architecture
- Clear directions
- Way finding

Figure 90:Landscape zones – arrival imagery

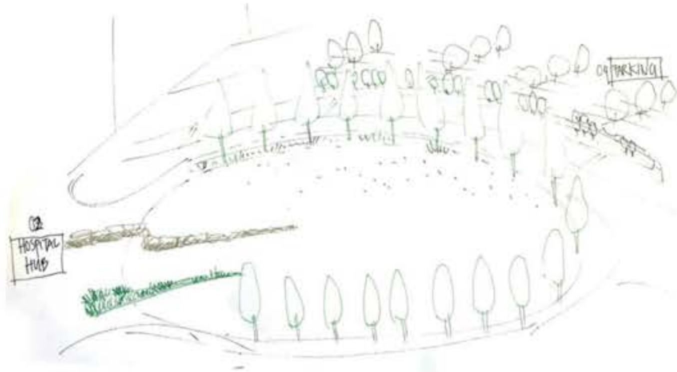


Figure 91: Landscape zones – arrival

9.9.13 Landscape zones – Parking

Key Design Elements
- WSUD
- Connections and wayfinding
- Easy to navigate
- Accessibility
- Drop off zones
- Surface treatment
- Shade and buffer
- Visual amenity
- Clear directions and routes
- Macrophytes
- Filtration of water run off
- Detention basin

Figure 92: Landscape zones - parking

9.9.14 Landscape zones – Landscape Buffer

Key Design Elements
- Endemic re-vegetation
- Bat deterrent species
- Fauna boxes
- Long term project
- Self-sustaining and weed suppressing
- Ecological corridors
- Visual screen for residential

Figure 93: Landscape zones - landscape buffer

9.9.15 Landscape zones – Bushland

Key Design Elements
- Enhance and protect existing vegetation
- Provide pathway opportunities
- Lightly touch the ground
- Simple resting spots
- Flora and Fauna information
- Natural materials
- Opportunities to integrate local storylines
- Educational opportunities
- Ecological corridors
- Existing Trees
- Bush regeneration

Figure 94: Landscape zones – bushland imagery

9.9.16 Landscape zones – Entry

Key Design Elements

- Easy to navigate
- Enhance the identity of the hospital
- Narrative of place
- Journey through the site
- Locally sourced rocks
- Strategically placed elements to frame views

Figure 95: Landscape zones – entry imagery

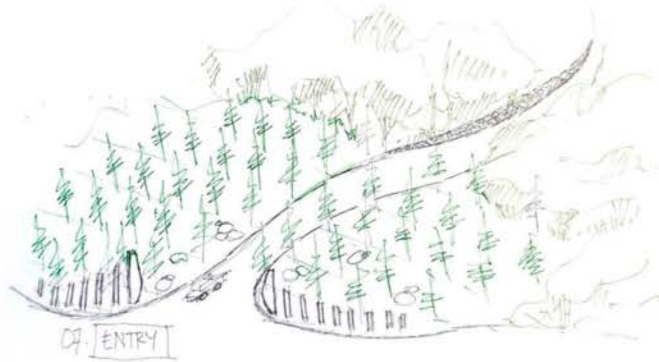


Figure 96: Landscape zones – entry

9.9.17 Landscape zones – Water Catchment

Key Design Elements

- Seasonal interest
- Dry and wet elements
- Endemic wetland species
- Utilize site rock and boulders
- Ecological corridors

Figure 97: Landscape zones – water catchment imagery

9.9.18 Landscape zones – Planting

The planting strategy throughout is to use predominantly locally endemic species with an emphasis on the local bioregional habitat planting. Habitat trees for swift parrot and regent honeyeater, two endangered species locally found, are to be included in areas suitable for habitat like the buffer planting, and bushland zones. Bat deterrent species are recommended along the residential edge of the site but trees that attract bats could be planted in areas further away from the main hospital grounds to provide habitat or food trees for both the Grey heading flying-fox and Eastern Freetail Bat.

Currently the site contains many mature remnant trees of Angophora and Eucalyptus, these are to be retained where possible, and new planting should compliment. The river flat areas contain small groves of swamp oak - casuarina glauca to western boundary, similar vegetation that coexists with swamp oak should be used along drainage lines and within riparian zones. Such species include Casuarina glauca, Carex appressa, Juncus gregiflorus, Eleocharis dietrichiana, Cyperus sanguinolentus.

Trees currently absent but normally found in the bioregion include:

Eucalyptus bauerinana,

Eucalyptus bosistoana,

Eucalyptus melliodora,

Eucalyptus viminalis

Habitat Trees:

Corymbia maculata

Eucalyptus robusta

Other Plants:

Dichondra repens

Carex appressa

Juncus articulatus

Themeda triandra

Casuarina glauca

Angophora floribunda

Angophora subvelutina

Eucalyptus eugenioides

Eucalyptus tereticornis

Sarsaparilla and bloodwood bush medicine plants

Tea tree once grew all through the area

Native Cherries

Won-dharma bush

Garara sticks

Burrawang leaves

Figure 98: Native planting

Figure 99: Landscape zones - planting

Native Raspberry
Rubus rosifolius
No Dhurga name available
Food source: fruit eaten

Devils Twine
Cassytha spp
Snotgollin
Food source: fruit eaten

Rib Grass
Plantago spp
No Dhurga name available
Medicinal use: leaves and flowers

Appleberry
Billardiera scandens
Wondarma
Food source: fruit, particularly seeds

Green Wattle
Acacia mearnsii
Gum Tree
Food source: Sap used as gum
Resource: Bark used as dye

Plant Species (not limited to)

Trees & Palms:

Acacia longifolia ssp longifolia

Allocasuarina littoralis **(1)**

Angophora floribunda

Acmena smithii

Backhousia myrtifolia **(2)** *Bush Tucker

Banksia integrifolia **(3)**

Brachychiton poulneus

Casuarina glauca

Eucalpyptus elata

Eucalyptus globoidea

Eucalyptus melliodora **(4)**

Eucalyptus pauciflora

Eucalyptus tereticornis *Koala habitat tree

Eupomatia laurina *Bush Tucker

Livistona australis **(5)**

Pittosporum undulatum

Shrubs:

Bursaria spinose **(6)**

Cassinia longifolia

Hovea heterophyll

Hymenanthera dentate

Melaleuca ericifolia **(7)**

Ozothamnus diosmifolius **(9)**

Acacia floribunda **(11)**

Banksia spinulosa

Callistemon citrinus **(8)**

Hibbertia aspera

Leptospermum polygalifolium

Macrozamia communis **(10)**

Pittosporum revolutum **(12)** *Bush Tucker

Doodia aspera

Rubus rosifolius *Bush Tucker

Vines:

Cissus Antarctica

Hardenbergia violacea

Kennedia rubicunda

Pandorea pandorana **(13)**

Groundcovers and Grasses:

Viola hederacea

Themeda australis

Baumea juncea

Carex appressa **(14)**

Gahnia aspera

Ficinia nodosa

Tetragonia tetragonioides *Bush Tucker

Ajuga australis

Arthopodium milleflorum *Bush Tucker

Bulbine glauca

Chrysocephalum apiculatum

Dianella caerulea

Dianella longifolia

Dianella revoluta **(15)** *Bush Tucker

Dichondra repens

Geranium solanderi

Hypericum gramineum

Poa labillardieri **(16)**

Themeda triandra

Gahnia aspera

Lomandra longifolia

Lomandra multiflora

Mentha satureoides *Bush Tucker

Plectranthus graveolens *Bush Tucker

Figure 100: Plant species

10.0 Interior Design

The evolution of hospital design has led to a strong focus on creating interior environments that are safe and sterile to minimise the risk of infection. Whilst this remains critical, there is acknowledgement that the spatial qualities, amenity and materiality of a hospital's interior also contribute to the wellbeing of patients, clinicians and staff and aid patient recovery.

The Interior Design strategy was considered during the Concept Design stage to inform key elements of the architectural design.

10.1 Design Philosophy

The philosophy for the interior design is to create spaces that facilitate a visceral spatial experience of place. Of particular significance to this grounding concept is the word visceral, 'relating to deep inward feelings rather than to the intellect'.

The below artwork by Alison Simpson titled 'Mothers, Families, Children' provides inspiration for this concept. The artwork represents a child in the centre, cradled by layers of family and community support. The work references the importance of directing supportive energy inward and the significance of river country to our survival.

Figure 101: 'Mothers, Families, Children' by Alison Simpson

This means that the interior must balance the concept of inward reflection and outward connection.

The design will gesture to country, by inviting light into the building and offering visual connection to the natural environment beyond the building's edge; while simultaneously providing intimate spaces within for reflection and sharing knowledge.

10.2 Key Concepts

As we progress into the Schematic Design phase, we will question how the interior design strategy can develop further to explore the following concepts:

- indigenous **stories layered** over **time**
- qualities of country
- indigenous cultural practices that are **alive** on the site
- matriarchal country
- **quiet** materiality
- roughness and smoothness
- **emerging** from landscape
- **projecting** into country
- protective outer/soft inner
- connect to country beyond
- allowing country to **flow** through the built form
- **Invite** country into the building
- **Feeling** of country

10.3 Design Principles

Light: Manipulation of light, pattern

Curated Views: Connection with sea, land and sky

Materiality: Biophilic, authentic, raw, signifier of time (patina)

Colour: Uplifting, of the land

Form: - Solid (emerging from landscape)

- Layering to depict the multiple layers of support shown in Alison Simpson's *Mothers, Families, Children'*

Scale: A careful balance between intimate enveloping spaces, and outward projecting, open spaces

10.4 Patient Bedroom.

The bedroom design will aim to provide the patient with opportunities to connect with country. Glazing will be used to bring natural light into the space and also guide the patient's sight line into the landscape. The glazing is proposed to be full height to ensure the field of view extends into the sky. A raise portion of the ceiling on the perimeter draws the eye upward and outward giving a sense of openness. A quiet and natural materiality will be developed to evoke feels of calm and comfort. The visuals below provide some early stage thinking on how these ideas may come to life.

Figure 102: Bedroom Glazing Testing (Conceptual Imagery only)

10.5 Clinical Spaces

Clinical spaces will be designed with funcionality at the forfront of the approach. However colour and natural looking materials will be utilised to bring warmth to the space.

Figure 103: Exemplar Clinical Spaces

10.6 Arts Strategy

As part of the Arts Strategy the project team is committed to providing a campus that will facilitate and optimise health and research practices of the highest standard.

The NSW Health and the Arts Framework will be used in coordination with the hospital design and construction, to acknowledge the major contribution the arts make to well-being, health, effective health care provision and positive health care environments.

10.6.1 Benefits of arts-in-health

An ever-growing and global body of research demonstrates the personal and social benefits derived from the arts when effectively integrated into health care and hospital practices and settings. These benefits extend across the health care network, enhancing the experiences of patients, carers, visitors, staff, and the wider community.

Medical and health care practitioners acknowledge the benefits of art, design, and new technologies in health care, particularly for stress reduction, distraction during painful or uncomfortable procedures, various therapeutic activities, acceptance, and ongoing healing and catharsis.

A variety of art forms may be used to deliver the program; visual arts (painting, drawing, sculpture, photography, film, mixed media), performing arts (music, theatre, dance, circus), and new technologies (digital media, projections, social networking, virtual worlds and gaming).

Over the last three decades, dedicated arts-in-health practices have developed in Australia and around the world. Research now demonstrates the following benefits can be derived from well-integrated arts practice and products in health care settings:

- Contributing to a positive and welcoming atmosphere for the arrival of patients and their families
- Generating different expectations for the general public about a hospital as a public institution
- Providing multiple varied ways to integrate the voices of patients and families into hospital operations
- Building effective patient-nurse communication
- Improving patient morale
- Improving staff morale, job satisfaction and assist in recruitment and retention of staff
- Promoting good health habits
- Raising awareness of public health issues
- Supporting and enhance the process of healing (reduced anxiety and depression, lowering of blood pressure, reduced use of anaesthesia and analgesia)
- Reducing the duration of hospital stays and need for medication
- Delivering therapeutic benefits and improved clinical outcomes
- Promoting holistic treatment
- Helping in recovery after trauma
- Enhancing medical education
- Providing a real perception of pain relief through entertainment, positive distraction, and comfort
- Fostering positive working conditions and open new lines of workplace communication through artistic outlets for healthcare professionals; and
- Enhancing the quality of service by creating arts-in-health culture.

Figure 104: Artwork by Loretta Parsley

10.6.2 Recommendations

a) Promote the benefits of an arts-in-health program for the Eurobodalla Hospital as defined by the seven key attributes:

1. Child-friendly, age-friendly, disability-friendly centred practices;
2. Staff involvement and managing change;
3. Dynamic and creative environment and program;
4. Health promotion and health communication;
5. Sustainable partnerships; and
6. International best practice.
7. Research leadership in mental health, arts and community outreach

b) Review of public art in hospitals and other health environments around the world, particularly rural and regional hospitals.

c) Review of urban art practice in Australia, especially recently commissioned works.

d) Review of architecture, landscape design, playscapes, playgrounds, performing art programs, interactive environments, furniture and other spaces as child-friendly, aged-friendly and disability-friendly exemplars.

Consider the establishment of a Curatorial Arts Working Group to define a vision for the program (in parallel with the hospital design and construction process), identify potential partners and funding sources for a sustainable arts program and produce strategic guidelines as a reference point for an arts program.

11.0 Appendices - Infrastructure Review

11.1 Architectural Concept Plans

Conrad Gargett

1 Existing Site Plan
1 : 1000

Revision

REV	DESCRIPTION	DATE	INT
A	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

MASTERPLAN - OVERALL EXISTING

PRELIMINARY

A1 Scale 1 : 1000
Project 20 157
Issue A

Number

EHS - HI - AR - DWG - FD - 10PW01

Details

Do not scale this drawing and verify all dimensions and levels on site
Nominated Architect: Lawrence Toaldo NSW Reg. 10255

0mm 40 80mm

1 Proposed Site Plan
1 : 1000

Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	21.06.21	EA
B	Preliminary Issue	09.07.21	SH
C	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT | Health Infrastructure

Project

Eurobodalla Health Service

Drawing

MASTERPLAN - OVERALL PROPOSED

PRELIMINARY

A1 Scale 1 : 1000
Project 20 157
Issue C

Number

EHS - HI - AR - DWG - FD - 10PW02

Details

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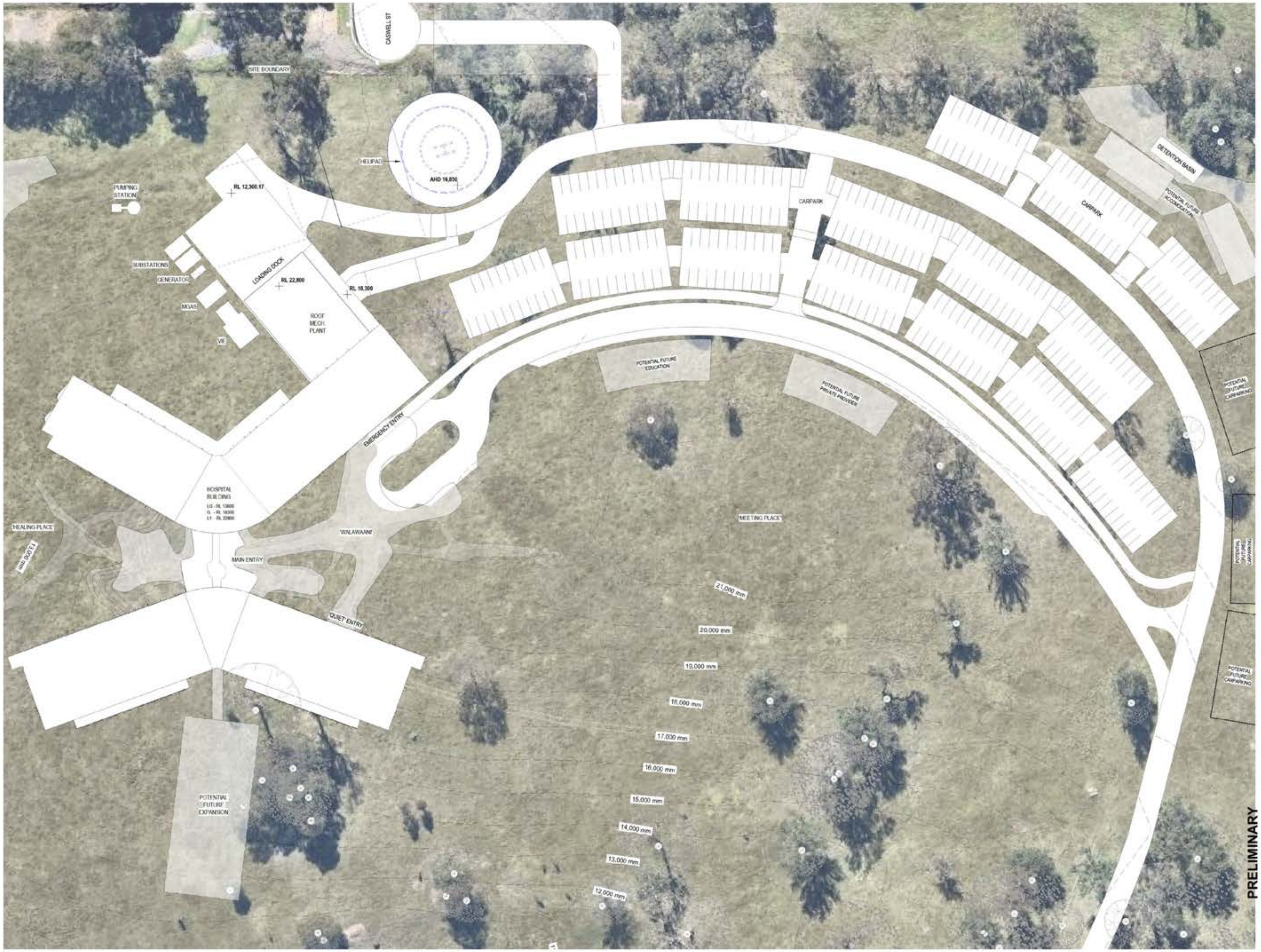

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	20.05.21	SH
B	Preliminary Issue	27.05.21	SH
C	Preliminary Issue	31.05.21	SH
D	Preliminary Issue	09.06.21	EA
E	Preliminary Issue	20.07.21	EA
F	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

SITE PLAN - PROPOSED

A1 Scale 1 : 500
Project 20 157
Issue F

Number

EHS - HI - AR - DWG - FD - 11PW02

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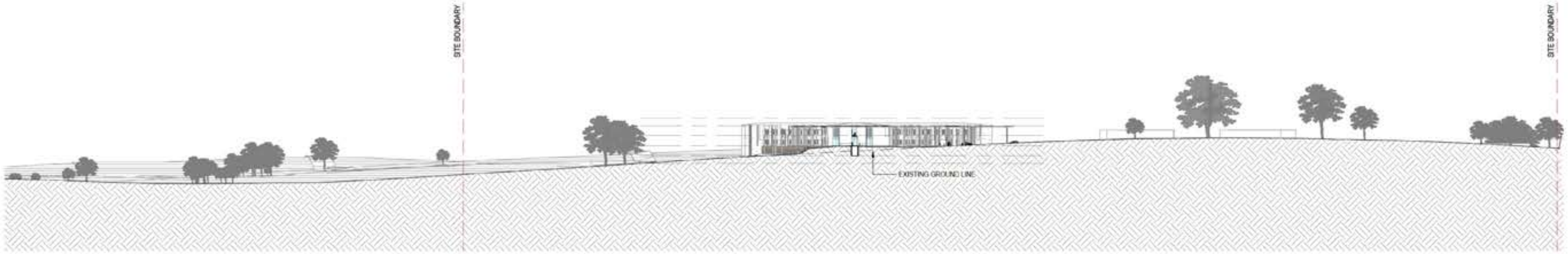

1 / 10PW02 Site Section E/W (Between Grids G-H)
1 : 1000

2 / 10PW02 Site Section N/S (Between Grids 3.2-3.3)
1 : 1000

3 / 10PW02 Site Section N/S (Through Carpark)
1 : 1000

Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	27.05.21	SH
B	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

SITE SECTIONS

PRELIMINARY

A1 Scale 1 : 1000
Project 20 157
Issue B

Number
EHS - HI - AR - DWG - FD - 11PW20

Details

Do not scale this drawing and verify all dimensions and levels on site.
Nominated Architect: Lawrence Toaldo NSW Reg. 10255

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CODE	DESCRIPTION
CCP	CLADDING, CFC, PANELISED
CN	CONCRETE
COL	COLUMN
GZ	GLAZING, ALUMINIUM FRAMED
LVG	LOUVRES, ADJUSTABLE GLASS
SCR	SCREEN, METAL
SCRA	SCREEN, ALUMINIUM
SUN	SUNSHADE

Conrad Gargett

1 East Elevation

2 North Elevation

Revision

REV	DESCRIPTION	DATE	INT
A	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

EXTERNAL ELEVATIONS

PRELIMINARY

A1 Scale As indicated
Project 20 157
Issue A

Number

EHS - HI - AR - DWG - FD - 30PW00

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

0 mm 40 80 mm

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CODE	DESCRIPTION
CCP	CLADDING, CFC, PANELISED
CN	CONCRETE
COL	COLUMN
GZ	GLAZING, ALUMINIUM FRAMED
LVG	LOUVRES, ADJUSTABLE GLASS
SUN	SUNSHADE

1 South Elevation 1 : 250

2 West Elevation 1 : 250

Revision

REV	DESCRIPTION	DATE	INT
A	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

EXTERNAL ELEVATIONS

PRELIMINARY

A1 Scale 1 : 250

Project 20 157

Issue A

Number

EHS - HI - AR - DWG - FD - 30PW01

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

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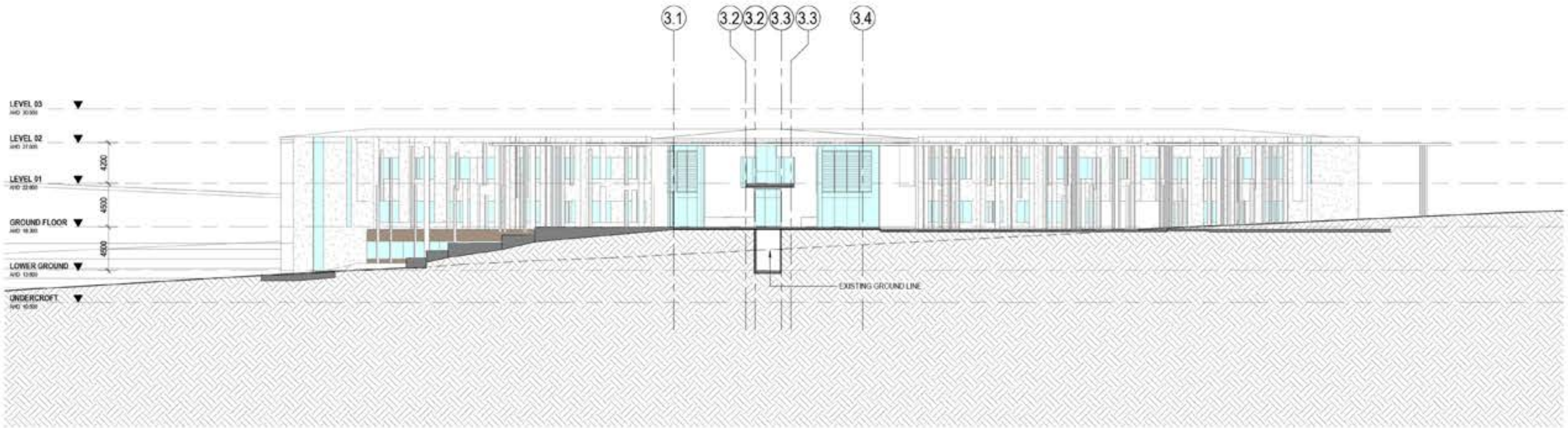

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Revision

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A	Preliminary Issue	28.04.21	NJA
B	Preliminary Issue	04.05.21	SH
C	Preliminary Issue	27.05.21	SH
D	Concept Design Issue	02.06.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

SECTIONS

PRELIMINARY

A1 Scale 1 : 250
Project 20 157
Issue D

Number

EHS - HI - AR - DWG - FD - 35PW01

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

0 mm 40 80 mm

Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	20.05.21	EA
C	Preliminary Issue	27.05.21	SH
D	Preliminary Issue	09.07.21	SH
E	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

LOWER GROUND FLOOR GENERAL ARRANGEMENT PLAN

PRELIMINARY

A1 Scale 1 : 250

Project 20 157

Issue E

Number

EHS - HI - AR - DWG - FD - 200L00

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

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Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	20.05.21	EA
C	Preliminary Issue	27.05.21	SH
D	Preliminary Issue	09.07.21	SH
E	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

GROUND FLOOR
GENERAL ARRANGEMENT PLAN

PRELIMINARY

A1 Scale 1 : 250
Project 20 157
Issue E

Number

EHS - HI - AR - DWG - FD - 200000

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

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Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	20.05.21	EA
C	Preliminary Issue	09.07.21	SH
D	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

LEVEL 01
GENERAL ARRANGEMENT PLAN

PRELIMINARY

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Project 20 157
Issue D

Number

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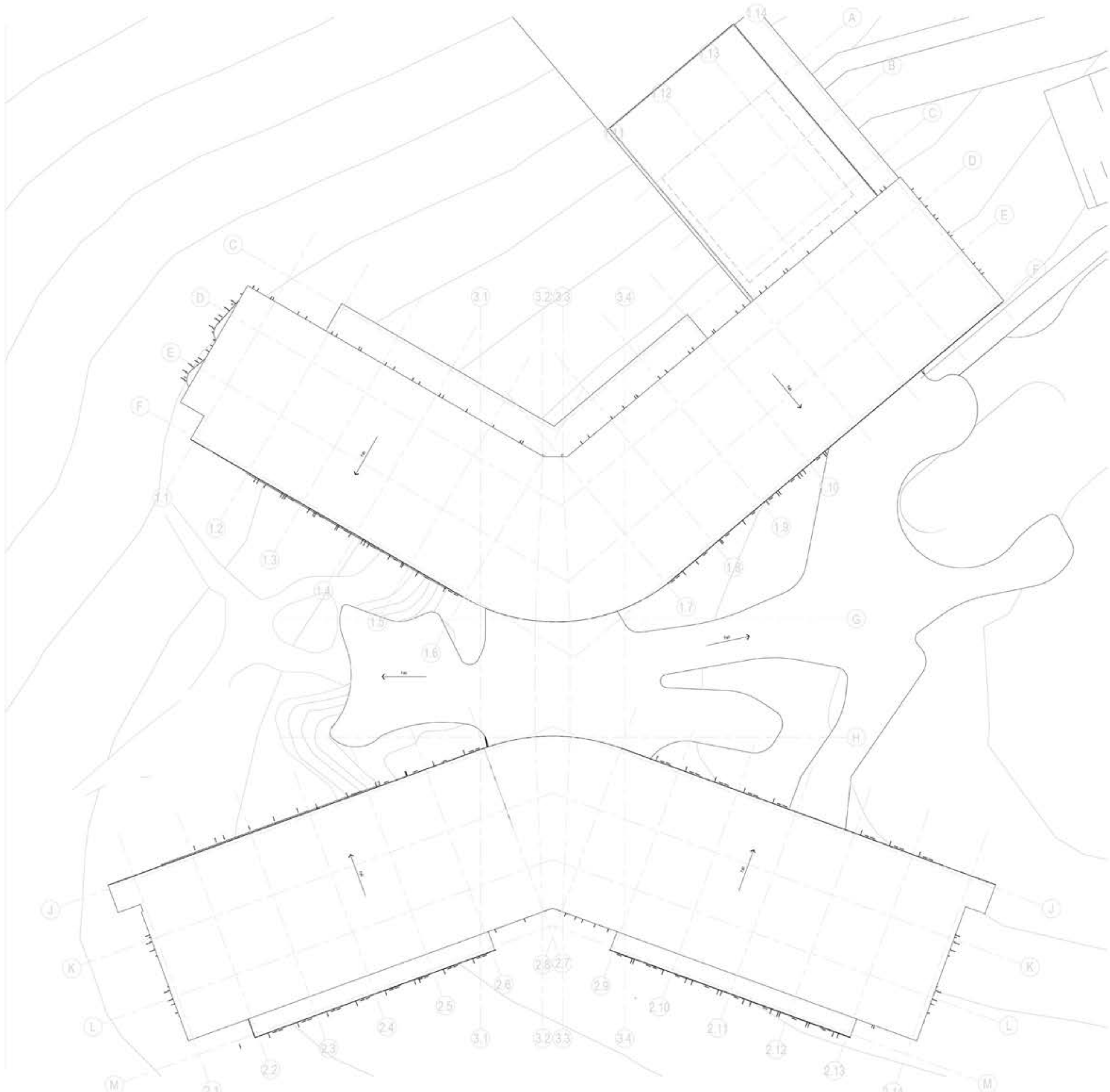

Conrad Gargett

Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	26.05.21	EA
B	Preliminary Issue	09.07.21	SH
C	Concept Design Issue	02.08.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project

Eurobodalla Health Service

Drawing

ROOF

PRELIMINARY

A1 Scale 1 : 250

Project 20 157

Issue C

Number

EHS - HI - AR - DWG - FD - 200301

Details

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Nominated Architect: Lawrence Toaldo NSW Reg. 10255

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11.2 ESD CD Report

Eurobodalla Health Service Redevelopment

Health Infrastructure NSW

ESD Concept Design Report

EHS-HI-ES-RPRT-0001

15 July 2021

Concept Report (Final)

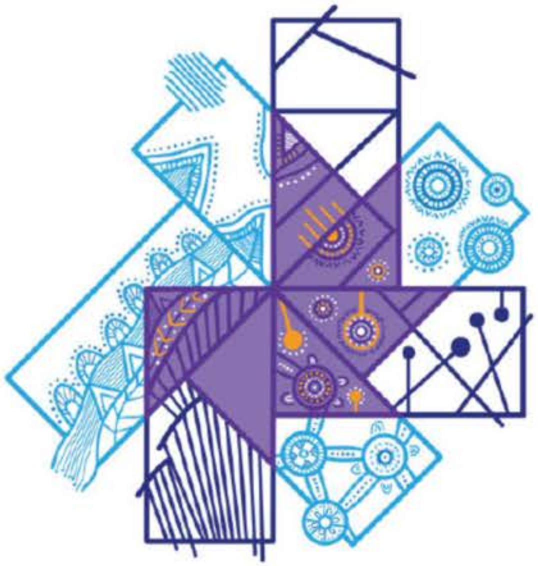
Image: Conrad Gargett

ARUP

Document Verification

Eurobodalla Health Service Redevelopment			282095-00		
ESD Report			ESD Concept Design Report		
Health Infrastructure NSW					
Revision	Date				
Draft	16 June 2021	Description			
			Prepared by	Checked by	Approved by
		Name	[redacted]	[redacted]	[redacted]
90% Concept Draft	23 June 2021	Description			
			Prepared by	Checked by	Approved by
		Name	[redacted]	[redacted]	[redacted]
Concept Report (Final)	15 July 2021	Description	Concept report for final issuance		
			Prepared by	Checked by	Approved by
		Name	[redacted]	[redacted]	[redacted]
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Description			
			Prepared by	Checked by	Approved by
		Name			

ARUP



The artwork is Shift to shape
an even better world by
Gilimbaa Artist Tarni O'Shea.

ACKNOWLEDGEMENT OF COUNTRY

Arup acknowledges the Traditional Owners of the land where our offices are located.

We also acknowledge the Traditional Owners of the land
on which this project would take place, the Walbanga and Djiringanj people of the Yuin Nation.

We pay our respects to Elders past, present, and emerging, and
to all Aboriginal peoples and Torres Strait Islanders. We recognise
and celebrate their cultures, traditions and protocols.

Arup's vision for reconciliation is to develop meaningful and respectful partnerships with Aboriginal and Torres Strait Islander peoples as we shape a better world.

Arup provides opportunities to raise awareness of the shared history between Aboriginal and Torres Strait Islander peoples and all Australians, to guide historical acceptance within our workforce. This includes recognising and celebrating Aboriginal and Torres Strait Islander cultures, traditions and protocols. Our vision is for an Arup, and a wider Australia, where all people are treated with dignity and respect.

ARUP

Contents

Click the sections below to navigate to each section of the report.

ARUP

Project Overview

Overview

The Eurobodalla Health Service will be a modern, purpose-built healthcare facility to support the Eurobodalla Shire community. The project has a clear focus on sustainability, patient and community centred design, and connection to Country throughout its design stages and operations.

This report outlines the ESD considerations at the core of the project design. It assesses the current sustainability targets and explores additional initiatives that could be integrated.

Project location: South-East Moruya

Client: Health Infrastructure NSW

Architect: Conrad Gargett

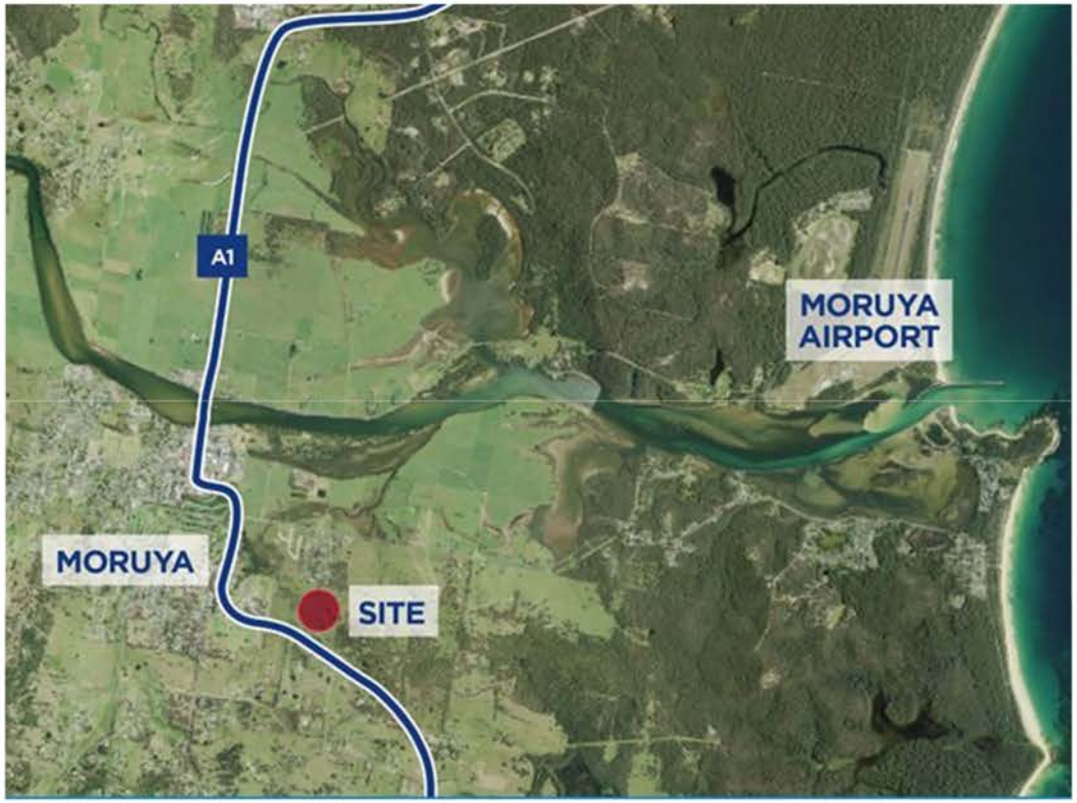


Figure Site location

Sustainability Targets

Overview of Sustainability Targets

The Eurobodalla Health Service is committed to embedding sustainability initiatives throughout its design and operations. At the core of the design methodology is a clear focus on climate change mitigation, patient and community centred design, integration with Indigenous design principles, and resilience to future social/environmental/technological changes.

The project sustainability targets are derived from the Health Infrastructure NSW *Sustainability Framework and Roadmap*, which centres around 6 Key Focus Areas listed on the right.

This section of the ESD Concept Report illustrates the project performance targets and outcomes that align with these 6 Key Focus Areas, and explores potential design initiatives to meet these targets.

Many of the performance targets and outcomes are achieved through the minimum requirement and stretch targets of the DGN58. The DGN58 pathway and credit criteria are further detailed in Section DGN58.

6 Key Focus Areas:

Greenhouse Gas Emissions

Sustainable Water

Climate Resilience

Local Focus

Transport

Circular Economy

Sustainability Performance Targets

Greenhouse Gas Emissions

DESIGN + CONSTRUCTION

The project aims to minimise its carbon footprint and limit its contribution to human-induced climate change. The building will be designed to be fully electric and utilise on-site and off-site renewable energy sources, as well as reduce its upfront embodied carbon. During construction, the project will achieve net zero emissions.

100%
Electric building

Net Zero Emissions
in Construction

10%
Annual onsite renewable energy

20%
Construction emission reduction

20%
Embodied emission reduction

Potential Design Initiatives

- Timber structure to reduce embodied carbon
- Low carbon, locally sourced materials
- PV panels on rooftops and carpark shading structures
- Building electrification – further detailed in Section Electrification

Sustainability Performance Targets

Greenhouse Gas Emissions

OPERATIONS

The Eurobodalla Health Service aims to achieve Net Zero Emissions in its operations. This is challenging for a hospital, but is attainable through high efficiency architectural and services design. As it is a hospital, the NCC 2019 Section J states that ward areas must meet more stringent performance requirements. These requirements will be assessed by others.

NABERS

5 Star
Rating for Public Hospitals

100%
Powered by renewable energy
(Net Zero Emissions in Operations)

30%
Operational emission reduction

Potential Design Initiatives

- Energy efficient lighting, appliances, equipment
- Powered by on-site and off-site renewable energy sources; energy storage
- Solar hot water
- High performance façade design – more stringent requirements for ward areas
  - Maximum wall-glazing U-value 2.0 for *non-ward areas*
  - Maximum wall-glazing U-value 1.1 for *ward areas*
- Mixed mode ventilation – further detailed in Mixed-mode ventilation in Central Spine

Sustainability Performance Targets

Sustainable Water

OPERATIONS

With the region susceptible to drought, the building must be water efficient. This may be a challenge as hospitals require extensive clean and potable water to ensure sanitary practices and treatments. The project aims to use recycled water for non-potable water needs, and use efficient fixtures to reduce potable water consumption.

30%
Potable water use reduction

No potable water
Used for non-potable needs

Potential Design Initiatives

- Best practices WELS rated fixtures
- Rainwater/Condensate/Greywater capture and reuse
- Captured water used for irrigation, toilet flushing, hosing outdoor surfaces, water features, etc.
- Drought tolerant native plants
- Manage surface run off through Water Sensitive Urban Design (WSUD) – detailed in DGN58 Emissions targets
- Stormwater detention

Sustainability Performance Targets

Climate Resilience

DESIGN + CONSTRUCTION

The climate has already changed over the past few decades impacting both the built and natural form through heatwaves, extreme weather, and bushfires. Projected changes in our climate are predicted to further exacerbate these risks, therefore the project building must be adaptable for the future climate, to ensure safety and quality of service to patients, visitors and staff.

Resilience is defined as the ability of a system, community or society to withstand, adapt to recover from, thrive and even transform in the face of anticipated or unexpected shocks and stresses – now and in the future.

Climate Change Risk and Adaptation

Address all extreme and high risks

Potential Design Initiatives

- Resilient infrastructure
- Reduce building dependence on electric grid/water provider
- Community Resilience Plan
- Hospital to act as point of safety/refuge for community in case of natural disasters
- Multi-disciplinary Climate Change Resilience workshop to develop a Climate Change Adaptation Plan – further details in Section Climate Change Resilience
- Extend resilience studies to encompass resilience to other significant risks other than climate e.g. pandemics

Sustainability Performance Targets

Local Focus

DESIGN + CONSTRUCTION

This area of focus encompasses the four themes: biodiversity, community engagement, Indigenous design, and patient-centric design/patient outcomes. As this project is a community asset, collaborating directly with the future visitors/patients is valuable, and can ensure that the building design will promote positive experiences and encourage improved patient health.

100% of in-patient rooms
Access to natural ventilation, daylight, views

100% of patients
have access to native indigenous landscape for social and individual respite

100% shaded hard surfaces
Between 9am and 3pm

Potential Design Initiatives

- Engage with local Aboriginal community leaders and integrate Indigenous design initiatives
- Community collaboration on artworks
- Connection to Country
- Operable windows in in-patient rooms
- Biophilic design – material use and connection to nature
- Accessible landscaped areas
- Shading with urban tree canopies, outdoor thermal comfort
- Microclimate analysis
- Employment and training opportunities for local community

Sustainability Performance Targets

Transport

DESIGN + CONSTRUCTION

The project aims to encourage use of sustainable transport modes and to accommodate for emerging transport technologies that may be adopted in the future.

End of Trip Facilities
for active transport mode users

EV Charging Stations
for cars and e-modes

OPERATIONS

The Eurobodalla Health Service ensures universal accessibility for all visitors and puts patient and visitor needs at the core of its operational design methodology.

Public Transport
with comfortable, shaded, accessible shelters and access

Potential Design Initiatives

- End of trip facilities for visitors and staff to encourage active transport
- Secure bicycle parking
- EV charging stations for all e-modes
- Attractive and well located stairs to encourage active movement within the building
- Shuttle bus service for visitors
- Connection to public transport

Sustainability Performance Targets

Circular Economy

OPERATIONS

Currently the healthcare industry embodies a linear economy system due to sanitation requirements, difficulty to re-use medical equipment, availability of inexpensive single-use devices, etc. This project aims to adopt circular economy principles where possible to encourage more responsible consumption.

100%
On-site organic waste management

No single use plastics
on site

Potential Design Initiatives

- Reduce current operational waste through recycling and reuse where possible
- Separation of waste streams
- Organic waste to energy (anaerobic digestor)
- Locally sourced materials
- Remove non-essential single use plastics
- Correct disposal of single-use medical tools and PPE
- General waste compactor – reducing number of waste collection vehicle trips and associated transport emissions

DGN58

Overview of DGN58 Pathway

The Health Infrastructure NSW Design Guidance Notes 58 (DGN58) acts as a formalised framework for delivering sustainability initiatives within the project. It is based on the GBCA Green Star rating tool, but as the project is not registered with the GBCA it will not achieve an official performance rating.

The project is required to meet a minimum 45 points to achieve a 4 Star rating.

The following section provides an outline of the credits to be targeted as part of the minimum requirement pathway (45 points + buffer). It also lists stretch targets to be incorporated in the design for a higher star rating.

The figures to the right illustrate the total number of points being targeted in the 4 Star and 5 Star pathways, and show the proportion of available points being targeted within each credit category.

It is noted that many of the current project Sustainability Targets detailed in the previous section (Sustainability Targets) go beyond the initiatives included in the DGN58 minimum requirements. To reflect the overall project Sustainability Targets, changes to the DGN58 pathway may be explored in the next design stage.

Refer to Appendix A for the full current DGN58 scorecard of targeted credits.

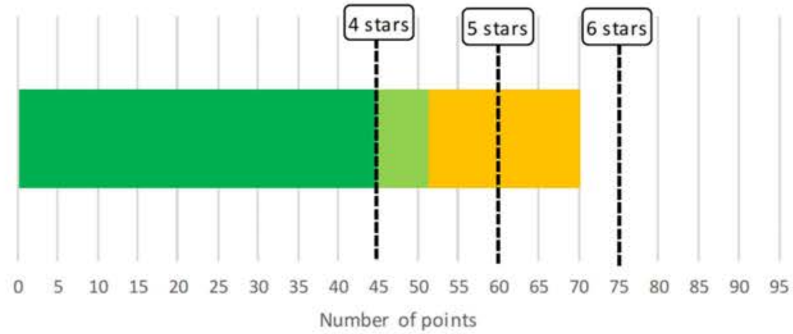


Figure Total Points Target

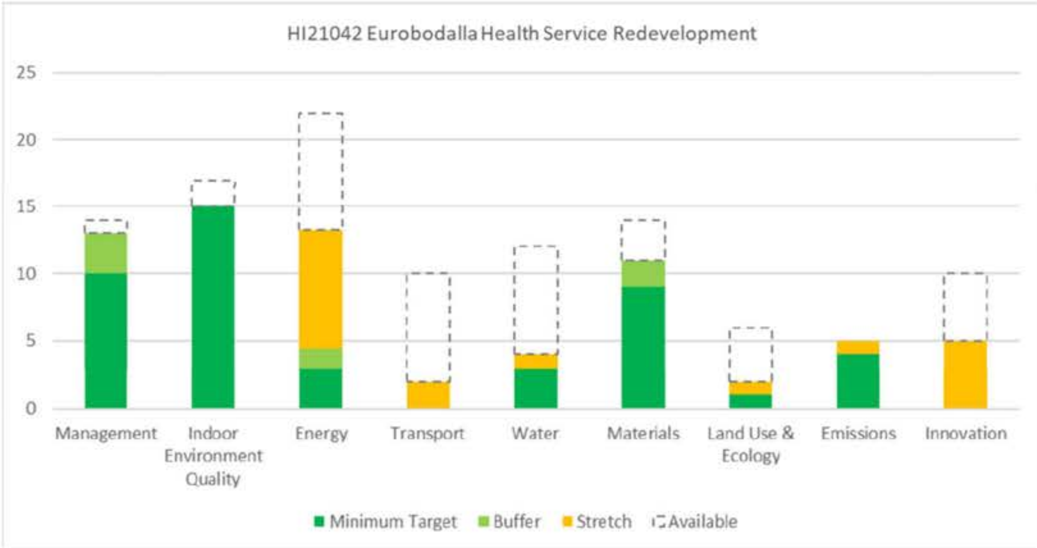


Figure Distribution of Categories with Targeted Points

Management

This category encourages the adoption of practices and processes that enable and support best practice sustainability outcomes throughout the different phases of the project.

MINIMUM REQUIREMENTS

Engage Green Star Accredited Professional (Arup ESD)

Commit and measure project Environmental Performance Targets

Perform a comprehensive Services and Maintainability Review – Engage ICA

Building Commissioning and Tuning – Engage ICA

Provide Building Information documents

Metering and Monitoring Systems

Formalised Environmental Management Plan

Operational Waste Management Specialist Plan

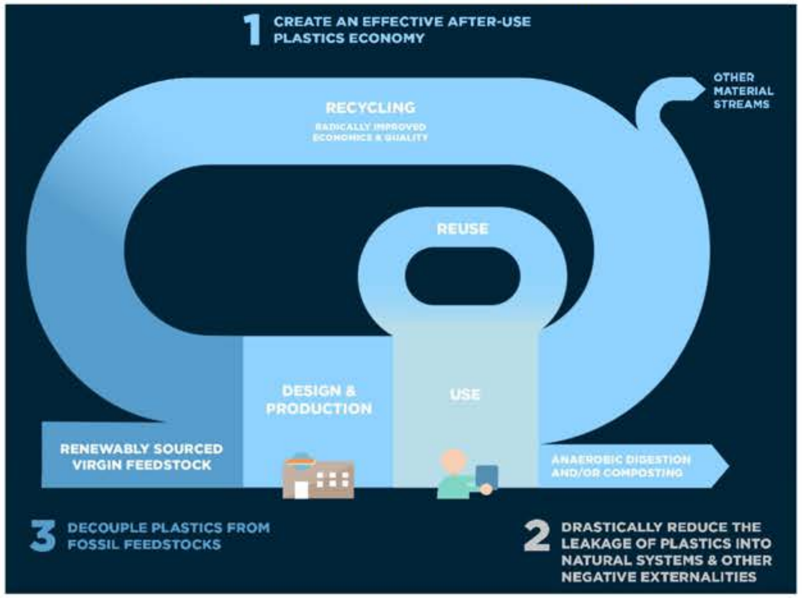
BUFFER

Climate Change Adaptation Plan – covered in [Climate Change Resilience] section of this report

Provide High Quality Staff Support for site workers

Figure Separation of waste streams; correct disposal of single-use medical equipment and PPE

Figure New Plastics Economy – Ban single-use plastics on site and encourage plastic recycling. Source: [World Economic Forum, the Ellen MacArthur Foundation, and McKinsey & Company]



Indoor Environment Quality

This category centres around enhancing the comfort and well-being of occupants. This closely aligns with the HI NSW Key Focus Area 'Local Focus'. As such, all of the targeted credits within this category are minimum requirements.

MINIMUM REQUIREMENTS

Mechanical systems to be designed for ease of maintenance and provide high air quality through outdoor air provision and elimination of pollutants

Maintaining low internal noise and reverberation levels

Installing acoustic separation between spaces

Comfortable lighting levels that eliminate glare and improve uniformity

High daylight levels in nominated spaces

Rooms have a view to nature

Reduction in internal air pollutant levels through low emissions paints, adhesive, sealants and carpets, and engineered wood

Maintain advanced occupant thermal comfort between PMV +- 0.5

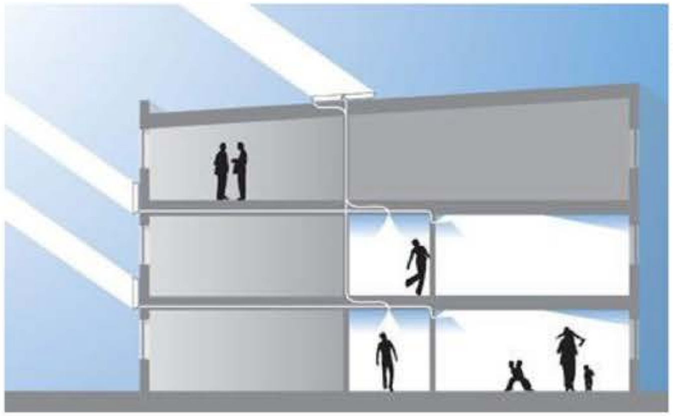
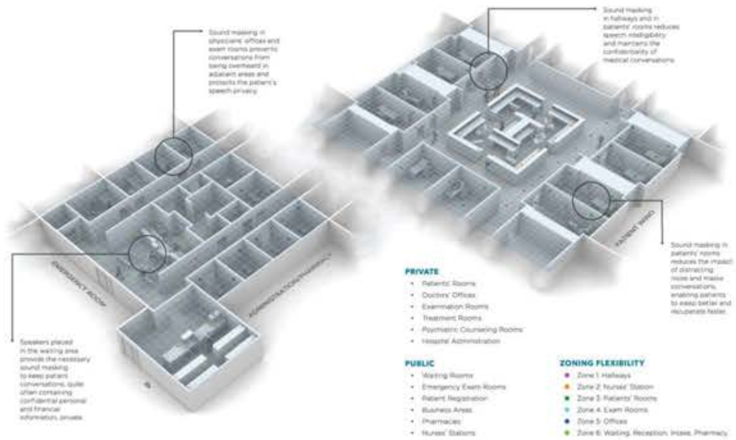


Figure Fibreoptic daylight solution – Introduce daylight into typically dark staff/patient areas such as nurse stations and patient holding bays for improved comfort

Figure Perforated cardboard plasterboards provide better sound absorption and their flexible drilling patterns allow for an aesthetic solution

Figure Sound masking solutions – addition of unobtrusive background noise to reduce the intelligibility of human speech for improved patient relaxation as well as patient and staff privacy. Shown: sample system layout by [Cambridge Sound]



Energy

This category influences projects to be designed and constructed to reduce their overall operational energy consumption below that of a comparable standard-practice building. This project will target the 'Reference Building Pathway', which compares performance against the NCC 2019 Section J DTS requirements.

MINIMUM REQUIREMENTS

Align with HI NSW ESG 10% Improvement and NSW GREP

Energy model to show 10% improvement on energy efficiency NCC 2019 Section J requirements by others

Section J DTS compliant building envelope

- Maximum wall-glazing U-value 2.0 for *non-ward areas*
- Maximum wall-glazing U-value 1.1 for *ward areas*

20% peak electricity demand reduction

BUFFER

20% improvement over energy efficiency Section J requirements

STRETCH TARGETS

Rooftop Solar PV to further improve energy efficiency

100% Green Power Purchase for 10 years

Transition Plan to phase out fossil fuels and become 100% Electric

No fossil fuels burned on site – exceptions where <1% used on site for purposes with no commercial alternatives e.g. emergency generators

For further details on the above stretch targets, refer to the Electrification section of this report.

Figure Relevant standards and policy documents targeting energy efficiency

Transport

This category facilitates a reduction on the dependency of occupants on private car use as an important means of reducing overall greenhouse gas emissions, by maximising alternative and more sustainable transport options.

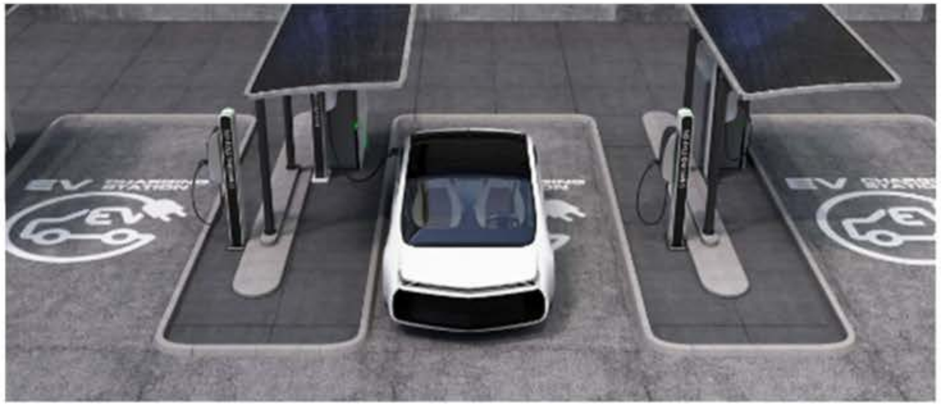


Figure EV charging parking spaces

STRETCH TARGETS

End of Trip Facilities onsite

5% of car parking spaces provide EV charging stations

15% of car parking spaces for fuel efficient vehicles

Figure Electric bike sharing

Figure End of Trip Facilities for staff and visitors

Water

This category encourages initiatives that reduce the consumption of potable water. As rising temperatures increase the risk of droughts in the region, efficient water practices will become increasingly vital.

MINIMUM REQUIREMENTS

WELS rated efficient sanitary fixtures

No potable water used or irrigation, or drip irrigation with moisture sensor override is installed

Water efficient Fire Protection System, or reuse of test water

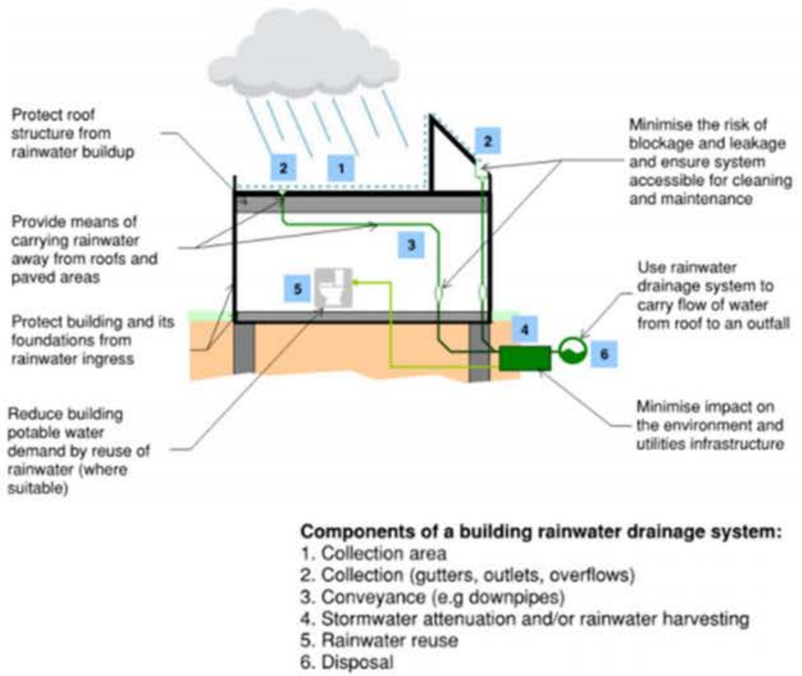


Figure Rainwater reuse (Source: Arup)

STRETCH TARGETS

Rainwater reuse

Condensate recapture (Performance Pathway)

Materials

This category addresses the consumption of resources within a building construction context, by encouraging the selection of lower-impact materials.

MINIMUM REQUIREMENTS

In concrete production, replace 30% of Portland cement with supplementary cementitious materials, and use reclaimed water and manufactured sand

Reduction in steel framing/reinforcement compared to standard practice

30% of the building's GFA is constructed and/or supported from structural timber

95% of building's steel is sourced from a Responsible Steel Maker

95% of timber in building and construction works is certified or from a reused source

No PVC products or 90% of products containing PVC meet best practice guidance

3% of products with sustainability certification

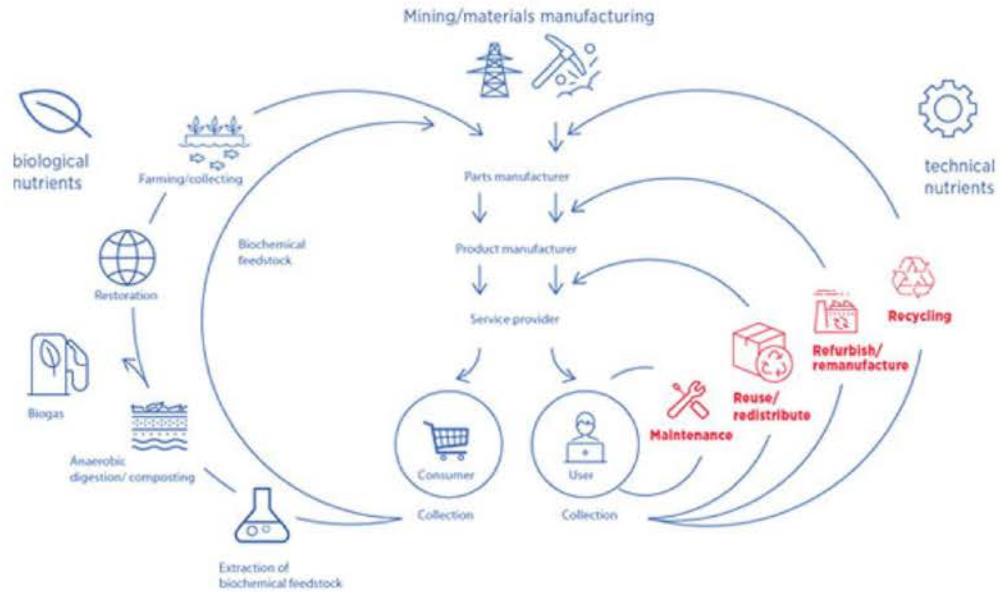
At least 90% of construction and demolition waste is diverted from landfill

BUFFER

In concrete production, replace 40% of Portland cement with supplementary cementitious materials, and use reclaimed water and manufactured sand

6% of products with sustainability certification

Figure Circular economy infographic (Source Ellen Macarthur Foundation)



Land Use & Ecology

This category focuses on reducing the negative impacts on the site's ecological value as a result of urban redevelopment and encourages enhancing the quality of local ecology.

MINIMUM REQUIREMENTS

Reduce heat island effect through building and landscape design – 75% of total project site area comprising of landscaping or high SRI building elements

Figure Green landscaping not only provides environmental benefits but also provides physical and mental health benefits to patients and staff.

STRETCH TARGETS

Improve ecological value of site through landscaping and green infrastructure

Figure Green roofs reduce heat island effect

Emissions

This category aims to reduce the risk of 'point source' pollution impacts, including damage through the environment through refrigerant leaks or disturbances to native fauna through light pollution.

MINIMUM REQUIREMENTS

Reduce peak stormwater flows

Minimise light pollution to night sky through control of upward lighting and direct illuminance

Minimise the legionella impacts from mechanical cooling systems

Minimise the environmental impacts of refrigeration and air conditioning equipment

Figure Bioswales act as a natural drainage and water treatment system for stormwater to be treated before it reaches lakes and rivers

STRETCH TARGETS

Stormwater treatment to reduce pollutants entering public sewer infrastructure e.g. Water Sensitive Urban Design (WSUD)

Innovation

This category encourages the project to go beyond the sustainability initiatives covered in the previous categories. Currently the initiatives included in the Innovation category are *stretch targets*. The following lists possible Innovation credits that could be targeted. Additional/alternative credits may be explored in the next design stage.

- Ultra-low VOC paints
- All mattresses supplied meet Green Guard emissions criteria
- Improved stormwater pollution targets (over stretch target)
- High performance site offices for site workers during construction
- Social return on investment
  - Encourages the holistic assessment of the direct and indirect costs and benefits of the building to the building users, community, and broader economy.
- Occupant engagement
  - Encourages owners to perform pre-occupancy and post-occupancy studies to explore how the sustainability performance outcomes impact productivity, patient stay length, patient satisfaction, etc.
- Reconciliation Action Plan
  - Develop a RAP and provide evidence of how the Eurobodalla Health Service plays a central role in delivering the RAP.

ONE
COMMUNITY
EUROBODALLA
COMMUNITY STRATEGIC PLAN
2017

QBL	VISION	CODE
Social	Friendly	
Environment	Responsible	
Economic	Thriving	
Civic Leadership	Proud	

Figure Eurobodalla Shire Council Community Strategic Plan – Emphasis on equally addressing each of the Quadruple Bottom Line (QBL) considerations (Source Eurobodalla Shire Council)

Electrification

What does it mean?

Electrification in the context of the new Eurbodalla Hospital means the removal of all fossil fuel powered equipment from the building services. The key business as usual item this will impact is the generation of domestic hot water and HVAC heating. A number of options for the development of these have been provided by hydraulic and mechanical consultant.

Arup have been working with Health Care Without Harm on a global decarbonisation road map which includes transition away from fossil fuels. Key finds from this report are noted on this page.

Key findings

HEALTH CARE CAN SIGNIFICANTLY REDUCE ITS GREENHOUSE GAS EMISSIONS.

Health care's emissions are growing. Under a business as usual scenario—without climate action inside and outside the sector—health care's absolute global emissions would grow enormously from a 2014 baseline and more than triple by 2050, reaching six gigatons a year.

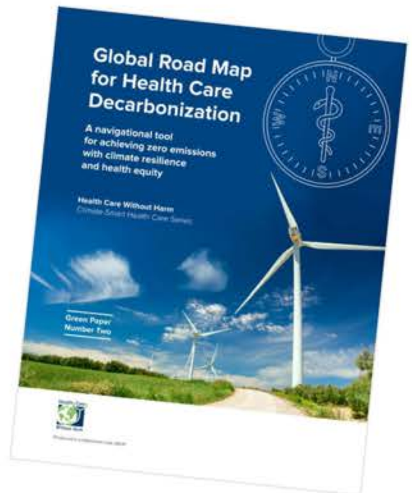
Fossil fuel combustion is the dominant source of health care climate emissions. The use of coal, oil, and gas to power hospitals, health care-related travel, and the manufacture and transport of health care products comprises 84% of all of health care's climate emissions across facility operations, supply chain, and the broader economy.

Countries' Paris Agreement commitments could cut projected health care emissions growth by 70%. If countries can meet the targets and commitments, they set to decarbonize their economies based on their pre-2017 Nationally Determined Contributions (NDCs) to the Paris Agreement, health care development will begin to decouple from climate emissions growth.

But health care's contribution to the climate crisis is still projected to grow and remain substantial. Even if the world's governments were to meet their Paris Agreement commitments up to 2017, health care's annual global climate footprint would still increase, reaching more than three gigatons a year by 2050.

Solutions exist. This Road Map highlights how health care can close the gap and significantly reduce its emissions beyond those that the Paris Agreement commitments would help achieve.

- It proposes actions with cumulative emissions reduction from 2014 to 2050 that add up to 44.8 gigatons of CO_2e.
- This cumulative reduction is equivalent to the entire world economy's global greenhouse gas emissions in 2017.
- It is analogous to leaving more than 2.7 billion barrels of oil in the ground each year for 36 years.



Electrification

Where are the emissions in health care?

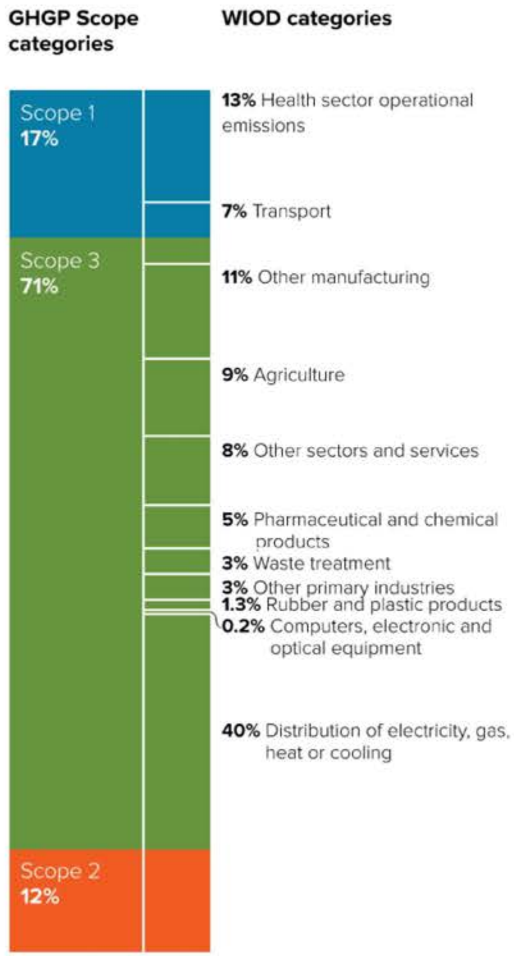
Hospitals by their nature are energy intensive. Understanding where the emissions associated with facilities helps us to target initiatives.

As our current design scope allows us, the key areas we can address are operational emissions, primarily Scope 2.

Scope 1 – emissions on site from processes (e.g. a diesel generator)

Scope 2 – emissions from energy supplied to site (e.g. grid electricity or gas)

Scope 3 – indirect emissions associated with the materials consumed on site (e.g. transport of sterilised goods to site)



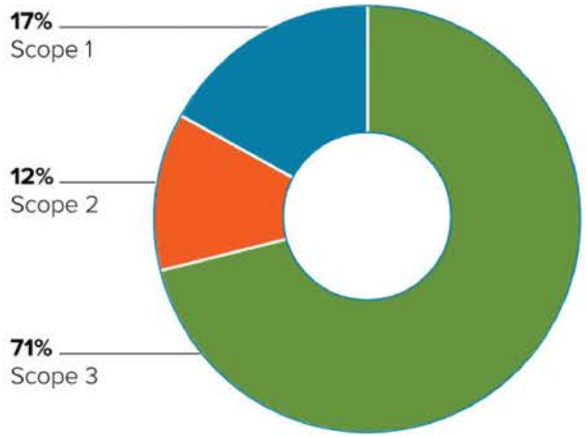


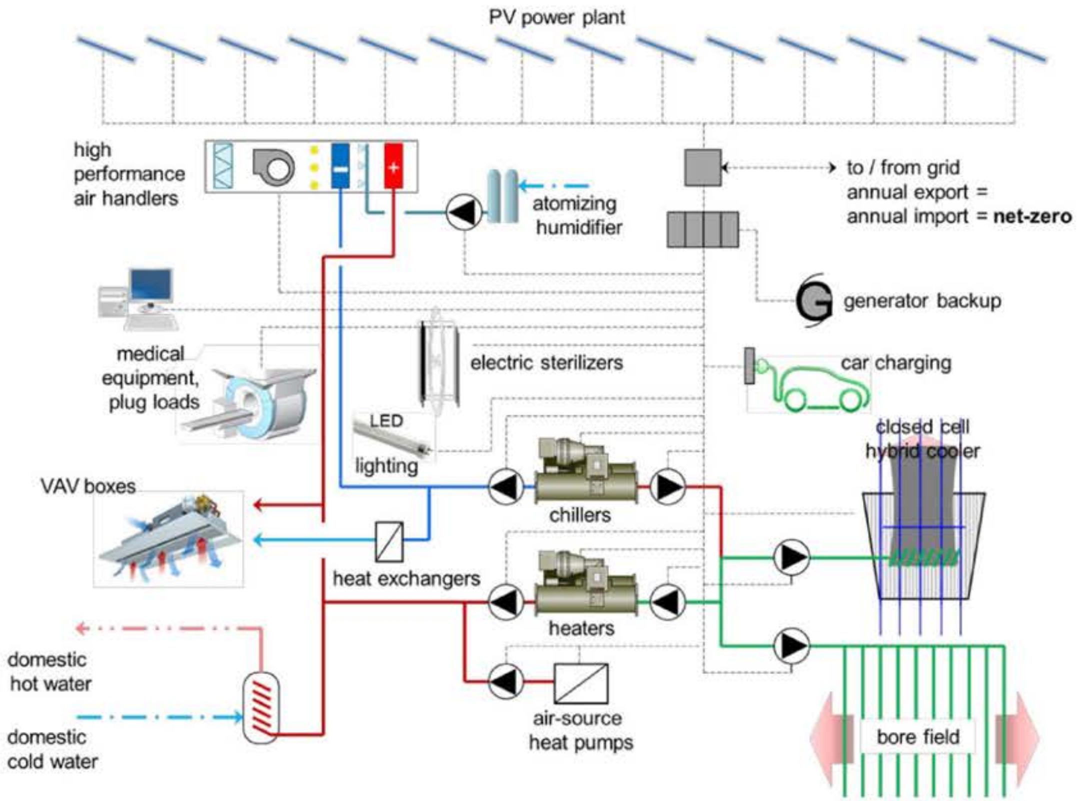
Figure 6. Global health care footprint split by GHGP Scopes.

Source: Green Paper One.

Electrification

What can we do?

Working collaboratively with the design team, a deeper understanding of all the end use energy requirements will assist in mapping out what needs to be targeted, similar to the diagram on the right. Once well understood what technologies can be used in place of current fossil fuel technologies, a life cycle cost argument will be presented to identify any potential return on investment.



Electrification

Assessment

To assess potential electrification technologies, the following criteria are proposed:

- Potential operational carbon benefit; now and in the future
- Capital expenditure impact
- Operational expenditure impact
- Life cycle cost (including maintenance and replacement)
- Equipment warranties

Gas sourced from either tanked LPG or natural gas grid typically has a lower carbon intensity per unit of energy delivered that electricity. The use of heat pumps can offset this in part but in terms of carbon intensity there is little difference when applying electric heating

However, as the electricity grid decarbonises, the benefits will be much greater. The table to the right show predictions for Indirect Scope 2 and 3 emissions for Australian grid-sourced electricity.

NSW/ACT grid emissions intensity is expected to reduce by over one third in the decade to 2030.

Indirect Scope 2 and 3 combined emissions factors, tonnes CO_2-e per MWh.

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Australia, all grid connected	0.81	0.74	0.68	0.63	0.61	0.60	0.59	0.58	0.56	0.53	0.50
NEM	0.82	0.75	0.69	0.63	0.61	0.61	0.59	0.58	0.56	0.53	0.51
NSW/ACT	0.86	0.80	0.74	0.69	0.66	0.62	0.58	0.57	0.57	0.55	0.53
QLD	0.91	0.85	0.82	0.75	0.72	0.71	0.71	0.70	0.69	0.67	0.65
SA	0.36	0.32	0.25	0.22	0.21	0.27	0.27	0.26	0.21	0.19	0.18
VIC	0.96	0.85	0.75	0.68	0.66	0.69	0.69	0.68	0.64	0.57	0.52
TAS	0.14	0.19	0.15	0.12	0.12	0.13	0.13	0.11	0.08	0.07	0.06
SWIS	0.70	0.60	0.57	0.56	0.55	0.53	0.51	0.51	0.51	0.47	0.44
NWIS	0.61	0.61	0.60	0.56	0.54	0.54	0.52	0.52	0.52	0.52	0.52
DKIS	0.72	0.64	0.59	0.57	0.56	0.54	0.52	0.50	0.46	0.41	0.37

Grid emissions factors are predicted to fall over the coming decade
source: DISER Report, Australia's emissions projections 2020, December 2020

Electrification

Assessment

To assess potential electrification technologies, the following criteria are proposed:

- Potential operational carbon benefit; now and in the future
- Capital expenditure impact
- Operational expenditure impact
- Life cycle cost (including maintenance and replacement)
- Equipment warranties
- Spatial impact

Cost

To understand the real cost of the systems, an understanding of the costs incurred over the lifetime is required.

This includes the initial capital outlay and maintenance costs. For fair comparison if the life of different systems should be compared against the period that includes the useful life of the longest life piece of equipment. For example, when comparing a gas-fired boiler to an electric heat pump for the generation of heating hot water, the useful life of a boiler is currently longer than that predicted for a heat pump.

Warranty

Electric technologies assessed for heating hot water, domestic hot water are typically larger than their gas-fired counterparts.

Space

Electric technologies assessed for heating hot water, domestic hot water are typically larger than their gas-fired counterparts.

Options – Heating Hot Water

Mechanical have made a summary of the potential options available for switching to electric for heating hot water in their technical memorandum ME-ME-003 (1 June 2021).

The memo presents a number of options including the use of:

- LPG fired boiler (BAU)
- Air-to-water heat pump
- Heat recovery chiller

A summary table of technologies from the memo is copied to the right. Additionally preliminary life cycle costs and maintenance details are presented in the memo. Key notes from this are summarised following.

Key notes

- Electric technologies are more expensive and larger in size
- Gas is less energy efficient
- Carbon emissions associated electric technologies is not significantly lower than LPG in current grid – likely to be better in the future.
- Warranties and expected life for each system are comparable.

Traditional Combustion Technology LPG Boilers		Electrified Technology Heat Pumps		Electrified Technology Heat recovery chiller	
Pros	Cons	Pros	Cons	Pros	Cons
Can have relative high efficiencies (up to 95% for condensing type boilers)	Requires coordination of flue for exhaust gases	No exhaust required for the system	Increased pipework size due to lower temperature differentials	Can be used to reclaim some heat from the cooling circuit	Low efficiency when used for heating or cooling only
Smaller plant footprint	Requires connection/coordination of gas pipework and regular filling of LPG gas Tank.	May be used for partial cooling load when design conditions are favourable (depending on unit used)	Requires larger pumps due to increased flow rate	Can be used to do part loads within the building	Payback period of the additional unit is heavily dependent on design conditions
Cheaper capital cost	Carbon emissions	Low carbon footprint, although often offset by incoming power source	Short Economic lifespan		High Capital Cost

Comparison table of heating hot water technologies
Source: Stantec memorandum, ME-ME-003 (Revision B) (30/06/2021)

Electrification

Options – Domestic Hot Water

Hydraulics have provided an assessment of the options available for providing domestic hot water to site. This is documented in their technical memorandum appended to their concept design report.

The technologies reviewed a part of the assessment include:

- LPG fired boiler (BAU)
- Electric air-to-water heat pumps with electric boost
- Electric storage

Key notes

- Electric powered systems are larger and more expensive
- Life expectancy electric resistance is comparable to LPG, however heat pumps are marginally less
- Carbon benefit is marginally better on day one for heat pumps, but would increase as grid decarbonises

Items	LPG storage with instantaneous heaters	Heat pumps with electric boost	Electric storage
Heat transfer	Combustion of gas to heat water	Electrically generated refrigerant cycle transfers heat absorbed through the air to heat the water	Use electric resistance coils to heat water
Electrical demand	-	10.25 kW per heat pump 30kW heating element per storage tank	60 kW per storage tank
LPG demand	3280 MJ/hr	-	-
Spatial requirement (m)	* *25 sqm* 3.3 x 2 for LPG heaters (installed back to back) 5.5 x 2.6 for storage tank (installed in line)	*** *60 sqm* 7.2 x 3.3 for heat pumps (installed parallel) 9 x 3.3 for storage tanks (installed in line)	** *30 sqm* 9 x 3.3 for storage tanks(installed in line)
Efficiency/COP		2.6~4.5	N/A
Capital cost - APPROX	$ $100k	$$$ $220k	$$ $150k
Average running cost	$	$$$	$$$$$
Life expectancy (Years)	15-20	10-15	15-20

Comparison table of domestic hot water technologies
Source: Arup memorandum (15/06/2021)

Electrification

Impact – Electrical Infrastructure

The flow on impacts to electrical infrastructure created by potential future expansion and switch to all electric have been assessed by the electrical consultant.

With no diversity applied to the potential electrical loads for DHW and HHW, the total electrical demand still sits within the proposed substation allowance. This means there is no electrical infrastructure upgrade required to enable electrification.

Other items that should be considered as part of this review include:

- Reliability is improved with multiple substations
- Potential solar PV and solar thermal hot water may offset some of the electrical demand, but wouldn't impact infrastructure allowance
- Potential future CSSD facilities would need to be reviewed in detail to confirm allowance noted in table.

Summary

	Load Description	Assessment	Anticipated KVA	Overall KVA	Proposed Substation Size	Comments	Costs	Running Costs	Reliability
Day One	Base load 15,322sqm	50 VA/m2 – 100 VA/m2 Range	1162	1162	1500 KVA	1 x TX with space for another.	Standard Cost	Standard energy cost	Lower only 1 Substation
2031	Future Expansion 4,806sqm (Total 20,128sqm)	85 /VAm2	409	1571	2 X 1500 KVA	2 x TX	Extra Cost $150K	Standard energy cost	Higher - 2 Substations
pending	CSSD	allowance only - TBC	200	1771	2 X 1500 KVA	2 x TX			
pending	Electrical Hot Water - No Gas	no diversity applied	390	2161	2 X 1500 KVA	30% added - assumed extra hot water load - pending final input	Submains and connections - less gas connection and smaller power	Additional elect energy cost / less gas energy cost	Higher - 2 Substations
pending	Electrical HVAC Hot Water - No Gas	no diversity applied	434	2595	2 X 1500 KVA	HVAC hot water load	Submains and connections - less gas connection and smaller power	Additional elect energy cost / less gas energy cost	Higher - 2 Substations

Electrification

Summary

The table to the right presents a summary of the qualitative impacts of electrification. In the following stage detailed costing from concept design deliverables will be utilised to provide robust life cycle costs – for now estimates based on experience are provided.

Recommendations

- Make spatial provision in plant and substation for future conversion to full electrification
- Assess detailed costing and carbon impact to finalise potential inclusion day-one.
- Confirm LHD policy regarding GreenPower purchase.

Heating Hot Water	LPG (BAU)	Heat Pump	Heat Recovery Chiller
Carbon (day one)			
Carbon (future)			
CAPEX			
Life Cycle Cost			
Warranty/Useful life			
Spatial			

Day one carbon may be offset in electric options by purchase of GreenPower

Domestic Hot Water	LPG (BAU)	Heat Pump	Electric Resistance
Carbon (day one)			
Carbon (future)			
CAPEX			
Life Cycle Cost			
Warranty/Useful life			
Spatial			

Day one carbon may be offset in electric options by purchase of GreenPower

Heat pump efficiency has a greater impact on DHW than HHW

Electrification

Embodied Carbon

Overview of Embodied Carbon

The whole-of-life carbon footprint of a building encompasses emissions from the extraction and production of materials and products, the process of constructing the building, operational carbon, and the end of life disposal/reuse of all building elements. Of this whole-life carbon footprint, approximately 30-50% is made up of embodied carbon emissions, and within the embodied carbon approximately 60% is accounted for by the building structure.

To ensure we do not further exacerbate climate change, we must not only look at reducing operational carbon, but also reduce embodied carbon.

This project is proposed to target a 20% reduction in embodied carbon emissions for production and transport of building materials and energy used in construction activities.

Concrete has the largest material impact for a typical concrete framed building which is standard practice in Australia. Therefore there is opportunity to reduce embodied carbon through the use of low carbon concrete or having a timber frame building.

Further assessments are required to understand the full extent of the project building's embodied carbon and possibilities of reduction.

This section of the report illustrates a few examples of strategies that maximise embodied carbon reduction within the building design.

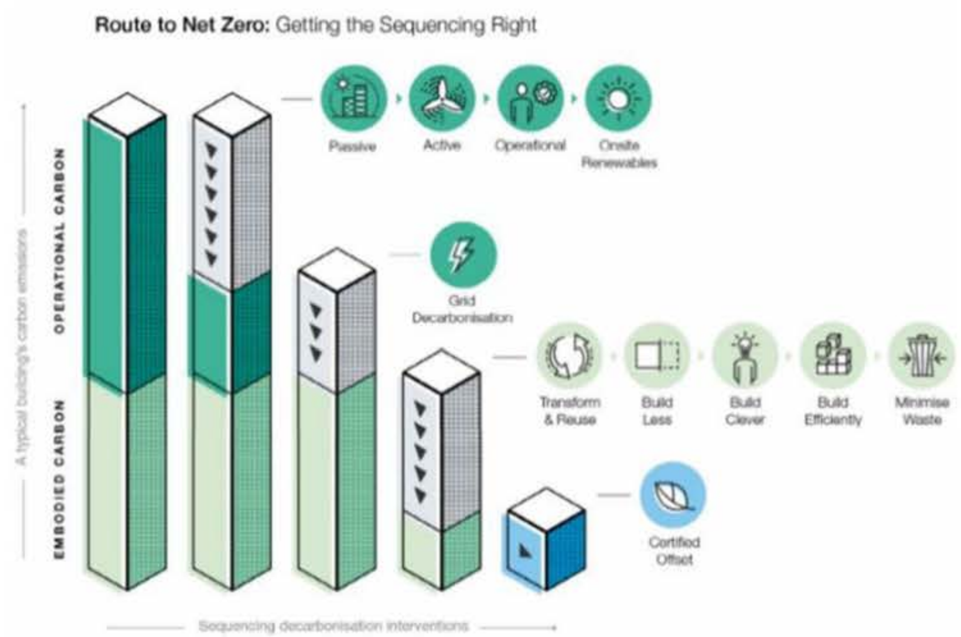


Figure 1 Whole-of-life carbon assessment – opportunities for carbon reduction (Source: Arup)

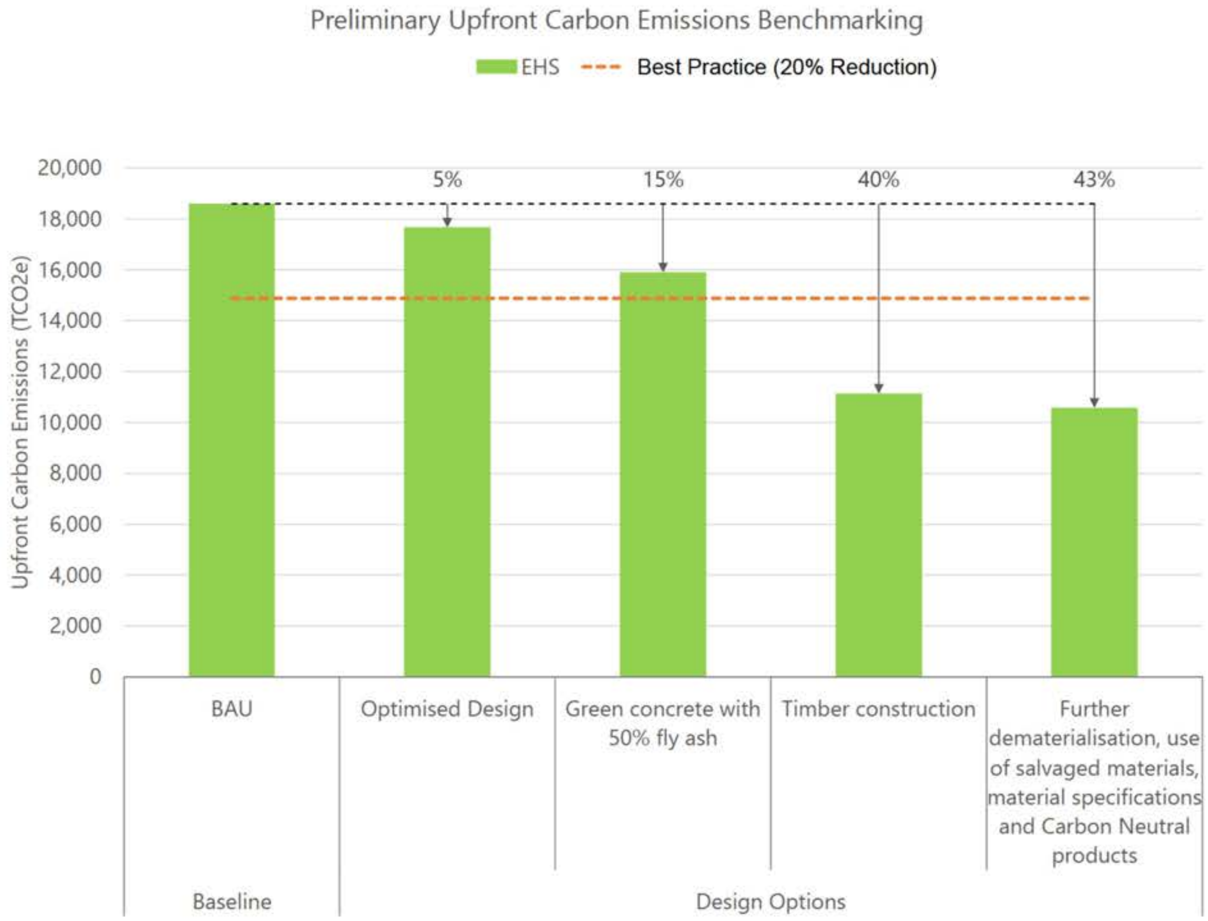
Reduced Embodied Carbon

The figure on the right illustrates possible ways to lower preliminary upfront embodied carbon by incorporating reduced carbon design initiatives.

The largest material contributors to embodied carbon are typically concrete, steel, aluminium, and glass. Material selection should focus on minimise the carbon impact of these materials.

The following are potential design options:

- Parametric design optimisation to design for structural strength using least material
- Low Carbon Concrete using at least 50% SCM replacement (Fly ash and/or GGBFS)
- Alternative structural construction such as timber frame buildings will further lower upfront carbon emissions to up to 40%.
- Salvage and recycle materials from demolition or other sites
- Installing carbon neutral certified products (Knauf, Australbricks, Holcim)



*Indicative based on past project experience

Climate Change Resilience

Climate Change Hazards and Impacts

The Eurobodalla Shire is located within the Southern Slopes Natural Resource Management (NRM) Climate Cluster. Climate change projections indicate that in the short and long term futures, this region will experience the primary and secondary effects of increased greenhouse gas emissions presented to the right. (CSIRO, BOM)

New and heightened climate change risks can pose consequences to the structure and operation of buildings and occupants. Developments built to withstand the historical climate are increasingly unlikely to be resilient to future climate. As this project will be a integral asset to the local community, and will play a crucial role during natural emergencies, it is imperative that the building is designed to be resilient to the changing local climate.

The project site is particularly susceptible to bushfires. This risk, among other high and extreme risks, should be a central area of focus when considering how to design for building resilience, as well as community resilience.

Primary Effects:

- Increasing average temperatures in all seasons
- Declining rainfall in winter months
  Fewer frost-risk days (< 2°C)
- Increasing solar radiation
  Increasing frequency of hot days (> 35°C) and duration of warm spells
- Increasing intensity of extreme rainfall events

Secondary Effects:

- Decreasing humidity
- Increase in time spent in drought
- More severe fire weather
- Increase in flooding events
- Annual changes in wind

Climate Change Resilience Workshop

The following outlines the process of developing a project-specific Climate Change Adaptation Plan to influence the building and operations design and ensure resilience to changing future climates.

- Establish the context – project-specific primary and secondary climate hazards/effects
- Consider changes in these impacts over short-term and long-term timescales (2040, 2070)
- Validate likelihood, consequences, and risk rating of each impact for the project
- Conduct a workshop with the project team to identify climate-related risks
- Identify potential design options and adaptation measures to address all risks rated as high or extreme
- Reassess risks to determine residual risk levels post-treatment
- Create a Climate Change Adaptation Plan report and implement design changes

Likelihood

Level	Descriptor	Consequence	Environmental	Social	Financial
1	Insignificant	No change, limited impacts	No adverse effect on natural environment	No adverse human health effects or complaints	Insignificant financial loss
2	Minor	Localised service disruption. No permanent damage. Some minor restoration work required. Lifespan reduced by 10-20%	Minimal effects on the natural environment.	Short-term disruption to employees, residents or businesses. Slight adverse human health effects or general amenity issues. Negative reports in local media.	Additional operational costs. Minor financial loss
3	Moderate	Widespread damage. Damage recoverable by maintenance and minor repair. Partial loss of local infrastructure. Lif[illegible]	Some damage to the environment, including local ecosystems. Some remedial action may be required	Frequent disruptions to employees, residents or businesses. Adverse human health effects. [illegible]	Moderate financial loss
4	Major	Ext[illegible] out[illegible]			
5	Catastroph[illegible]				

Consequence

Level	Descriptor	Description	Recurrent risk
A	Almost Certain	Event is almost certain to occur (90% probability) within the next 12 months or is imminent.	May occur several times per year
B	Likely	Event is likely to occur within the next 12 months (greater than 60% probability).	May arise about once per year
C	Possible	Event is possible within the next 12 months (30% probability) OR, has a reasonable chance (more than 50% probability) of occurring in next 3 years.	May arise once in 10 years
D	Unlikely	Event is not likely to occur in a given year (less than 30% probability).	May arise once in 10 to 25 years
E	Very Unlikely	The event may occur in exceptional circumstances (less than 1% probability) within the next 3 years).	Unlikely during the next 25 years

Risk Rating Matrix

			Consequence				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	A	Almost Certain	Low	Medium	High	Extreme	Extreme
	B	Likely	Low	Medium	Medium	High	Extreme
	C	Possible	Low	Low	Medium	High	High
	D	Unlikely	Low	Low	Medium	Medium	High
	E	Very Unlikely	Low	Low	Low	Medium	Medium

Figure 1 Example Risk Assessment Rating Matrices

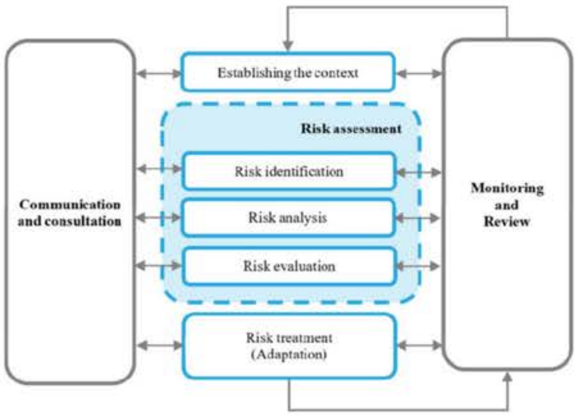


Figure 2 Climate Change Resilience Workshop Methodology

Mixed-mode ventilation

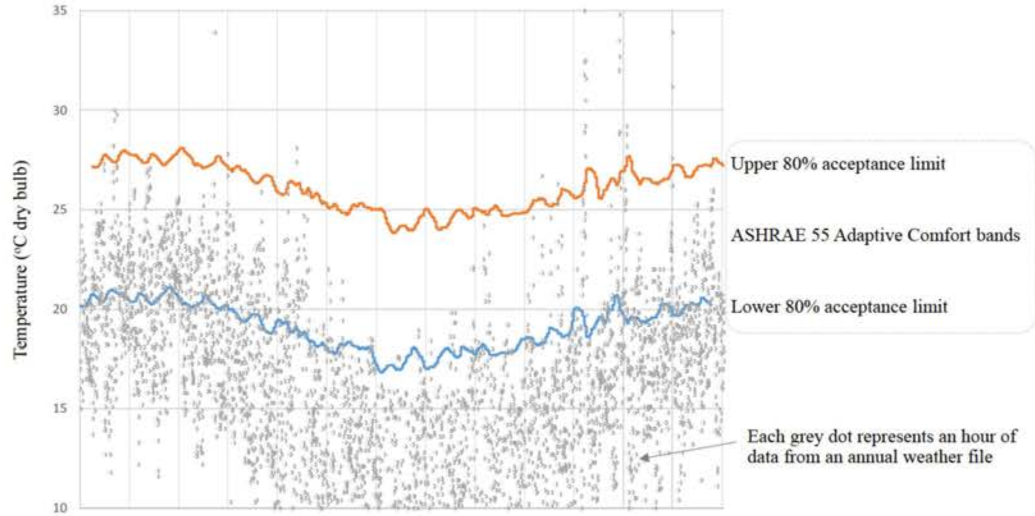
Mixed-mode Ventilation

An opportunity exists to naturally ventilate a significant portion of the building. As the climate of Moruya is mild, this would provide a significant energy benefit. The system could be either a seasonal operation or supplemental to the proposed HVAC. Thermal comfort could be relaxed in this area to further enhance the energy savings.

The well recognised industry body ASHRAE has developed standards which recognise how people's perception of thermal comfort adapts to the local climate. Throughout the year, as the average temperatures change, acceptable comfort bands vary.

The climate or Moruya is mild in summer and cool through winter. The plot to the right shows the hourly weather data plotted against the ASHRAE55 Adaptive comfort metric for 80% acceptance. The bands for acceptable comfort conditions are based on a rolling average of the conditions in the previous 7 days of weather.

Based on this analysis, <5% of all hours exceed the upper limit. Many hours exceed the lower limit and heating is likely need in localised areas for permanent staff or in waiting locations. Transient occupants will be dressed according to the prevailing conditions.



Annual weather data for Moruya
source: http://climate.onebuilding.org/
AUS_NSW_Moruya.AP.959370_TMYx.2004-2018

Operational energy & Amenity Benefits

ARUP

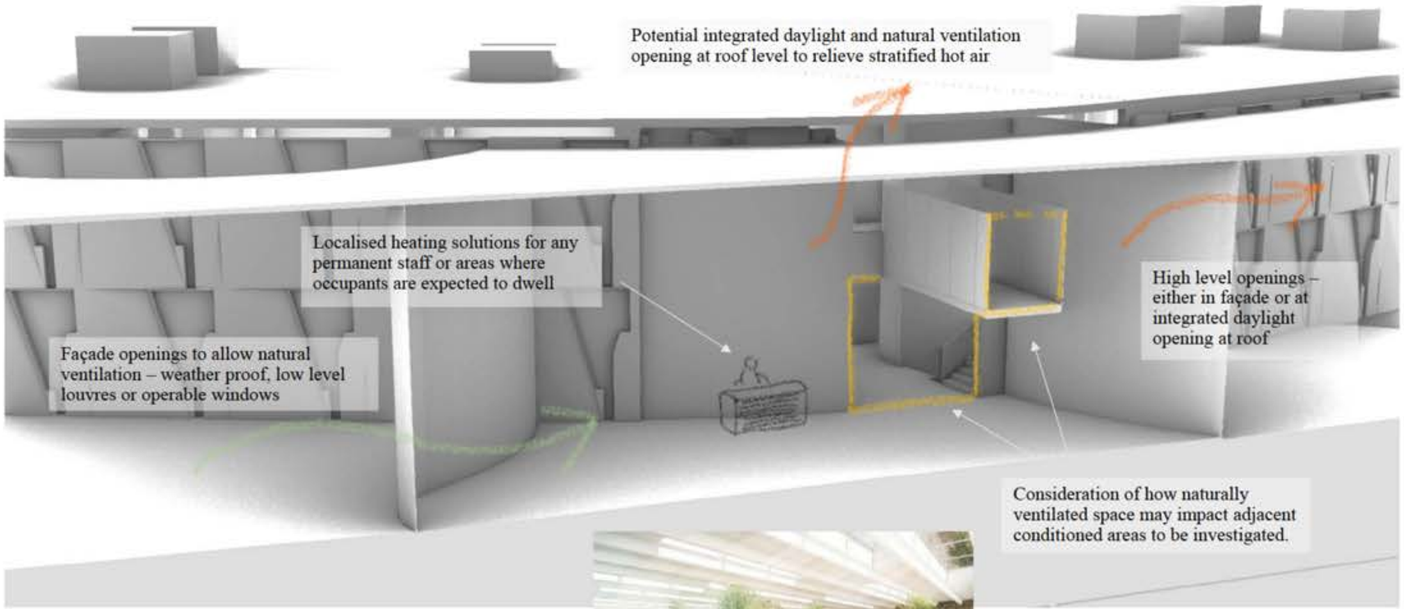
Mixed-mode

Even with significant hours below the lower limit, there is potentially major energy benefit from reducing cooling to the large Town Square volume. Appropriate use of localised heating will also minimise heating energy compared to conditioning the full volume.

Patient experience will be a moderated journey from outdoors to clinical space, rather than an abrupt change.

Next Steps

- Confirm with HI potential thermal comfort relaxation in proposed area
- Assess potential energy savings
- Coordinate heating solution for non-transient occupants



Concept schematic for natural ventilation system

Naturally ventilated and daylit circulation space at Bispebjerg Hospital

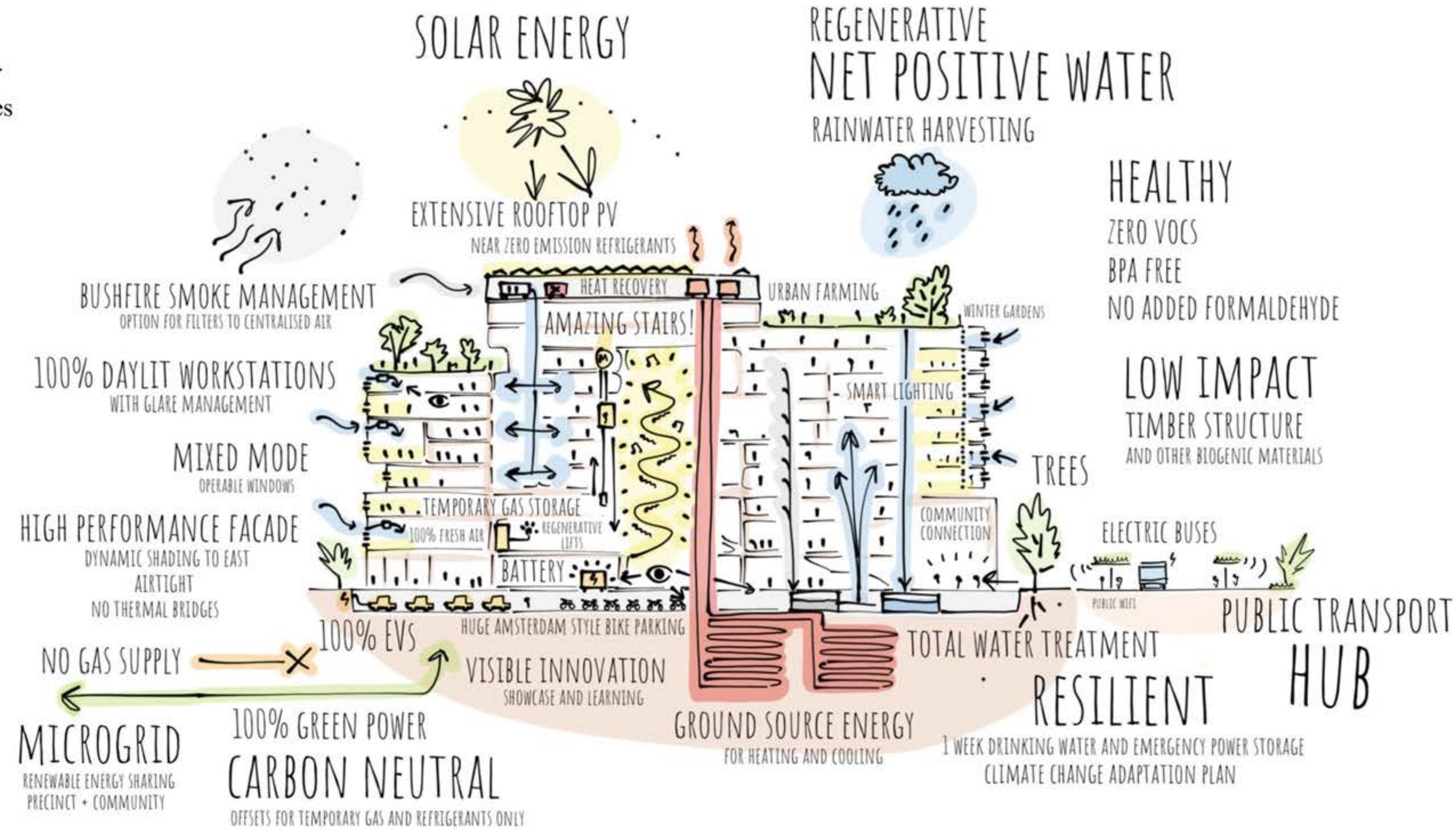
Passive Design

Benchmark Projects

Benchmarking

The development's aspiration is to be a sustainability showcase healthcare project and a range of different environmental initiatives are being explored and tested as part of the design.

This section explores world-leading hospitals in sustainable design.



Sunshine Coast University Hospital

Queensland Government and Exemplar Health PPP

2020

Greenfield site

152,000m², 567 beds

Key sustainability features:

- 75% of patients and visitors have access to a place of respite
- 50,000m² is green space
- Solar thermal hot water
- Rainwater harvesting
- Thermal energy storage
- Certified 6 star Green Star D&AB v1.1

Certified 6 Star Green Star

Significant green space

Khoo Teck Puat Hospital

Yishun, Singapore

Ministry of Health/Alexandra Health PTE LTD

2010

Greenfield site

108,000m^2, 550 bed general and acute care

Key sustainability features:

- Biophilic design integration
- Rooftop garden with organic produce for hospital kitchen
- 40% of green space publicly accessible
- Stormwater pond
- Access to daylight and natural ventilation
- Award winner – Living Future Institute
- Award winner – Stephen R. Kellert Biophilic Design Award

Biophilic design integration

With production of organic produce

Klinikum Frankfurt

Frankfurt, Germany

City of Frankfurt, Wörner Traxler

2021

Brown field site

78,000m^2, 664 beds

Key sustainability features:

- Certified Passivhaus
- Triple-glazed windows
- Air-tight building
- Efficient medical equipment
- Monitoring of systems in operation
- Converts waste heat into heating energy through MVHR system

Targeting Passivhaus certification

High performance façade

Eurobodalla Health Service | HI NSW

San Diego Medical Centre

California, USA

Kaiser Permanente

2017

61,600m², 321 beds

Greenfield site

Key sustainability features:

- Rainwater harvesting
- Omittance of one-pass cooling
- Active chilled beams
- Trigen
- Connected technology (virtual bed rails)
- Solar PV
- LEED Healthcare Platinum

High performance, integrated technology

LEED Healthcare Platinum

New Hospital Bispebjerg

Copenhagen, Denmark

Region Hovedstaden (Capital Region of Denmark)

2025

77,500m^2, 576 beds

Brownfield + Greenfield site

Key sustainability features:

- View maximised to surrounding greenery
- Openable windows
- Use of BIM/energy modelling to optimise design
- Wayfinding for staff, patients and visitors
- Aquifer Thermal Energy Storage – reduces CO2 emissions by ~50%
- Preservation of existing structures

Will reduce CO2 emissions by ~50%

And will preserve existing structures

Eurobodalla Health Service | HI NSW

Macksville Hospital

New South Wales Mid North Coast

NSW Health Infrastructure and Mid North Coast Local Health District

2020

Greenfield site

7,400 m^2, **567 beds**

Key sustainability features:

- Indigenous community collaboration and management of building and fitout design
- Aboriginal art providing positive health impacts
- Bilingual signage
- Native flora landscaping

Connection to Country

Through collaboration, language, and art

Summary

Summary

Project sustainability targets have been identified to align with the 6 Key Focus areas of the Health Infrastructure NSW *Sustainability Framework and Roadmap* – these are Greenhouse Gas Emissions, Sustainable Water, Climate Resilience, Local Focus, Transport and Circular Economy.

The current DGN58 pathway outlines the baseline sustainability targets of the project. To respond to the current ambitious project sustainability targets, the project can extend the DGN58 pathway to implement the stretch targets identified.

Future work will include feasibility studies to meet DGN58 credit criteria, NCC 2019 compliance, alignment potential planning constraints.

It is understood that electrification is an important driver in the development of the design. Options for inclusion now or provision in the future will be developed early in the next phase of design.

The following page provides an index of the sustainability initiatives included in this report. Each of these initiatives have been assigned one of the following statuses, to determine how they will be incorporated in the next stages of the project design:

- *Minimum requirement* – part of the DGN58 4 Star pathway, or for NCC 2019 compliance.
- *Recommended* – as a stretch target of the DGN58 pathway, or recommended to meet the main project performance targets.
- *Explore feasibility* – further investigation required in the next stages of design to determine whether to implement.

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Timber structure	Timber structure instead of concrete to reduce embodied carbon.	Sustainability Targets Page 9; Embodied Carbon Page 33	20% Embodied Emissions Reduction	Explore feasibility
Low carbon, locally sourced materials	Reduce embodied carbon of building materials and their transportation.	Sustainability Targets Page 9	20% Embodied Emissions Reduction	Recommended
PV panels on rooftops	Rooftop PV for on-site renewable energy generation.	Sustainability Targets Page 9; Sustainability Targets Page 10; DGN58 Page 19	100% Powered By Renewable Energy 30% Operational Emissions Reduction	Recommended
PV panels on carpark shading structures	Additional PV to increase on-site renewable energy generation capacity.	Sustainability Targets Page 9; DGN58 Page 19	30% Operational Emissions Reduction	Explore feasibility
Building electrification	Design for removal of all fossil fuel powered equipment from the building services.	Sustainability Targets Page 9; Electrification Page 27; DGN58 Page 19	100% Electric Building	Recommended
Energy efficient lighting, appliances, equipment	To reduce operational energy emissions.	Sustainability Targets Page 10; DGN58 Page 19	5 star NABERS Public Hospital	Recommended
Off-site renewable energy source	100% Green Power Purchase for 10 years.	Sustainability Targets Page 10; DGN58 Page 19	100% Powered By Renewable Energy	Recommended
On-site renewable energy storage	For resilience and to minimise dependence on the grid.	Sustainability Targets Page 10; Sustainability Targets Page 12	100% Powered By Renewable Energy Climate Change Risk and Adaptation	Explore feasibility
High performance façade	For reduced operational carbon emissions and occupant comfort.	Sustainability Targets Page 10; DGN58 Page 19	30% Operational Emissions Reduction	Minimum requirement
Mixed-mode ventilation	Naturally ventilating most of the building will reduce operational carbon emissions.	Sustainability Targets Page 10; Mixed-mode ventilation Page 43	30% Operational Emissions Reduction	Recommended

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Best practice WELS rated fixtures	Water efficient sanitary fixtures to reduce potable water consumption.	Sustainability Targets Page 11; Sustainability Targets Page 12; DGN58 Page 22	30% Potable Water Use Reduction; Climate Change Risk and Adaptation	Minimum requirement
Rainwater capture and reuse	Recycled rainwater used for irrigation, toilet flushing, hosing outdoor surfaces, water features, etc.	Sustainability Targets Page 11; Sustainability Targets Page 12; DGN58 Page 22	30% Potable Water Use Reduction; Climate Change Risk and Adaptation	Recommended
Greywater capture and reuse	Treated greywater used for irrigation, toilet flushing, hosing outdoor surfaces, water features, etc.	Sustainability Targets Page 11; Sustainability Targets Page 12	30% Potable Water Use Reduction; Climate Change Risk and Adaptation	Recommended
Condensate capture and reuse	Treated condensate used for irrigation, toilet flushing, hosing outdoor surfaces, water features, etc.	Sustainability Targets Page 11; Sustainability Targets Page 12; DGN58 Page 22	30% Potable Water Use Reduction; Climate Change Risk and Adaptation	Recommended
Landscaping using drought tolerant native plants	Reduce water used for irrigation by planting drought tolerant native species.	Sustainability Targets Page 11	30% Potable Water Use Reduction	Explore feasibility
WSUD landscaping design	Manage surface run off through Water Sensitive Urban Design (WSUD).	Sustainability Targets Page 11; DGN58 Page 25	30% Potable Water Use Reduction	Recommended
Stormwater detention	Manage stormwater through detention tanks or landscape.	Sustainability Targets Page 11; DGN58 Page 25		Explore feasibility
Climate resilient infrastructure	Design building and select materials for resilience to changing climate.	Sustainability Targets Page 12	Climate Change Risk and Adaptation	Recommended
Community Resilience Plan	Consult community and develop plan on how the project can contribute to community resilience.	Sustainability Targets Page 12	Climate Change Risk and Adaptation	Recommended

ES6 AH1

Slide 57

ES6	remove stormwater detention? Enda Seyama-Heneghan, 22-Jun-21
AH1	modified to note potential for landscape dentention Alexander Hespe, 24-Jun-21

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Design as community safety point	Hospital to act as point of safety/refuge for community in case of natural disasters	Sustainability Targets Page 12	Climate Change Risk and Adaptation	Explore feasibility
Multi-disciplinary climate change resilience workshop	Discuss the high and extreme climate risks to the project and implement design options to all areas of project that mitigate these risks.	Sustainability Targets Page 12; Climate Change Resilience Page 34; DGN58 Page 18	Climate Change Risk and Adaptation	Recommended
Additional resilience studies	Extend resilience studies to encompass resilience to significant risks other than climate e.g. pandemic	Sustainability Targets Page 12	Climate Change Risk and Adaptation	Recommended
Connection to Country	Engage with local Aboriginal community leaders and integrate Indigenous design initiatives	Sustainability Targets Page 13		Recommended
Community collaboration on artworks	Engage with local and Aboriginal artists to incorporate artworks in the building Fitout.	Sustainability Targets Page 13		Explore feasibility
Employment and training opportunities for local community	Contribute to community development by providing employment and training opportunities.	Sustainability Targets Page 13		Explore feasibility
Operable windows in in-patient rooms	To increase patient thermal comfort and mental wellbeing.	Sustainability Targets Page 13	100% of in-patient rooms have access to natural ventilation, daylight, views	Recommended

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Biophilic design	Biophilic design principles in architectural design and material selection, to develop connection to nature.	Sustainability Targets Page 13		Explore feasibility
Accessible landscaped areas	Native indigenous landscape for patients to have social and individual respite.	Sustainability Targets Page 13	100% of patients have access to native indigenous landscape for social and individual respite	Recommended
Shading with urban tree canopies	Shading outdoor hard surfaces with tree canopies to provide outdoor thermal comfort.	Sustainability Targets Page 13	100% shaded hard surfaces between 9am and 3pm	Explore feasibility
Microclimate analysis	To assess effect of landscaping and building design on outdoor thermal comfort.	Sustainability Targets Page 13		Explore feasibility
End of Trip Facilities for visitors and staff	To encourage active transport modes to and from the site.	Sustainability Targets Page 14; DGN58 Page 21	End of Trip Facilities for active transport mode users	Recommended
Secure bicycle parking	To encourage visitors and staff to cycle to and from the site.	Sustainability Targets Page 14; DGN58 Page 21	End of Trip Facilities for active transport mode users	Recommended
EV charging stations for all e-modes	Install EV charging stations from day 1 or allow for future provision of these charging stations.	Sustainability Targets Page 14; DGN58 Page 21	EV Charging Stations for cars and e-modes	Recommended
Attractive and well-located stairs	To encourage active movement within the building.	Sustainability Targets Page 14		Explore feasibility

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Shuttle bus service for visitors	To reduce emissions from the personal vehicles of visitors and extend the service accessibility to all members of the local community.	Sustainability Targets Page 14		Explore feasibility
Connection to public transport	To extend the service accessibility to all members of the local community.	Sustainability Targets Page 14	Public Transport with comfortable, shaded, accessible shelters and access	Recommended
Accessible design of public transport stops	Provide waiting areas/shelters that are comfortable, shaded and accessible.	Sustainability Targets Page 14	Public Transport with comfortable, shaded, accessible shelters and access	Recommended
Recycle and reuse	Reduce current operational waste through recycling and reuse where possible.	Sustainability Targets Page 15; DGN58 Page 18		Minimum requirement
Separation of waste streams	Maximise operational waste being diverted from landfill.	Sustainability Targets Page 15; DGN58 Page 18		Minimum requirement
Anaerobic digestor	Organic waste to energy technology.	Sustainability Targets Page 15	100% on-site organic waste management	Explore feasibility
Remove non-essential single use plastics	Retail tenancy agreement to remove single use plastics and remove other non-essential single use plastics used in operations.	Sustainability Targets Page 15	No single use plastics on site	Recommended
Correct disposal of single-use medical tools and PPE	To minimise operational waste going to landfill.	Sustainability Targets Page 15		Explore feasibility
General waste compactor	To reduce the number of waste collection vehicle trips and associated transport emissions.	Sustainability Targets Page 15		Explore feasibility

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Commit and measure project Environmental Performance Targets	Outline sustainability targets of the project in a design intent report or OPR.	DGN58 Page 18		Minimum requirement
Comprehensive Services and Maintainability Review	Engage ICA to carry out review during design stage and prior to construction.	DGN58 Page 18		Minimum requirement
Building Commissioning and Tuning	Engage ICA to carry out review on all nominated building systems.	DGN58 Page 18		Minimum requirement
Building Information documents	To facilitate operator and user understanding of a building's systems.	DGN58 Page 18		Minimum requirement
Install Metering and Monitoring Systems	For energy and water systems.	DGN58 Page 18		Minimum requirement
Develop a Formalised EMP	Environmental Management Plan (EMP) to cover environmental impacts arising from the construction works.	DGN58 Page 18		Minimum requirement
Provide High Quality Staff Support	To promote a safe and sustainable working environment for site workers.	DGN58 Page 18		Minimum requirement
Mechanical systems to be designed for ease of maintenance	To both sides of moisture and debris-catching components.	DGN58 Page 19		Minimum requirement
Provide high indoor air quality	Mechanical systems to provide increased outdoor air volumes and eliminate of pollutants.	DGN58 Page 19	100% of in-patient rooms have access to natural ventilation, daylight, views	Minimum requirement

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Acoustic insulation	To maintain low internal noise and reverberation levels, and separation between spaces.	DGN58 Page 19		Minimum requirement
Comfortable lighting levels	To eliminate glare and improve lighting uniformity.	DGN58 Page 19		Minimum requirement
High daylight levels	In nominated spaces to increase occupant wellbeing and comfort.	DGN58 Page 19	100% of in-patient rooms have access to natural ventilation, daylight, views	Minimum requirement
Rooms with a view to nature	In nominated spaces to increase occupant wellbeing and comfort.	DGN58 Page 19	100% of in-patient rooms have access to natural ventilation, daylight, views	Minimum requirement
Low emissions paints, adhesive, sealants and carpets, and engineered wood	To reduce internal air pollutant levels.	DGN58 Page 19		Minimum requirement
Mechanical systems designed to maintain indoor thermal comfort	Advanced occupant thermal comfort between PMV +-0.5.	DGN58 Page 19		Minimum requirement
No or little potable water for irrigation	No potable water used or irrigation, or drip irrigation with moisture sensor override is installed.	DGN58 Page 22	No potable water used for non-potable needs	Minimum requirement
Water efficient fire testing	Water efficient Fire Protection System, or reuse of test water	DGN58 Page 22	30% Potable Water Use Reduction	Minimum requirement

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Low carbon concrete	Replace 30-40% of Portland cement with supplementary cementitious materials, and use reclaimed water and manufactured sand.	Embodied Carbon Page 33; DGN58 Page 23	20% Embodied Emissions Reduction	Minimum Requirement
Reduced steel use	Reduction in steel framing and reinforcement compared to standard practice for lower embodied carbon.	Embodied Carbon Page 33; DGN58 Page 23	20% Embodied Emissions Reduction	Minimum Requirement
Structural timber	30% of the building's GFA is constructed and/or supported from structural timber.	DGN58 Page 23; Sustainability Targets Page 9; Embodied Carbon Page 33	20% Embodied Emissions Reduction	Minimum Requirement
Responsible steel source	95% of building's steel is sourced from a Responsible Steel Maker.	DGN58 Page 23		Minimum Requirement
Responsible timber source	95% of timber in building and construction works is certified or from a reused source.	DGN58 Page 23		Minimum Requirement
Responsible PVC source	No PVC products or 90% of products containing PVC meet best practice guidance.	DGN58 Page 23		Minimum Requirement
Sustainable products and materials selection	At least 3-6% of products to have sustainability certification.	DGN58 Page 23		Minimum Requirement
Diversion of construction and demolition waste	At least 90% of construction and demolition waste diverted from landfill.	DGN58 Page 23		Minimum Requirement

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Green landscaping design and building material selection	Reduce heat island effect by 75% of project site comprising of landscaping or high SRI building elements.	DGN58 Page 24	100% shaded hard surfaces between 9am and 3pm	Minimum requirement
Improve site ecological value	Through landscaping and green infrastructure.	DGN58 Page 24		Recommended
Minimise light pollution	Through control of upward lighting and direct illuminance.	DGN58 Page 25		Minimum requirement
Control refrigerant impacts	Minimise Legionella impacts from mechanical systems.	DGN58 Page 25		Minimum requirement
Refrigerant and equipment selection	Minimise the environmental impacts of refrigeration and air-conditioning equipment.	DGN58 Page 25		Minimum requirement
Stormwater treatment	To reduce pollutants entering public sewer infrastructure.	DGN58 Page 25		Recommended
Ultra low VOC paints	To reduce internal air pollutant levels.	DGN58 Page 26		Recommended
All mattresses meet Green Guard emissions criteria	To reduce internal air pollutant levels.	DGN58 Page 26		Recommended
High performance site offices	To promote a safe and sustainable working environment for site workers.	DGN58 Page 26		Recommended

List of Sustainability Initiatives

Initiative	Description	Report Reference	Project Performance Target	Status
Prioritise social return on investment	Holistically assess the direct and indirect costs and benefits of the building to the building users, community, and broader economy.	DGN58 Page 26		Recommended
Understand occupant engagement	Perform pre-occupancy and post-occupancy studies to explore how the sustainability performance outcomes impact productivity, patient stay length, patient satisfaction, etc.	DGN58 Page 26		Recommended
Develop a Reconciliation Action Plan	Develop a RAP and provide evidence of how the Eurobodalla Health Service plays a central role in delivering the RAP.	DGN58 Page 26		Recommended
Solar Thermal Hot Water	Utilise roof space to provide pre-heat of domestic hot water via solar thermal panels.	Sustainability Targets Page 10		

Appendix A
DGN58 Scorecard

For further information, please contact:

[redacted]

Level 5, 151 Clarence Street

Sydney NSW 2000

ARUP

Health Infrastructure ESD Evaluation Tool

Project HI21042 Eurobodalla Health Service Redevelopment
Date 17-May-21
Part 2 - Feasibility

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	INPUT	Low focus initiatives	Project Target (Minimum)	Project Buffer	Project Target (Stretch)	Notes
Management				14						
Accredited Professional	To recognise the appointment and active involvement of an Accredited Professional (under an Environmental Rating System) in order to ensure that the rating tool is applied effectively and as intended.	1.0	Accredited Professional	1	ESD		1			
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets	-	HI		0			
		2.1	Services and Maintainability Review	1	ICA		1			
		2.2	Building Commissioning	1	ICA		1			
		2.3	Building Systems Tuning	1	ICA		1			
		2.4	Independent Commissioning Agent	1	ICA	Requires an additional consultant. HI undertake a similar role to ICA.	0			
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	2	ENV/ESD		0	2		CAP is increasingly relevant and essential to address climate change risks on the project
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information	1	ARCH		1			
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	1	HI		1			
		5.2	End of Life Waste Performance	1	WASTE		0			
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	-	MECH/HYD/ELEC		0			
		6.1	Monitoring Systems	1	MECH/HYD/ELEC		1			
Responsible Building Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	HI		1			
		7.1	Formalised Environmental Management System	1	HI		1			
		7.2	High Quality Staff Support	1	CONTR	Construction related credit for contractor to consider.	0	1		Good practice to be adopted by Contractor
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan	1	WASTE		1			
		8B	Prescriptive Pathway - Facilities	-	WASTE		0			
Total				14			10	3	0	

Indoor Environment Quality				17						
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	1	MECH		1			
		9.2	Provision of Outdoor Air	2	MECH		1			
		9.3	Exhaust or Elimination of Pollutants	1	MECH		1			
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	1	ACOUS		1			
		10.2	Reverberation	1	ACOUS		1			
		10.3	Acoustic Separation	1	ACOUS		1			
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort	-	LIGHT/ELEC		0			
		11.1	General Illuminance and Glare Reduction	1	LIGHT/ELEC		1			
		11.2	Surface Illuminance	1	ARCH		1			
		11.3	Localised Lighting Control	1	LIGHT/ELEC		1			
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	-	ESD		0			
		12.1	Daylight	2	ESD		1			
		12.2	Views	1	ARCH		1			
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1	Paints, Adhesives, Sealants and Carpets	1	HYDR/MECH/ELEC/ ARCH		1			
		13.2	Engineered Wood Products	1	STRUC		1			
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	MECH		1			
		14.2	Advanced Thermal Comfort	1	MECH		1			Advanced thermal comfort might be challenging. Thermal Comfort modeling is required
Total				17			15	0	0	
Energy				22						
Greenhouse Gas Emissions		15E.0	Conditional Requirement: Reference Building Pathway	-	MECH		0			
		15E.1	GHG Emissions Reduction: Building Fabric (Intermediate Building Relative to Reference Building)	4	ARCH/ESD		0			
		15E.2	GHG Emissions Reduction (Proposed building relative to Benchmark Building)	16	MECH, ESD		2	1.4	0.7	(Buffer) Additional 10% improvement over Section J (Stretch) Rooftop Solar PV (assume only <5% energy offset)
		15E.3	Off-site renewables	-	HI NSW		0		6.2	100% GreenPower Purchase for 10 years
		15E.4	District Services	1	MECH		0			
		15E.5	Additional Prescription Measures: - Transition Plan	1	HI NSW		0		1	HI NSW to provide transition plan
		15E.5	Additional Prescription Measures: - Fuel Switching	2	MECH, HYD		0		1	Stretch target: Electrification
		15E.5	Additional Prescription Measures: - On-site Storage	1	ELEC		0			
Peak Electricity Demand Reduction	Prescriptive Pathway	16A	Prescriptive Pathway - On-site Energy Generation	-	ELEC		0			
		16B	Performance Pathway - Reference Building	2	ELEC		1			20% peak electricity demand reduction
Total				22			3	1.4	8.9	

Transport				10						
Sustainable Transport	Performance Pathway	17A.1	Performance Pathway	10	TRANS/CONTR	Hospitals are usually well connected to public transport nodes. Large percentage of patients require access to hopsitals via vehicles. Expansion of exisitng hospital also require additional carparking.	0			Greenfield south of Moruya town center. Limited public transport facilities Stretch target: EoTF on site, 5% of EV charging station/15% parking for fuel efficient vehicles
		17B.1	Access by Public Transport	0			0			
		17B.2	Reduced Car Parking Provision	0			0			
		17B.3	Low Emission Vehicle Infrastructure	0			0		1	
		17B.4	Active Transport Facilities	0			0		1	
		17B.5	Walkable Neighbourhoods	0			0			
Total				10			0	0	2	
Water				12						
Potable Water	Prescriptive Pathway	18A.1	Potable Water - Performance Pathway	0	HYDR	Hospitals require extensive use of potable water and typically lower use for recycled water. AusHFG requirements limit use of rainwater systems, limiting the use to primarily landscaping.	0			
		18B.1	Sanitary Fixture Efficiency	1	HYDR		1			
		18B.2	Rainwater Reuse	1	HYDR		0		1	Stretch target: to collect and treat rainwater for onsite reuse
		18B.3	Heat Rejection	2	MECH		0			
		18B.4	Landscape Irrigation	1	LAND		1			
		18B.5	Fire System Test Water	1	FIRE		1			TBC with Hydraulics and Fire
Total				12			3	0	1	
Materials				14						
Life Cycle Impacts	Prescriptive Pathway - Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	6		Life Cycle Assessor (additional consultant) required	0			
		19A.2	Additional Life Cycle Impact Reporting	4		Life Cycle Assessor (additional consultant) required	0			
		19B.1	Concrete	3	ARCH		2	1	0	30% cement replacement + reclaimed water + manufactured sand in Concrete Stretch: 40% cement replacement
		19B.2	Steel	1	ARCH		1			
		19B.3	Building Reuse	4	ARCH		0			Not applicable
		19B.4	Structural Timber	4	STRUC		1			Applicable only if Structural timber is used
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	1	STRUC		1			
		20.2	Timber Products	1	ARCH		1			
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	HYDR/MECH/ELEC/ ARCH/STRUC		1			
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	ARCH		1	1		3% of products with certification Stretch: 6% of products with certification
Construction and Demolition Waste	Fixed Benchmark	22A	Fixed Benchmark	1			0			
		22B	Percentage Benchmark	-	CONTR		1			
Total				14			9	2	0	
Land Use & Ecology				6						
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	ECO	Hospitals usually built on brown field sites	0			
		23.1	Ecological Value	3	ECO/ESD	Hospital sites are usually mainly buildings with minimal landscape area.	0		1	Ecological value improvement (ie landscape area) should be considered,
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	-	LAND		0			
		24.1	Reuse of Land	1	CONTR	Most hospital and healthcare projects are located within exisitng hospital sites. For most projects, this credit would be considered achieved.	0			Project site is a brownfield
		24.2	Contamination and Hazardous Materials	1	CONTR		0			
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.0	Heat Island Effect Reduction	1	ARCH/LAND/ESD		1			At least 75% of the total project site area comprises landscaping or high SRI building elements that reduce the impact of the heat island efffect
Total				6			1	0	1	

Emissions				5						
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge	1	CIVIL		1			
		26.2	Stormwater Pollution Targets	1	CIVIL		0		1	Stormwater should be treated to meet Column A pollutant target (cross check with council requirement)
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-	LIGHT/ELEC	Neighbouring buildings are usually the hospital buildings. Consider impacts to surrounding residential if any.	0			
		27.1	Light Pollution to Night Sky	1	LIGHT/ELEC		1			
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28.0	Legionella Impacts from Cooling Systems	1	MECH		1			
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1	MECH		1			BAU to meet refrigerant impact target
Total				5			4	0	1	
Innovation				10						
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process	10			0			
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation				0			
Improving on Benchmarks	The project has achieved full points in a credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Benchmarks		CONTR/ARCH/CIVIL		0		5	Options - Ultra Low VOC paints (ARCHITECT) - All mattress supplied meet GreenGuard emission criteria (ARCHITECT) - Stormwater pollution targets meet column B (HYDRAULICS)
	Supplementary or tenancy fitout systems review	30C	Commissioning and Tuning		ICA		0			
	Daylight See credit	30C	Visual Comfort		ESD		0			
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the above Credits.	30D	Innovation Challenge		CONTR/HI NSW		0			Options: - High Performance Site Offices (CONTRACTOR) - Social Return on Investment (HI) - Occupant Engagement (HI) - Reconciliation Action Plan (HI)
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this rating tools.	30E	Global Sustainability				0			
Total				10			0	0	5.0	
TOTAL							45	6.4	18.9	

11.3 BCA CD Report

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PHILIP CHUN
Building Compliance

Eurobodalla Health Service

Concept design BCA report

Report prepared for:	Health Infrastructure NSW C/o – Root Partnerships Contact: [redacted]
Report prepared by:	Philip Chun BC NSW Pty Ltd Suite 404, Level 4 44 Hampden Road, Artarmon NSW 2064 Contact: [redacted]
Report Ref:	021-216588_EHS_Concept_BCA_R03_210721.doc
Job Number:	021-216588
Date:	21 July 2021

CONTENTS

DOCUMENT ACCEPTANCE

	Name	Signed	Date
Prepared by	[redacted]	[redacted]	21/07/2021

REVISION HISTORY

Revision No.	Prepared by	Description	Date
R01	[redacted]	Masterplan Draft	16/6/2021
R02	[redacted]	Concept design report – 90%	23/6/2021
R03	[redacted]	Concept design report – Final	21/07/2021

1.0 Introduction and Documentation

1.1 Brief

The new development will be built for the Eurobodalla community. The proposed redevelopment will be located to replace the existing facilities in Batemans Bay and Moruya. The new development will be located on the eastern side of Moruya NSW on a greenfield site.

The project scope of work includes the following:-

A $200m investment, to build a sustainable, modern and purpose-built facility to support the needs of the Eurobodalla community.
• Clinical Services Plan delivering on projections to 2031.
• Sustainability will be a key initiative for the project.
• the project will include working with the NSW Government Architect to deliver against the "Connecting with Country Program", incorporating Indigenous design into the Health Facility design and cultural practices have been discussed with Local Aboriginal Representatives.
• Co-ordination with Transport for NSW in relation to the Moruya Bypass Project.
• provision of a greenfield site that enables future expansion of health care facilities, including the decommissioning of existing hospital facilities in Batemans Bay and Moruya.

EHS
Project Overview - Location

Masterplan View

This assessment involves a review of the masterplan and concept and looks to inform the design team on high level issues that may affect the design. Consideration has been take with respect to compliance with the Building Code of Australia, namely 2019 Amendment 1 (BCA2019).

Methodology is principally inspection of the available documentation.

This report is for the exclusive use of the client and cannot be used for any other purpose without prior permission from Philip Chun BC NSW Pty Ltd. The report is valid only in its entire form.

This report does not include nor implies any detailed assessment of the building with respect to structural engineering or engineering services, material fire resistance levels or compliance with any Australian Standards. Therefore the following are excluded from this assessment:

- structural adequacy of the building;
- fire-resistance ratings of any structural elements of the building;
- design basis and/or operating capabilities of electrical, mechanical, hydraulic, fire services and fire protection services;
- Disability Discrimination Act 1992 including the Disability (Access to Premises – Buildings) Standards 2010;
- requirements of other regulatory authorities and utilities including, but not limited to, Telstra and the like communications authority, Gas Supply Authority, Water Supply Authority, Electricity Supply Authority, Work Cover, Roads and Maritime Services (RMS), Local Council, ARTC, ASA, Department of Planning and the like; and any existing conditions of Development Consent issued by the Local Consent Authority.

1.2 Documentation available and assessed

The concept design phase documentation assessed comprises of the following report issued by Conrad Gargett to date.

EHS-HI-AR-DWG-FD-10PW02_B	Masterplan
EHS-HI-AR-DWG-FD-200L001_D	Lower Ground Floor General Arrangement Plan
EHS-HI-AR-DWG-FD-200000_D	Ground Floor General Arrangement Plan
EHS-HI-AR-DWG-FD-200201_C	Level 01 General Arrangement Plan
EHS-HI-AR-DWG-FD-200301_B	ROOF

1.3 Alternate solutions and performance based assessment

Where compliance with the deemed to satisfy provisions is not readily achievable, performance based assessment and performance solutions will need to be used to demonstrate compliance with the Building Code of Australia. These will be identified in general terms in the future assessment of design and will be informed by fire engineering.

The use of performance solutions comes about due to the generic and prescriptive nature of the Building Code of Australia with respect to the deemed to satisfy provisions and the inability for the document to be ultimately flexible for all building types and applications. This is the main reason the Building Code of Australia allows performance solutions, where meeting the performance requirements of the code, are deemed to also be compliant with the Building Code of Australia.

1.4 Additional Performance Solutions

Areas outside fire that may have variances from the Deemed-to-Satisfy provisions and hence addressable by performance solutions that may also need to be considered are as follows:

DtS Clause	Performance Requirement	Variance from Deemed-to-Satisfy provisions	Status
N/A	FP4.1	Weatherproofing of external façade	Performance solution to be provided for the wall construction and waterproofing to ensure

DtS Clause	Performance Requirement	Variance from Deemed-to-Satisfy provisions	Status
			compliance. Assessment by the architects and designers required to validate that the walls will meet the performance requirements. Compliance readily achievable and detailed during the next phase of design.

2.0 Use and Class of Building

The proposed new hospital building will be a mixed use healthcare building with associated support facilities, on grade carpark, minor retail and healthcare related offices.

The use and classification is as per the following table for the parts of the building assessed.

2.1 Building Use Matrix

Building Use Matrix		
Levels	**BCA Class**	**Use**
Lower ground floor	9a Health – Patient care areas and Non Patient care areas	Hospital, BOH, Docks and Loading
Ground Level	9a Health – Patient care areas and Non Patient care areas	Hospital, Entry / Administration, Café / Minor retail
Level 1	9a Health – Patient care areas and Non Patient care areas	Hospital

2.2 Rise in Storey, Type of Construction and Effective Height

The building is designed to NOT exceed 25 metres in effective height. It is proposed that the building will contain 3 storeys to the highest part of the building excluding the plantroom level. The effective height will also be less than 12 metres.

The building type of construction will need to be at least Type A construction as it contains a rise in storey of 3 and contains a Class 9 use.

Table C1.1 Type of construction required

Rise in storeys	Class of building 2, 3, 9	Class of building 5, 6, 7, 8
4 or more	A	A
3	A	B
2	B	C
1	C	C

2.3 BCA 2019 Amendment 1 Classifications and general definitions

According to the Building Code of Australia the following definitions assist in the classification of the building and the various parts.

2.2.1 Def – A3.1 Principles of classification

The classification of a building or part of a building is determined by the purpose for which it is designed, constructed or adapted to be used.

2.2.2 Def – A3.2 Classifications

The different parts of the building are classified as follows as they relate to the complex:

Class 5: *- An office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.*

Class 6*: - A shop or other building for the sale of goods by retail or the supply of services direct to the public, including—*
(a) An eating room, café, restaurant, milk or soft-drink bar; or
(b) A dining room, bar area that is not an assembly building, shop or kiosk part of a hotel or motel; or
(c) A hairdresser's or barber's shop, public laundry, or undertaker's establishment; or
(d) Market or sale room, showroom, or service station.

Class 7: - a building which is—
*(a) **Class 7a** — a carpark; or*
*(b) **Class 7b** — for storage, or display of goods or produce for sale by wholesale.*

Class 9: - a building of a public nature—

*(a) **Class 9a** — a health-care building, including those parts of the building set aside as a laboratory; or*

2.2.3 Definitions for uses of Class 9a Health Care Buildings

The following definitions apply to the different uses within the health care portions of the building:

***Health-care building** – means a building whose occupants or patients undergoing medical treatment **generally need physical assistance to evacuate** the building during an emergency and includes—*
(a) a public or private hospital; or
(b) a nursing home or similar facility for sick or disabled persons needing full-time care; or
(c) a clinic, day surgery or procedure unit where the effects of the predominant treatment administered involve patients becoming non-ambulatory and requiring supervised medical care on the premises for some time after the treatment.

***Patient Care Areas** – means a part of a health-care building normally used for the treatment, care, accommodation, recreation, dining and holding of patients including a **ward area and treatment area**.*

Treatment Areas** – means an area within a patient care area such as an operating theatre and rooms used for recovery, minor procedures, resuscitation, intensive care and coronary care from which a patient **may not be readily moved.

***Ward Area** – means that part of a patient care area for resident patients and may contain areas for accommodation, sleeping, associated living and nursing facilities.*

2.2.4 Definitions for type of construction

The following definitions apply to assessment of the building with respect to type of construction:

***Effective height** – means the vertical distance between the floor of the lowest storey included in the calculation of rise in storeys and the floor of the topmost storey (excluding the topmost storey if it contains only heating, ventilating, lift or other equipment, water tanks or similar service units).*

***Rise in storeys** means the greatest number of storeys calculated in accordance with C1.2.*

C1.2 Calculation of rise in storeys
(a) The rise in storeys is the sum of the greatest number of storeys at any part of the external walls of the building and any storeys within the roof space—
(i) above the finished ground next to that part; or
(ii) if part of the external wall is on the boundary of the allotment, above the natural ground level at the relevant part of the boundary.
(b) A storey is not counted if—
(i) it is situated at the top of the building and contains only heating, ventilating or lift equipment, water tanks, or similar service units or equipment; or
(ii) it is situated partly below the finished ground and the underside of the ceiling is not more than 1 m above the average finished level of the ground at the external wall, or if the external wall is more than 12 m long, the average for the 12 m part where the ground is lowest.

2.2.5 External façade and wall construction, requirements for non combustibility

The following are the applicable clauses on façade and external wall construction

C1.9 Non-combustible building elements

(a) In a building required to be of Type A or B construction, the following building elements and their components must be non-combustible:
(i) External walls and common walls, including all components incorporated in them including the facade covering, framing and insulation.

(ii) The flooring and floor framing of lift pits.

(iii) Non-loadbearing internal walls where they are required to be fire-resisting.

(b) A shaft, being a lift, ventilating, pipe, garbage, or similar shaft that is not for the discharge of hot products of combustion, that is non-loadbearing, must be of non-combustible construction in—

(i) a building required to be of Type A construction; and

(ii) a building required to be of Type B construction, subject to C2.10, in—

(A) a Class 2, 3 or 9 building; and

(B) a Class 5, 6, 7 or 8 building if the shaft connects more than 2 storeys.

(c) A loadbearing internal wall and a loadbearing fire wall, including those that are part of a loadbearing shaft, must comply with Specification C1.1.

(d) The requirements of (a) and (b) do not apply to the following:

(i) Gaskets.

(ii) Caulking.

(iii) Sealants.

(iv) Termite management systems.

(v) Glass, including laminated glass.

(vi) Thermal breaks associated with glazing systems.

(vii) Damp-proof courses.

(e) The following materials may be used wherever a non-combustible material is required:

(i) Plasterboard.

(ii) Perforated gypsum lath with a normal paper finish.

(iii) Fibrous-plaster sheet.

(iv) Fibre-reinforced cement sheeting.

(v) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0.

(vi) Sarking-type materials that do not exceed 1 mm in thickness and have a Flammability Index not greater than 5.

(vi) Bonded laminated materials where—

(A) each lamina, including any core, is non-combustible; and

(B)each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm; and

(C) the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole do not exceed 0 and 3 respectively.

C1.14 Ancillary elements

An ancillary element must not be fixed, installed or attached to the internal parts or external face of an external wall that is required to be non-combustible unless it is one of the following:

(a) An ancillary element that is non-combustible.

(b) A gutter, downpipe or other plumbing fixture or fitting.

(c) A flashing.

(d) A grate or grille not more than 2 m2 in area associated with a building service.

(e) An electrical switch, socket-outlet, cover plate or the like.

(f) A light fitting.

(g) A required sign.

(h) A sign other than one provided under (a) or (g) that—

(i) achieves a group number of 1 or 2; and

(ii) does not extend beyond one storey; and

(iii) does not extend beyond one fire compartment; and

(iv) is separated vertically from other signs permitted under (h) by at least 2 storeys.

(i) An awning, sunshade, canopy, blind or shading hood other than one provided under (a) that—

(i) meets the requirements of Table 4 of Specification C1.10 as for an internal element; and

(ii) serves a storey—

(A) at ground level; or

(B) immediately above a storey at ground level; and

(iii) does not serve an exit, where it would render the exit unusable in a fire.

(j) A part of a security, intercom or announcement system.

(k) Wiring.

(l) A paint, lacquer or a similar finish.

(m) A gasket, caulking, sealant or adhesive directly associated with (a) to (k).

3.0 Building super structure and element fire ratings

The assumed scope of work to the building will require that it is built to current BCA 2019 Amendment 1 requirements. The building will need to be constructed in Type A construction.

3.1 Building Code of Australia Table 3 requirements

The fundamental concept of fire rating for the new building works will be as per the following table:

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

Building element	Class of building — FRL: (in minutes)			
	Structural adequacy/Integrity/Insulation			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any fire-source feature to which it is exposed is—				
For loadbearing parts—				
less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120	240/240/180
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90	240/180/ 90
For non-loadbearing parts—				
less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 60	–/ 90/ 90	–/180/120	–/240/180
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed is—				
less than 3 m	90/–/–	120/–/–	180/–/–	240/–/–
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	120/120/120	180/180/180	240/240/240
INTERNAL WALLS—				
Fire-resisting lift and stair shafts—				
Loadbearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Non-loadbearing	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding public corridors, public lobbies and the like—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-loadbearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding sole-occupancy units—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-loadbearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Ventilating, pipe, garbage, and like shafts not used for the discharge of hot products of combustion—				
Loadbearing	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
Non-loadbearing	–/ 90/ 90	–/ 90/ 90	–/120/120	–/120/120
OTHER LOADBEARING INTERNAL WALLS, INTERNAL BEAMS, TRUSSES				
and COLUMNS—	90/–/–	120/–/–	180/–/–	240/–/–
FLOORS	90/ 90/ 90	120/120/120	180/180/180	240/240/240
ROOFS	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30	240/ 90/ 60

3.2 Height of building and sprinkler protection

The building will NOT exceed an effective height of 25m, however the building **is proposed to be sprinkler protected throughout** as part of the required services and equipment according to E1.5 and this also assists in compliance with the requirements of smoke hazard management under E2.2.

3.3 Openings to the façade

The façade of the building has to be checked for exposure between different fire compartment openings as required by C3.3 of the BCA2019 Amendment 1. Areas that have exposure will be assessed according to fire engineering to validate the need for additional fire sprinkler protection. This will be determined once the fire compartmentation has been determined for the building at the next stage of design.

3.4 Openings facing other buildings

The current design does not have any other buildings located within 6 metres therefore there will be no likelihood of exposure to other buildings

4.0 Compartmentation for Type A construction buildings

The fire compartmentation for the building has been designed by the architects and assessed on the following basis.

Summary Table – Maximum Fire Compartment Sizes & Relevant FRL's

BCA Classification	Max Compartment Size	FRL	Max Volume
5 or 9b	8,000m²	120/120/120	48,000m²
6	5,000m²	180/180/180	30,000m²
7a	sprinkler protected – exempt	120/120/120	n/a
9a – Non-Patient Care	5,000m²	120/120/120	-
9a – Patient Care	2,000m²	120/120/120	-
9a – Patient Care (Ward Areas)	2,000m²	120/120/120	-
	1,000m²	-/60/60 + smoke proof + non combustible	
	500m²	smoke proof + non combustible	
	If total <1,000m² - required	-/60/60 + smoke proof + non combustible	
9a – Patient Care (Treatment Areas)	2,000m²	120/120/120	-
	1,000m²	smoke proof + non combustible	
9a – Non Patient Care	5000 m²	120/120/120	30,000 m²

Subdivision of the building within the patient care areas is to be determined by the above fire compartmentation parameters and also by the necessity to provide horizontal exits in all the ward areas and treatment areas providing exits within 30 metres of any point on the floor.

A performance solution according to fire engineering is to be provided where compliance with the deemed to satisfy provisions of the BCA is not possible in terms of meeting the fire compartmentation parameters of C2.5 of the BCA2019 Amendment 1. This will be considered as the design progresses and will be finalised as part of the design development phase.

4.1 Class 9a (Patient care areas)

Patient Care Areas are to be separated from non patient care areas by FRL 120/120/120 (BCA, clause C2.5) fire rated walls. The maximum floor area of such a patient care area is to be 2000m2.

A smoke reservoir must be provided above fire and smoke doors as required by BCA Specification C2.5, Clause 4 in that the head of the doors must not be within 400 mm of the ceiling where there is no zone pressurisation system provided to the fire and smoke compartment.

4.2 Ward areas

The logic in the design requires that the ward areas have been compartmented according to the BCA and specifically treated as follows;

- Fire compartments are to be maintained with areas of a maximum of 2000m^2, by walls having an FRL of 120/120/120.
- Such compartments are to be further divided into 1000m^2 areas by smoke walls having a FRL of 60/60/60.
- Furthermore, non combustible smoke walls will be provided to reduce the maximum area of a smoke compartment to 500m^2.
- Where the fire compartment is less than 1000 m^2 (i.e. the 120/120/120 fire resistance level compartment is less than 1000 m^2) the first division needs to be a wall with a fire resistance level of at least 60/60/60.

4.3 Treatment areas

Treatment areas need also to be compartmented according to the BCA and specifically treated as follows;

- Fire compartments are to be maintained with areas of a maximum of $2000m^2$, by walls having an FRL of 120/120/120.
- Such compartments are to be further divided into $1000m^2$ areas by non combustible smoke walls.

4.4 Other uses within patient care areas

Kitchens having a combined area >30 m2, medical store areas, Sterilising Services and laundries will also be separated with fire rated walls of an FRL of at least 60/60/60 where located within the patient care area fire compartments.

Therefore, a Class 9a building to the patient care areas must comply with the following:

- *Ancillary use areas located within a patient care area and containing equipment or materials that are a high potential fire hazard, must be separated from the remainder of the patient care area by walls with an FRL of not less than 60/60/60.*

- *The ancillary use areas referred to in (v) include, but are not limited to, the following:*

    - *A kitchen and related food preparation areas having a combined floor area of more than 30 m2.*
    - *A room containing a hyperbaric facility (pressure chamber).*
    - *A room used predominantly for the storage of medical records having a floor area of more than 10 m2.*
    - *A laundry, where items of equipment are of the type that are potential fire sources (e.g. gas fire dryers).*

4.5 General fire ratings of non patient care areas – Class 9a buildings

Plant rooms containing essential services will also need to be kept separated from the remainder of the building by construction with a minimum fire resistance level of 120/120/120.

This applies to the following

- lift motors and lift control panels, except that the separating construction between the lift shaft
- and the lift motor room need only be 120/–/–; or
- emergency generators or central smoke control plant; or
- boilers; or
- batteries (installed in the building that has a total voltage of 12 volts or more and a storage capacity of 200 kWh or more); or
- main switchboard located within the building which sustains emergency equipment operating in the emergency mode

According to the local Energy Supply Authority, requirements for separation between the substation and the remainder of the building in some instances, will require a minimum fire resistance level of 180/180/180. This is to be verified by the electrical engineering team.

5.0 Access and Egress

5.1 General parameters

The buildings' egress system will need to be generally designed using the following principles:

- Every fire compartment has at least two exits.
- In **Class 5 – 9 building, not including patient care areas**, no point on a floor must be more than 20 metres from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40 metres.
- In a **Class 9a patient care area**, no point on the floor must be more than **12 metres from a point of choice** from which travel in different directions to 2 of the required exits is available.
- In a **Class 9a patient care area**, the maximum **distance to one of those exits** must not be more than **30 metres** from the starting point.
- The **distance between alternate exits** is not to **exceed 45 metres for class 9a patient care areas**, nor be closer than **9 metres**.
- The **distance between alternate exits** is not to **exceed 60 metres for all other class 2 – 9 areas** nor be closer than **9 metres.**
- **Widths of exits** and corridors will be **sufficient to allow egress for the population** occupying the building off the floors and out from each fire compartment as applicable.
- For **patient care areas** – where only horizontal exits are used in any one compartment, the adjacent compartment must be provided with an exit not being a **horizontal exit**, (i.e. a fire stair, a stair leading directly to the outside, or directly via a door to the outside).
- For **non patient care areas** – at least 50% of exits are to be **non horizontal exits**.
- **Access for disabled persons** will need to meet the requirements of AS1428.1-2009
- All **stairs** in patient care areas of the building **will be fire isolated** or fire separated to comply.
- In **patient care areas open stairs will not be permitted between levels**.
- Open stairs may be used to connect non patient care area compartments.
- **Fire isolated stairs** to the main building will **need to discharge to the outside of the building** via a fire isolated passageway where not discharging directly to open space.
- Discharge of exits from patient care areas cannot involve stairs or steps to connect to the road (ramps not steeper than 1 in 8 are required).

Further work will be continued at the next stage of design to ensure compliance or where appropriate fire engineering could be employed for variations to the deemed to satisfy provisions.

5.2 Building population capability

The requirements of the Building Code of Australia are such that in general terms each floor needs to have adequate exits for the occupants. This is based on the level at which the storey is located and hence reflects the number of provided exits from each of those levels.

Adequate egress according to the deemed to satisfy provisions will need to be rechecked at the next stage of design.

5.3 Design of fire stairs

Stair dimensions particular to Class 9a Health Care Buildings (D2.14 Landings)

- The area of any landing must be sufficient to move a stretcher, 2 m long and 600 mm wide, at a gradient not more than the gradient of the stairs, with at least one end of the stretcher on the landing while changing direction between *flights*; or
- The stair must have a change of direction of 180°, and the landing a clear width of not less than 1.6 m and a clear length of not less than 2.7 m.

Compliance is readily achievable with the deemed to satisfy or performance requirements of the Building Code of Australia and needs to be considered in the next stage of building design.

6.0 Service and Equipment

6.1 General fire equipment requirements

The following is a commentary on the services that will be required to the building.

Fire Hydrants	Fire hydrants, pumps and boosters must be provided throughout to AS 2419.1-2005 A ring main will be required to each hydrant riser.
Fire Hose-Reels	Fire hose-reels should be arranged to provide for full coverage to the building in accordance with AS 2441-2005. Fire hose-reels are to be located within 4 metres of an exit or a fire hydrant.
Sprinklers	A sprinkler system complying with AS 2118.1 - 2017 is to be provided. Ensure the control valves do not control an area greater than that permitted for each applicable occupancy class.
Sprinklers – External Wall Wetting	Any openings within the prescribed distances in BCA for openings in different compartments, facing each other may be protected with external wall wetting sprinkler heads to Australian Standards.
Fire control centres	A fire control centre facility in accordance with Specification E1.8 must be provided for— (a) A building with an effective height of more than 25 m; and (b) A Class 6, 7, 8 or 9 building with a total floor area of more than 18 000 m2. **A fire control centre must—** (a) provide an area from which fire-fighting operations or other emergency procedures can be directed or controlled; and (b) contain controls, panels, telephones, furniture, equipment and the like associated with the required fire services in the building; and not be used for any purpose other than the control of— (i) Fire-fighting activities; and (ii) Other measures concerning the occupant safety or security. A fire control centre must be also located in a building that egress from any part of its floor, to a public road or open space, does not involve changes in level which in aggregate exceed 300mm. The total floor area of the building to be verified at the next stage to determine whether a fire control room is required, **however unlikely if less than 18,000m^2 in area**.
Portable Fire Extinguishers	**General provisions**—Class 2 to 9 buildings: a) To cover Class AE or E fire risks associated with emergency services switchboards. (Note 1) b) To cover Class F fire risks involving cooking oils and fats in kitchens. c) To cover Class B fire risks in locations where flammable liquids in excess of 50 litres are stored or used (not including that held in fuel tanks of vehicles). d) To cover Class A fire risks in normally occupied fire compartments less than 500 m2 not provided with fire hose reels (excluding open deck carparks). e) To cover Class A fire risks associated with a Class 2, 3 or 5 building or Class 4 part of a building Specific provisions (in addition to general provisions) – a) Class 9a health-care building, including a Class 9a building used as a residential care building

6.2 Smoke hazard management

The smoke hazard management requirements are defined in the Building Code of Australia for the building and based on the component, the building use and effective height.

The following criteria apply to the buildings: -

Fire isolated stairs	Requirements
A required- (a) a fire-isolated stairway, including any associated fire-isolated passageway or fire-isolated ramp serving- (iv) a Class 9a building with a rise in storeys of more than 2; and (b) fire-isolated passageway or fire-isolated ramp with a length of travel more than 60 m to a road or open space, must be provided with an automatic air pressurisation system for fire-isolated exits in accordance with AS/NZS 1668.1;	• Fire isolated stairs in a class 9a building need to be provided with an exit pressurisation system. • Fire isolated passageways also need an exit pressurisation system if greater than 60 metres in length.
Notes: 1. An automatic air pressurisation system for fire-isolated exits applies to the entire exit. 2. Refer D1.7 (d) for pressurisation of a fire-isolated exit having more than 2 access doorways from within the same storey.	

Buildings NOT more than 25 metres in effective height	Requirements
A Class 9a health-care building or a Class 9c building, or a building containing a part thereof, must be provided throughout with—	
(a) an automatic smoke detection and alarm system complying with Specification E2.2a; and	As1670.1 – 2018 smoke detection and alarm system required
(b) automatic shutdown of any air-handling system which does not form part of a zone smoke control system (other than individual room units with a capacity not more than 1000 L/s, systems serving critical treatment areas and miscellaneous exhaust air systems installed in accordance with Sections 5 and 6 of AS/NZS 1668.1) on the activation of— (i) smoke detectors installed in accordance with (a); and (ii) any other installed fire detection and alarm system including a sprinkler system complying with Specification E1.5; and	Auto shutdown of all mechanical ventilation systems
(c) in a building having a rise in storeys of more than 2 and not more than 25 m effective height (not being a Class 9c building)— (i) a zone smoke control system in accordance with AS/NZS 1668.1; or (ii) a sprinkler system complying with Specification E1.5 throughout with residential sprinkler heads in patient care areas.	Option of EITHER • zone smoke control system OR • a fire sprinkler system **throughout** the building. **It is proposed to provide sprinkler protection to the entire building.**

The installation will need to comply with E2.2 (a) to (d) for the protection of ductwork through the fire and smoke walls to the building i.e. Fire and smoke dampers are required where the ducts pass through fire and smoke walls.

Variations from the above will need to be assessed and justified using fire engineering where possible and will be reviewed as part of design development phase.

6.3 Lift systems

The lift services designer will need to review and include the requirements from BCA Part E3, clauses E3.1 to E3.10 including –

Stretcher facility in lifts	Required to the building as an emergency lift is to be provided.
Emergency lifts	As two passenger lifts are proposed at least two emergency lifts are to be provided as an emergency lifts, ensure the dimensions under Table E3.4 are satisfied.

Accessible Lifts	Required to the building in accordance with the Australian Standards and this includes BCA E3.6 and Tables E3.6a and E3.6b. E3.5 and E3.6

Note: As the building is to be provided with emergency power, the emergency lifts must be connected along with essential plant serving the essential fire safety systems.

6.4 Emergency Lighting, Exit Signs and Warning Systems

Exit and emergency lighting	A system of emergency lights and exit signage will be installed in the building to AS2293.1-2018.
EWIS - emergency warning and intercom systems	An EWIS complying with AS 1670.4-2018 must be installed in hospitals where they have a *floor area* more than 1000 m^2 or a *rise in storeys* of more than 2. In this instance an EWIS is to be provided in accordance with AS1670.4.

7.0 Health and Amenity

7.1 Sanitary facilities

The following criteria detail the required sanitary facilities to be provided to the building.

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	Number	Design Occupancy	Number	Design Occupancy	Number
Class 3, 5, 6 and 9 other than *schools*						
Male employees	1 — 20 > 20	1 Add 1 per 20	1 — 10 11 — 25 26 —50 >50	0 1 2 Add 1 per 50	1 — 30 > 30	1 Add 1 per 30
Female employees	1 — 15 > 15	1 Add 1 per 15			1 — 30 > 30	1 Add 1 per 30

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	Number	Design Occupancy	Number	Design Occupancy	Number
Class 9a — *health-care buildings*						
Male patients	1 — 16 >16	2 Add 1 per 8			1 — 8 > 8	1 Add 1 per 8
Female patients	1 — 16 >16	2 Add 1 per 8			1 — 8 > 8	1 Add 1 per 8

This will need to be considered in the next stage of design.

7.2 Facilities for persons with disabilities

The following need to be provided to the public banks of sanitary facilities all to which access for people with disabilities is required,

- minimum of one unisex closet pan and washbasin; and
- one ambulant WC within the male and female toilets.

All facilities for persons with disabilities need to comply with AS1428.1 and 2.

7.3 Swing and operation of doors to the WC's

Doors to fully enclosed sanitary compartments to open outwards, or slide or have 1.2 metres clear space between door and closet plan or be readily removable from the outside of the sanitary compartment.

7.4 Light and ventilation

Ventilation All classes of buildings	Natural ventilation in accordance with F4.6 or mechanical ventilation to AS 1668.2 is to be provided.
Natural lighting	Natural light **must be provided** in Class 9a buildings to **all rooms used for sleeping** purposes and is to be provided in accordance with F4.2 of the Building Code of Australia.

7.5 Room Sizes and Heights

The ceiling minimum height of 2.4m is required to areas, with an operating theatre or delivery room needing a minimum of 3 m, except corridors, sanitary facilities and storage areas, where it may be 2.1m. Compliance is readily achievable. Plant rooms need to be checked and the correct heights allowed in the design.

8.0 Liaison with Fire and Rescue NSW on the project

A preliminary meeting will need to be arranged with Fire and Rescue NSW on the future scheme one adequate information has been provided which identifies the fire services to the building and should there be any performance solutions with respect to fire and life safety.

9.0 Part J – Energy Efficiency

The proposed hospital must be designed in accordance with the requirements of Part J of the BCA in terms of Energy Efficiency. The requirements are to be considered and integrated in the design prior to certification for construction. The following components must be addressed in design.

Part J1 Building Fabric
Part J3 Building Sealing
Part J5 Air conditioning and ventilation systems
Part J6 Artificial Lighting and Power - whole building
Part J7 Hot Water Supply
Part J8 Facilities for energy monitoring.

Compliance with Clause J1 to J8 is required for the new works.

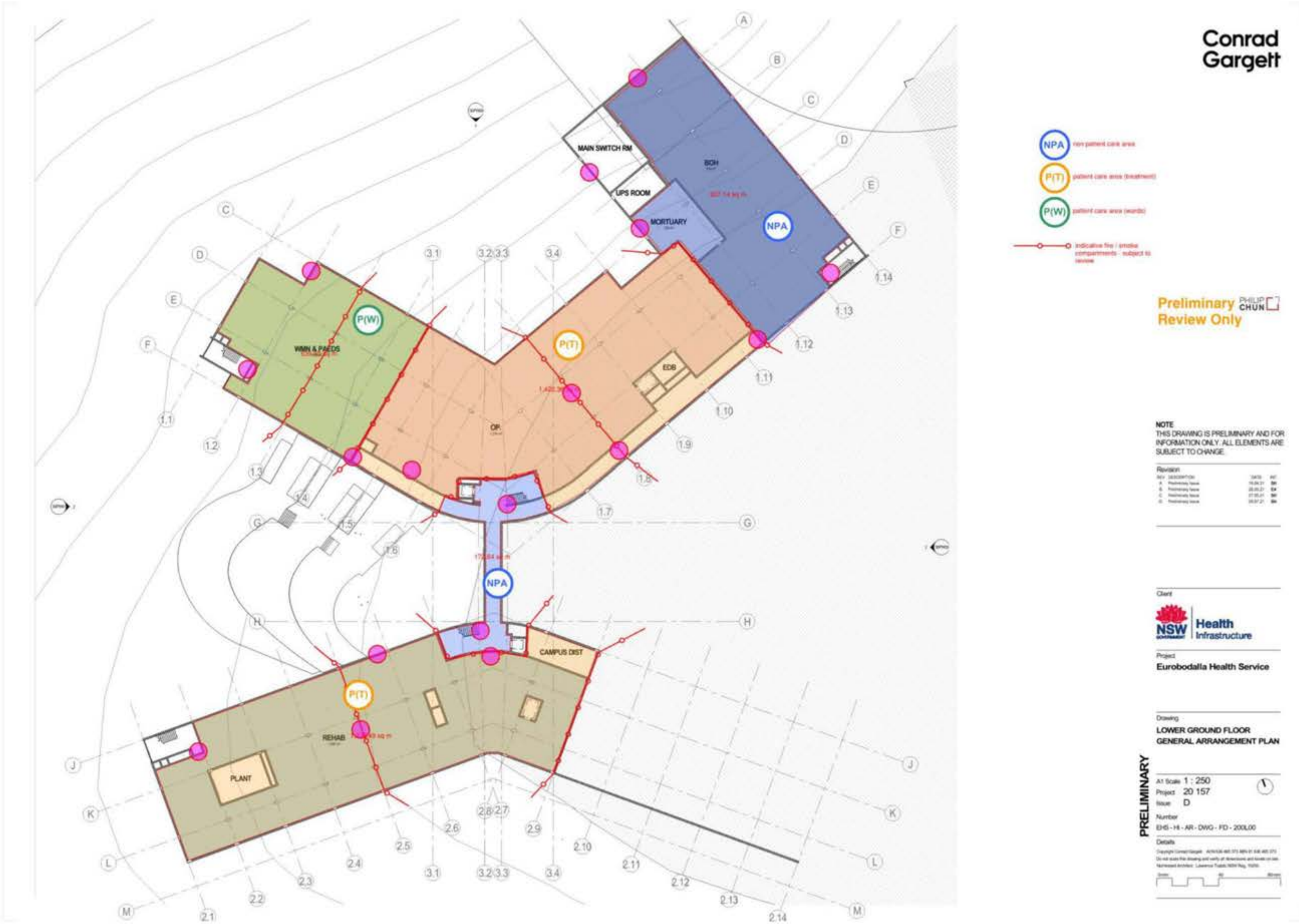
The architectural drawings must note compliance with J0, J1 and J3 – refer to compliance requirements in the table below. **Due to the complexities of the current Part J requirements, including the modelling requirements, a specialist report from a qualified energy efficiency consultant needs to be obtained for the design.**

The services drawings and design, particularly the electrical, hydraulic and mechanical drawings and design, must include compliance with Parts J5, J6 and J8 of BCA.

Note, the application of BCA Part J5 applies also to spaces provided with split systems – Mechanical consultant to provide comment in future design phases to ensure compliance.

Appendix A – Floor Plans

General conceptual comments – indicative only



Conrad Gargett
NPA
P(T)
P(W)
Preliminary Review Only
PHILIP CHUN
MAIN SWITCH RM
UPS ROOM
BOH
MORTUARY
WMN & PAEDS
OP
EDB
REHAB
PLANT
CAMPUS DIST
NOTE
THIS DRAWING IS PRELIMINARY AND FOR INFORMATION ONLY. ALL ELEMENTS ARE SUBJECT TO CHANGE.
Revision
Client
NSW Health Infrastructure
Project
Eurobodalla Health Service
Drawing
LOWER GROUND FLOOR
GENERAL ARRANGEMENT PLAN
PRELIMINARY
A1 Scale 1 : 250
Project 20 157
Issue D
Number
EHS - HI - AR - DWG - FD - 200L00
Details

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NPA
P(T)
P(W)

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Revision

Client
NSW Government Health Infrastructure

Project
Eurobodalla Health Service

Drawing
GROUND FLOOR
GENERAL ARRANGEMENT PLAN

PRELIMINARY

A1 Scale 1 : 250
Project 20 157
Issue D

Number
EHS - HI - AR - DWG - FD - 200000

Details

Conrad Gargett

NPA non patient care area
P(T) patient care area (treatment)
P(W) patient care area (wards)
indicative fire / smoke compartments - subject to review

Preliminary Review Only PHILIP CHUN

NOTE
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Revision

Client
NSW Government Health Infrastructure

Project
Eurobodalla Health Service

Drawing
LEVEL 01
GENERAL ARRANGEMENT PLAN

PRELIMINARY

A1 Scale 1 : 250
Project 20 157
Issue C
Number
EHS - HI - AR - DWG - FD - 200201
Details

11.4 Accessibility CD Report

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Building Compliance

Eurobodalla Health Service

Concept design Accessibility report

Report prepared for:	Health Infrastructure NSW C/o – Root Partnerships Contact: [redacted]
Report prepared by:	Philip Chun Accessibility Pty Ltd Suite 404, Level 4 44 Hampden Road, Artarmon NSW 2064 Contact: [redacted]
Report Ref:	AN021-216595_EHS_Concept_Access_R03_210721.doc
Job Number:	021-216595
Date:	21 July 2021

CONTENTS

DOCUMENT ACCEPTANCE

	Name	Signed	Date
Prepared by	[redacted] *Access Consultant*	[redacted]	21 July 2021

REVISION HISTORY

Revision No.	Prepared by	Description	Date
R01	[redacted]	Issue for comment	16 June 2021
R02	[redacted]	Concept design report 90%	23 June 2021
R03	[redacted]	Concept design report – Final	21/07/2021

This report has been prepared based on the available time allocated to conduct the review, and all reasonable attempts have been made to identify key compliance matters pursuant to the Building Code of Australia (BCA) and additional issues which have been deemed an impediment to access provision and may increase Client risk of attracting a complaint under the Disability Discrimination Act 1992 (Cth) (DDA).

The information provided within this report is relevant to this project and the documentation referenced. As such the information provided may not be transferred to other projects. This report must not be issued for public comment or be used for any other purpose without prior permission from Philip Chun Accessibility.

Philip Chun Accessibility accepts no responsibility for any loss suffered as a result of any reliance upon such assessment or report other than providing guidance to alleviate access barriers in the built environment and reduce Client risk of attracting a complaint under the DDA.

1. INTRODUCTION

1.1 Brief

This assessment involves a review of the masterplan and concept design of the building and looks to inform the design team on high level issues that may affect the design. This report documents a high-level review of the proposed project documentation to date with consideration to aspects of accessibility to the site and throughout the development and with reference to the Building Code of Australia 2019 Amendment 1 (BCA), Disability (Access to Premises – Buildings) Standards 2010 (Premises Standards), relevant Australian Standards as they relate to access to premises and the spirit and intent of the Disability Discrimination Act 1992 (Cth) (DDA).

This report has been prepared by Philip Chun Accessibility with the aim of providing reasonable recommendations in regards to access to premises. Philip Chun Accessibility has endeavoured to clearly identify each issue of concern with respect to the building element and with reference to relevant legislation and guidelines.

Matters that fall outside the scope of this report include structure or installation methods and assessment against Occupational Health and Safety legislation.

1.1 Site and Context

The new development will be built for the Eurobodalla community. The proposed redevelopment will be located to replace the existing facilities in Batemans Bay and Moruya. The new development will be located on the eastern side of Moruya NSW on a greenfield site.

The project scope of work includes the following

A $200m investment, to build a sustainable, modern and purpose-built facility to support the needs of the Eurobodalla community.
• Clinical Services Plan delivering on projections to 2031.
• Sustainability will be a key initiative for the project.
• the project will include working with the NSW Government Architect to deliver against the "Connecting with Country Program", incorporating Indigenous design into the Health Facility design and cultural practices have been discussed with Local Aboriginal Representatives.
• Co-ordination with Transport for NSW in relation to the Moruya Bypass Project.
• provision of a greenfield site that enables future expansion of health care facilities, including the decommissioning of existing hospital facilities in Batemans Bay and Moruya.

EHS

Project Overview - Location

Plan View

1.2 Reviewed Documentation

The concept design phase documentation assessed comprises of the following report issued by Conrad Gargett.

EHS-HI-AR-DWG-FD-10PW02_B	Masterplan
EHS-HI-AR-DWG-FD-200L001_D	Lower Ground Floor General Arrangement Plan
EHS-HI-AR-DWG-FD-200000_D	Ground Floor General Arrangement Plan
EHS-HI-AR-DWG-FD-200201_C	Level 01 General Arrangement Plan
EHS-HI-AR-DWG-FD-200301_B	ROOF

1.3 Methodology

Philip Chun Access aims to provide achievable recommendations related to the provision of access to premises based on current legislation and' best practice' options, enabling independent, equitable and functional access for all.

Access requirements for people with a disability have been assessed against the provisions of the BCA-2019 Amendment 1. Any assessment against Australian Standards such as AS1428.1-2009, where not specifically referenced in the BCA, will be provided as recommendations.

2. LEGISLATION

2.1 Disability Discrimination Act

The Disability Discrimination Act 1992 (Cth) has a section that addresses access requirements for 'buildings', under Section 23, which relates to access to premises and facilities which the public may enter or use.

There is also a mechanism within the DDA to create specific Disability Standards. These Standards provided more details and certainty in specific areas.

The following Standards apply to this DA - Disability (Access to Premises –Buildings) Standards 2010.

2.2 Access to Premises Standards

The purpose of the Premises Standards (and corresponding changes to the Building Code of Australia and state and territory building law) is:

- to ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with disability, and
- to give certainty to building certifiers, developers and managers that if the Standards are complied with they cannot be subject to a successful complaint under the DDA in relation to those maters covered by the Premises Standards.

This Capability Statement refers to clauses within BCA 2019 and referenced Australian Standards. This report does not refer to the Access to Premises Standards 2010, as the BCA access provisions discussed within this report are in effect mirrored from Schedule 1 (Access Code) of the Premises Standards. Any reference to access requirements in the BCA is also, by default, consistent with the provisions of the Premises Standards.

2.3 National Construction Code / Building Code of Australia

The National Construction Code (NCC) comprises the Building Code of Australia (BCA) and the Plumbing Code of Australia (PCA). NCC is all encompassing and contains Volumes One, Two and Three; The Guide; and the Consolidated Performance Requirements.

Part D3 of the BCA and Premises Standards prescribes the minimum requirement for access to a building. Access for people with disabilities is required through the principal pedestrian entrance and throughout the building in accordance with Table D3.1.The following table outlines the general building use matrix with corresponding access requirements for this project:

Building Use Matrix		
Levels	**BCA Class**	**Use**
Lower ground floor	9a Health – Patient care areas and Non Patient care areas	Hospital, BOH, Docks and Loading
Ground Level	9a Health – Patient care areas and Non Patient care areas	Hospital, Entry / Administration, Café / Minor retail
Level 1	9a Health – Patient care areas and Non Patient care areas	Hospital

3. ACCESS AND APPROACH

3.1 Approach from the Allotment Boundary
BCA Part D3.2

The BCA requires that a continuous accessible path of travel within the meaning of AS1428 .1 (2009) be provided from the allotment boundary at the main points of pedestrian entry to the main entrance.

<u>Comments:</u>
Please confirm external accessible paths of travel as per BCA requirement. Ensure pedestrian path from the allotment boundary is accessible within the meaning of AS 1428.1 (2009) requirements.

This can be detailed to comply during subsequent schematic and detailed design development stages. Refer to Appendix A for compliance requirements regarding pathways, ramps and walkways.

3.2 Approach between Buildings on Site
BCA Part D3.5

The BCA requires that a continuous accessible path of travel within the meaning of AS1428.1 (2009) be provided between associated accessible buildings.

<u>Comments:</u>
This can be detailed to comply during subsequent schematic and detailed design development stages if additional buildings are proposed. Refer to Appendix A for compliance details.

3.3 Building Entrance
BCA Part D3.2

A continuous, accessible path of travel must be provided through the principal pedestrian entrance and not less than 50% of all pedestrian entrances / exits.

Where the total floor area of the building exceeds 500m^2, therefore the distance of travel between accessible and inaccessible entrances must not exceed 50 metres.

Where a door required to be accessible has more than one door leaf, one of the leaves must have a clear opening of 850mm.

<u>Comments:</u>
At current concept stage, building entrances and entrance doorways have yet to be detailed to assess their accessibility. Ensure main building entrance/s are along continuous accessible path/s of travel from the allotment boundary and achieve clear open width/s, door circulation spaces on both sides of each doorway in accordance with AS 1428.1 (2009) requirements.

This can be detailed to comply during subsequent schematic and detailed design development stages. Refer to Appendix A for compliance details.

3.4 Accessible Carparking
BCA Part D3.5

Accessible carparking, designed and constructed in accordance with AS 2890.6 (2009), is required to be provided as per the below ratio:

Class of building to which the Class 7a building or carparking area is associated	Number of accessible carparking spaces required
Class 9a	
(a) Hospital (non-outpatient area).	1 space for every 100 carparking spaces or part thereof.
(b) Hospital (outpatient area):	
(i) Up to 1 000 carparking spaces; and	1 space for every 50 carparking spaces or part thereof.
(ii) For each additional 100 carparking spaces or part thereof in excess of 1 000 carparking spaces.	1 space.
(c) Nursing home.	1 space for every 100 carparking spaces or part thereof.
(d) Clinic or day surgery not forming part of a hospital.	1 space for every 50 carparking spaces or part thereof.

Comments:
At current concept stage, accessible car parking spaces (new and existing) have yet to be detailed on drawings to assess their accessibility and compliance in accordance with AS2890.6 (2009).

Please also confirm of the total number, distribution and uses of new car parking spaces (incl. accessible spaces) provided along with the total number of beds proposed within the new hospital building for both outpatient and non-outpatient.

Confirm adequate number of accessible car parking facilities will be provided per BCA requirement above.

This can be coordinated to comply during subsequent schematic and detailed design development stages.

3.5 Approach from the Accessible Carpark
BCA Part D3.2

The BCA requires that a continuous accessible path of travel within the meaning of AS1428.1 (2009) be provided from the accessible car parking areas to the main building entrance.

Comments:
Ditto as above.

Accessible linkages to accessible car parking spaces can be coordinated to comply during subsequent schematic and detailed design development stages.

4. ACCESSIBILITY PROVISIONS

4.1 Internal Paths of Travel

BCA Part D3.1 and D3.3

The BCA requires that accessways complying with AS 1428.1 (2009) is to be provided to and throughout areas of buildings required to be made accessible, including:

- Minimum corridor widths of not less than 1000mm;
- Passing spaces with a minimum width and length of 1800 x 2000mm to be provided in corridors at maximum 20 metres intervals where a direct line of sight is not available. A passing space may serve as a turning space.
- Turning spaces with a minimum width and length of 1540 x 2070mm to be provided within 2 metres of the end of corridors and at maximum 20 metres intervals.
- Increased landings are required at changes of direction, including 1500 x 1500mm turning spaces to facilitate a 60-90 degree turn, and 1540 x 2070 for a 180 degree turn.

Accessible path of travel is required to be step free, not include a stairway, turnstile, revolving door, escalator, moving walk or other impediment. Accessible path is required to have a slip-resistant surface (AS 1428.1 (2009), Clause 6.1 and 7.1).

Comments:
At current masterplan stage, layouts of circulation spaces have yet to be detailed on drawings to assess their accessibility and compliance in accordance with AS2890.6 (2009).

This can be detailed to comply during subsequent schematic and detailed design development stages.

4.2 Floor Finishes / Surfaces

BCA Part D3.3

The following applies to interior finishes and surface materials, in keeping with AS1428.1 (2009):

- Where carpet or any soft flexible materials are used as flooring material, the pile height or pile thickness is to be no greater than 11mm and the carpet backing to be not more than 4mm thick.
- Matting recessed within a continuous accessible path of travel to have a surface level difference to surrounding materials not more than 3mm for vertical and 5mm for rounded or bevelled edges.
- Grates are to have openings no greater than 13mm in diameter and any slotted openings to be no more than 13mm wide and orientated perpendicular to the dominant direction of travel.

Comments:
Floor finishes have not been indicated at this stage of the development process. We recommend that this item be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

4.3 Internal Doors

4.3.1 Circulation Spaces at Doorways

Doors and doorways to be provided with the following circulation clearances as per AS 1428.1 (2009):

Table 5.3(a) Hinged Door Requirements:

Door Approach	Door opening direction	Clearances (mm)		
		Latch side	Hinge side	Depth in front of door
Front	Towards occupant	530	110	1450
	Away from occupant	510	-	1450
Latch Side	Towards occupant	900	110	1670
	Away from occupant	660	240	1240
Hinge Side	Towards occupant	900	660	1670
	Away from occupant	340	560	1220
Either Side	Towards occupant	900	660	1670
	Away from occupant	660	560	1240

Table 5.3(b) Sliding Door Requirements:

Door Approach	Clearances (mm)		
	Latch side	Slide side	Depth in front of door
Front	530	-	1450
Slide Side	395	660	1280
Latch Side	660	185	1230
Either Side	660	660	1280

Note: the above clearances are based on an unobstructed door opening width of 850mm, which is the minimum required clearance. Widths greater than 850mm have different requirements. This will be reviewed upon the provision of a door schedule and detailed architectural drawings.

Where a door required to be accessible has more than one door leaf, one of the leaves must have a clear opening of 850mm.

The distance between successive doors within airlocks, vestibules and the like require a minimum 1450mm depth between swing doors, and 900mm for the path of travel to ambulant toilet cubicles.

> *Comments:*
> *At current concept stage, layouts and locations of all doorways have yet to be detailed on drawings to assess their accessibility and compliance in accordance with AS1428.1 (2009).*
>
> *This can be detailed to comply during subsequent schematic and detailed design development stages.*

4.3.2 Door Operational Forces

Door operating forces are required to meet AS 1428.1 (2009), Clause 13.5.2 (e).

Where a door closer is fitted to doors other than fire doors and smoke doors, the force required at the door handle to operate the door does not exceed:

- 20N to initially open the door;

- 20N to swing the door; and
- 20N to hold the door open between 60 and 90 degrees.

  Comments:
  Door operational forces have not been indicated at this early stage of the development process. We recommend that the abovementioned item be addressed during subsequent design stages. We also recommend operation force requirements be noted on construction documentation.

4.4 Exemptions
BCA Part D3.4

The following areas are not required to be accessible:

a) An area where access would be inappropriate because of the particular purpose for which the area is used.
b) An area that would pose a health or safety risk for people with a disability.
c) Any path of travel providing access only to an area exempted by (a) or (b).

Comments:
The following areas may be the subject of a D3.4 exemption:
- *Plant areas and Engineering plant area*
- *Roof levels*

We recommend that exemptions be sought for such areas from the relevant authorities and stakeholders due to the inappropriateness and health or safety risks of these areas.

4.5 Signage
BCA Part D3.6

Braille and tactile signage is required to be provided throughout any building required to be made accessible in accordance with BCA specification D3.6 and AS1428.1 (2009) and required to identify:

- Each sanitary facility;
- Any space with a hearing augmentation system;
- Accessible unisex facilities and indicate whether the facility is suitable for left or right handed use;
- Ambulant accessible sanitary facilities on the door of the cubicle;
- Where an entrance is not accessible, directional signage to identify nearest accessible entrance;
- Where a bank of sanitary facilities is not provided with an accessible sanitary facility, directional signage to identify nearest accessible sanitary facility; and
- Each door required by BCA Part E4.5 to be provided with an exit sign and state "Exit" and "Level" followed by either the floor level number, the floor descriptor or combination of these.

Comments:
Signage details have not been indicated at this early stage of the development process. We recommend that the abovementioned items be addressed during subsequent design stages. Refer Appendix A for compliance requirements.

4.6 Tactile Indicators
BCA Part D3.8

Tactile indicators are required to be provided, in accordance with AS1428.4.1 (2009) to:

- A stairway;
- A ramp, other than kerb ramp;
- Any overhead obstruction less than 2 metres above the finished floor level, other than a doorway, where a suitable barrier has not been provided; and
- Where an accessway meets a vehicular way in the absence of a kerb or kerb ramp.

Comments:
At current concept stage, tactile indicators have not been indicated on the drawings. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

4.7 Glazing on an Accessway
BCA Part D3.12

The BCA requires that where full height glazing that can be mistaken for an unobstructed opening is provided along an accessway, the glazing must be provided with visual identification as per AS 1428.1 (2009).

Comments:
Glazing details have not been indicated at this early stage of the development process. If required, we recommend this item be addressed during subsequent design stages. Refer Appendix A for compliance requirements.

4.8 Slip Resistance
BCA Part D2.14

Landings in a stairway are required to have:

(a) a surface with a slip-resistance classification not less than that listed in Table D2.14 when tested in accordance with AS 4586; or
(b) a strip at the edge of the landing with a slip-resistance classification not less than that listed in Table D2.14 when tested in accordance with AS 4586, where the edge leads to a *flight* below.

Application	Surface Conditions	
	Dry	Wet
Ramp steeper than 1:14	P4 or R11	P5 or R12
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11
Tread or landing surface	P3 or R10	P4 or R11
Nosing or landing edge strip	P3	P4

Comments:
Slip resistance requirements have not been indicated at this early stage of the development process. We recommend this item be addressed during subsequent design stages.

4.9 Thresholds
BCA Part D2.15

The threshold of a doorway must not incorporate a step or ramp at any point closer to the doorway than the width of the door leaf unless:

(a) In patient care areas in a Class 9a health-care building, the door sill is not more than 25 mm above the finished floor level to which the doorway opens; or
(b) In a Class 9c aged care building, a ramp is provided with a maximum gradient of 1:8 for a maximum height of 25 mm over the threshold; or
(c) In a building required to be accessible by Part D3, the doorway:
    (i) Opens to a road or open space; and
    (ii) Is provided with a threshold ramp or step ramp in accordance with AS 1428.1 (2009); or

In NSW D2.15 (d) and (e):

(d) in a Class 9b building used as an entertainment venue, the door sill of a doorway opening to a road, open space, external stair landing or external balcony is not more than 50mm above the finished floor level to which the doorway opens; or
(e) in other cases:
  (i) the doorway opens to a road or open space, external stair landing or external balcony; and
  (ii) the door sill is not more than 190 mm above the finished surface of the ground, balcony, or the like, to which the doorway opens.

Comments:
Threshold details have not been indicated at this early stage of the design development process. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

5. VERTICAL CIRCULATION

5.1 Passenger Lifts
BCA Part E3

Every passenger lift in an accessible building is required to be suitable for use by people with a disability and offer compliance with AS1725.12. Typically, the following are required to be provided:

Lift dimensions:

- Lift floor dimensions of not less than 1100 x 1400mm for lifts which travel not more than 12m.
- Lift floor dimensions of not less than 1400 x 1600mm for lifts which travel more than 12m.
- Provision for a stretcher facility within at least one emergency lift required by E3.4, or where an emergency lift is not required, if passenger lifts are installed to serve any storey above an effective height of 12m, in at least one of those lifts to serve every floor served by lifts.

Lift Features:

- Handrail complying with the provisions for a mandatory handrail in AS1735.12.
- Minimum clear door opening complying with AS1735.12.
- Passenger protection system complying with AS1735.12.
- Lift landing doors at the upper landing.
- Lift car and landing control buttons complying with AS173.5.12.
- Lighting in accordance with AS1735.12.
- Emergency hands-free communication, including a button that alerts a call centre of a problem and a light to signal that the call has been received.

All passenger lifts serving more than 2 levels are required to possess:

- Automatic audible information within the lift car to identify the level each time the car stops.
- Audible and visual indications at each lift landing to indicate the arrival of the lift car.
- Audible information and audible indication must be provided in a range between 20-80dB(A) at a maximum frequency of 1500Hz.

Comments:
At current concept stage, lift locations, distribution and details have not been indicated. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

5.2 Walkways

The ground surface abutting 1:20 to 1:33 walkways on either side are required to be provided with:

- A firm and level surface of a different material, and following the grade of the walkway extending for a minimum of 600mm horizontally; or
- A kerb; or
- A kerb rail and handrail; or
- A 450mm low height wall.

Note that ramps and walkways require the following landing spaces at appropriate intervals:

- 1200mm length for no change of direction.
- 1500mm length for a 90 degree turn.
- 1540 x 2070mm turning space for a 180 degree turn.

<u>*Comments:*</u>
At current concept stage, walkway locations, distribution and details have not been indicated. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

5.3 Ramps
BCA Part D3.3

All ramps (if and where provided) other than fire-isolated ramps must meet the requirements of BCA Clause D3.3 and Clause 10 of AS1428.1 (2009), including:

- Minimum clear width of 1m
- Maximum gradient of 1:14, being consistent throughout its length
- Provision of suitably located and sized landings
- Continuous handrails to both sides of the ramp, meeting Clause 12 in AS1428.1, extending 300mm beyond the top and bottom of the ramp
- Provision of suitable kerb rails to either side of the ramp
- Provision of tactile ground surface indicators to the head and foot of the ramp, meeting AS1428.4 (2009)

Ramps must be set back from transverse paths of travel to allow for installation of warning tactile ground surface indicators and handrail extensions without protrusion into the adjacent pathway (BCA D3.3).

<u>*Comments:*</u>
At current concept stage, ramp locations, distribution and details have not been indicated. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

5.4 Stairs and Escalators
BCA Part D3.3

Stairs and escalators (if and where provided) will need to meet BCA requirements for accessibility. The layouts shown indicate that compliance is capable of being met. Details can be reviewed when available as part of further design detailing. At this stage, it is assumed that many stairways will be used for egress only, which can be confirmed as part of the further assessment process.

All stairways, excluding fire-isolated stairs, are required to be designed and constructed in accordance with AS 1428.1 (2009), Clause 11. Stairs to have a minimum clear unobstructed width of 1000mm, and to include the provision of handrails, handrail extensions, opaque risers, contrasting nosing strips and tactile indicators as per the following:

- Handrails both sides with appropriate profile and extensions;
- Tread and riser dimensions per BCA Table D2.13;
- Opaque risers with no over-hanging treads or angled risers exceeding 25mm setback;

- Visual nosing strips; and
- Warning tactile ground surface indicators per AS 1428.4.1 (2009) (BCA D3.8)

Stairways must be set back from transverse paths of travel to allow for installation of warning tactile ground surface indicators and handrail extensions without protrusion into the adjacent pathway (BCA D3.3). This also applies to internal stairs and is an important design element to ensure sufficient space to allow handrail extensions to the top and bottom of stairs.

Further to this, it is recommended that fire-isolated stairways proposed to be used as a means of general communication between floors should meet these enhanced requirements for the safety of all occupants.

Comments:
At current concept stage, stair and escalator locations, distribution and details have not been indicated. We recommend that the abovementioned items be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

5.5 Fire-Isolated Stairs
BCA Part D3.3

All fire-isolated stairways are required to have luminance contrast to the stair nosing as per AS 1428.1 (2009), Clause 11.1(f) and (g).

As per BCA Clause D2.17 (a) and (vi), handrails within the fire isolated stairways are required to comply with AS 1428.1 (2009), Clause 12. The height of handrails is to be between 865-1000mm and be consistent along the length of the stair.

Comments:
Details of this nature have not been provided at this early stage of the design process. We recommend this item be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

SANITARY FACILITIES

5.6 Unisex Accessible Sanitary Facilities
BCA Part F2.4

The BCA states that accessible unisex sanitary compartments must be provided in accessible parts of the building in accordance with Table F2.4(a) & (b) as per below:

Class of building	Minimum accessible unisex sanitary compartments to be provided
Class 5, 6, 7, 8 and 9 – except for within a ward area of a Class 9a *health-care building*	Where clause F2.3 of the *BCA* requires closet pans: (a) 1 on every *storey* containing *sanitary compartments*; and (b) where a *storey* has more than 1 bank of *sanitary compartments* containing male and female *sanitary compartments* at not less than 50% of those banks

BCA Table F2.4(a)

Class of building	Minimum accessible unisex showers to be provided
Class 5, 6, 7, 8 and 9 – except for within a ward area of a Class 9a *health-care building*	Where clause F2.3 of the *BCA* requires 1 or more showers, not less than 1 for every 10 showers or part thereof

BCA Table F2.4(b)

Based on the above, accessible sanitary and shower facilities are not formally required within ward areas for patient and staff under the BCA (although the DDA would continue to require suitable equitable access to facilities). However, such facilities are required within treatment, non-patient care areas, and all other areas.

At a minimum, accessible sanitary and shower facilities for patients, public and staff must be provided within treatment and non-patient care areas, and all other areas (BCA F2.4). However, in order to meet the DDA, an accessible sanitary and shower facility for public, visitors and staff with disabilities should be provided wherever gender facilities are proposed.

- The internal dimensions and layout of these facilities must be appropriate to ensure circulation of not less than 1900mm x 2300mm to the pan and 1600mm x 2350mm to the shower, in accordance with AS 1428.1 (2009). The washbasin may not encroach greater than 100mm into these spaces when located opposite to the pan.

- All accessible facilities to be designed and constructed with appropriate selection and placement of fixtures and fittings which enable access by all users and meet the compliance requirements of AS 1428.1 (2009) (BCA F2.4).

- Facility doors must be openable and/or removable from the outside in an emergency situation, specifically where there is less than 1200mm between the pan and the nearest part of the doorway (BCA F2.5).

- Provision of alternate left and right handed facilities should be included in the scheme, which should be provided with suitable signage.

- Signage provision in accordance with AS1428.1 (2009) and BCA D3.6

Comments:
At current concept stage, location and distribution of all sanitary facilities (incl. accessible facilities) have yet to be identified.

Details of this nature have not been provided at this early stage of the design process. We recommend this item (esp. overall bathroom sizes, exact set outs of sanitary ware) be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

Further discussion with the client will be required to determine the suitability for these facilities to be designed for people with disabilities, as noted above and to meet the requirements of the tables above.

5.7 Ambulant Toilet Cubicles
BCA Part F2.4

Cubicles for use by a person with an ambulant disability need to be included in the scheme, in accordance with AS 1428.1 (2009) and (BCA F2.4). This should be reviewed and included within the scope of the scheme; which is in addition to wheelchair accessible unisex facilities, noted above.

Ambulant toilet facilities should be provided to meet the guidance identified in BCA Part F2.4(c), which prescribed the following requirement:

- At each bank of toilets where there is one or more toilets in addition to an accessible unisex sanitary compartment at that bank of toilets, a sanitary compartment suitable for a person with an ambulant disability in accordance with AS1428.1 must be provided for use by males and females

Furthermore, design detailing should follow the guidance in Clause 16 of AS1428.1 (2009), which includes the following requirements:

- Each ambulant cubicle will require a clear circulation space of 900mm x 900mm internally between the ambulant pan (610mm to 660mm depth projection) and the cubicle door in its most open position (if door swings into the cubicle)
- Each ambulant cubicle will require a clear circulation space of 900mm x 900mm externally between the cubicle door in its most open position (if door swings out of the cubicle) to any obstruction

- Each ambulant cubicle shall achieve a clear width ranging between 900mm to 920mm
- Each ambulant cubicle shall be provided with a cubicle entry door achieving a clear open width of minimum 700mm
- If ambulant cubicle is provided within a larger male and/or female bank of toilets, the entry door/s (incl. door forming air locks) to the toilets (other than unisex accessible toilet) shall achieve a clear open width of minimum 700mm
- If airlocks are provided leading to the ambulant toilet facility, a clear circulation space of 900mm x 900mm is required between consecutive door swings in each air lock
- Each ambulant cubicle requires provision of grab rails on both sides
- Each ambulant cubicle requires provision of a coat hook
- Signage provision in accordance with AS1428.1 (2009) and BCA D3.6

Comments:
At current concept stage, location and distribution of all sanitary facilities (incl. ambulant sanitary facilities) have yet to be identified.

Details of this nature have not been provided at this early stage of the design process. We recommend the items mentioned above be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

Further discussion with the client will be required to determine the suitability for these facilities to be designed for people with ambulant disabilities, as noted above and to meet the requirements of the tables above.

Note: Unisex ambulant sanitary compartments are technically non-compliant with BCA Part F2.4.

6. PATIENT AREAS

6.1 Patient Areas

Within patient areas, specifically the inpatient units, not less than one bedroom and ensuite in each ward and of each type should be designed to permit access for all, in order to facilitate access to and within all areas normally used by the occupants.

All patient rooms will need to be accessible for use by the patient as well as visitors. Further discussion with the client is required to determine the suitability for these facilities to be designed for people with disabilities.

As mentioned above, within patient areas, specifically the inpatient units, not less than one bedroom and ensuite in each ward and of each type should be designed to permit access for all, including appropriate internal doors, internal paths of travel to and within suites and sufficient circulation space to permit independent and dignified movement by people with disabilities (DDA). Whilst the BCA does provide an exemption to accessible sanitary accommodation in ward areas, it is recommended for inclusion to meet the spirit and intent of the DDA as well as providing flexible facilities for patients who may be admitted who also have a disability, particularly a mobility disability (DDA).

All areas of a Class 9a ward should be accessible for the patients as well as staff and visitors (except the sanitary accommodation noted above). Note: Whilst accessible sanitary facilities are not required in ward areas, provision for equitable access remains relevant under the DDA.

Accessible rooms should be representative of the range of amenity available, e.g. not less than one standard room, and not less than one room with access to a balcony, in each ward, where a ward benefits from such a feature (DDA).

Any accessible rooms should incorporate an accessible ensuite, designed and constructed with appropriate selection and placement of fixtures and fittings which enable access by all users and meet the compliance requirements of AS 1428.1 (2009) (DDA). The facility may exclude installation of a shower seat and backrest at the pan, and incorporate increased setout of the pan from the adjacent wall and drop-down grabrails to either side of the pan to facilitate occupational health and safety requirements for the provision of patient support by staff, as detailed below (refer also to Section 4).

General arrangement layouts of typical inpatient rooms and accessible rooms should be provided and reviewed to establish level of compliance, when available. These should be finalised and agreed to ensure they remain accessible for patients and visitors in particular.

All corridors in hospitals should be provided with suitable handrails to meet D2.17 of the BCA.

Comments:
At current concept stage, detailed layout plans for patient areas, including ward rooms and fully accessible rooms (one to each ward) have not been provided for review.

Details of this nature have not been provided at this early stage of the design process. We recommend the requirements mentioned above be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

Further discussion with the client will be required to determine the suitability for these facilities (at least one accessible bedroom and ensuite in each ward of each type) to be designed for people with disabilities, as noted above.

6.2 Treatment Consulting and Waiting Areas

All non-patient care areas, including consulting suites and treatment spaces, such as medical imaging must be designed to permit access by all (unless considered for exemption under D3.4 of the BCA - see Appendix A). Further discussion with the client is required to determine the suitability for these facilities to be designed for people with disabilities.

All non-patient care areas, including consulting suites and treatment spaces and therapy areas must be designed to permit access by all, including appropriate internal doors, internal paths of travel to and within suites and sufficient circulation space to permit independent and dignified movement by people with disabilities (BCA D3.1).

Waiting areas should be designed with sufficient circulation space to permit movement of people with disabilities between furniture items. A range of seating, including seats at 450 - 520mm height with armrests and backrests will be provided, including designated wheelchair seating spaces (of minimum 900mm width x 1300mm length) setback from pathways with companion seating located adjacent (DDA).

Comments:
At current concept stage with regards to waiting areas, limited information has been provided including range of seating provided. There will need to be designated wheelchair seating spaces proposed within waiting areas.

Details of this nature have not been provided at this early stage of the design process. We recommend the requirements mentioned above be addressed during subsequent design stages. Refer to Appendix A for compliance requirements.

Further discussion with the client will be required to determine the suitability for these facilities (at least one accessible bedroom and ensuite in each ward of each type) to be designed for people with disabilities, as noted above.

7. HEARING AUGMENTATION

7.1 Hearing Augmentation

Where an inbuilt amplification system (other than one used for emergency purposes only) is installed in a meeting / conference or teaching room, an appropriate assistive listening system must be provided.

If Reception counters are screened between the patients and staff, a hearing augmentation listening system must be provided (per D3.7 of BCA).

> *Comments:*
> *At current concept stage, it is unclear from the documentation if any hearing augmentation listening systems are proposed. However, if there is a proposal for an education area/program on any level of the new building, this area will likely to have a building classification of 9b, which will require provision of hearing augmentation system.*
>
> *During subsequent design stages, provide details of any proposed hearing augmentation listening systems for Philip Chun review and comment.*

Note: Consideration to the design specifications of AS 1428.5 (2010) is recommended, however, this is not mandatory.

8. ADDITIONAL ACCESSIBILITY CONSIDERATIONS

As detailed above, it is acknowledged that the BCA and likewise the Premises Standards, are limited in scope, covering aspects of building compliance applicable under the BCA only.

Philip Chun Access provides the following as a summary of additional accessibility issues that can be addressed in order to reduce Client risk of attracting a discrimination complaint.

- Fire Egress for People with Disabilities
- Seating in Public Areas
- Signage and Wayfinding
- Access controlled entries to carparks
- Luminance Contrast
- Lighting and Glare

9. CONCLUSION

We have assessed the high-level architectural documentation available to date and have reviewed the scope of work with respect to the Building Code of Australia. The design is at an early conceptual stage where the inherent BCA, Access and DDA philosophies need to be further investigated during subsequent design stages. The finer details with respect to compliance can be integrated and finalised prior to the issue of the next stages.

11.5 Civil and Structural CD Report

Concept Design Report

Eurobodalla Hospital Development
Civil and Structural
13086-BON-CIV-RPT-001

July 2021

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REV	ISSUE/AMENDMENT	WRITTEN BY	REVIEWED BY	DATE
A	DRAFT SUBMISSION	[redacted]		19/03/21
B	DRAFT SUBMISSION			23/04/21
C	DRAFT SUBMISSION			16/06/21
D	90% FINAL SUBMISSION			23/06/21
E	100% FINAL SUBMISSION			21/07/21

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1 Overview

On 7th December 2020, NSW Health announced that a rural site east of Moruya TAFE, between Albert Street and the Princes Highway would be the site for the new Eurobodalla Regional Hospital. The NSW government has committed $200 million to the development which will combine Eurobodalla's two hospitals, Moruya District Hospital and Batemans Bay Hospital. The site is legally described as Lot 6, DP 1212271 located in Moruya NSW 2537. (Project Site).

This Concept Design Report has been prepared to describe the project in relation to civil and structural disciplines.

This project consists of:

Delivery of a new major referral hospital to provide the health services required to meet the needs of the growing population of Eurobodalla, in conjunction with the other hospitals and community health centres across the region;

Delivery of the supporting infrastructure required for the new major referral hospital, including green space and other amenities, campus roads and car parking, external road upgrades and connections, utilities connections, and other supporting infrastructure.

The new hospital will include the following:

- A main entry and cafe area
- Ambulatory Services
- Executive/ Admin/ Education
- Women's & Paediatrics
- Intensive Care Unit
- Health Information Unit
- Pathology
- Pharmacy
- Emergency Department
- Integrated Practice Units
- Medical Imaging
- Mortuary
- Back of house Services
- Car parking
- Future expansion area
- Operating Theatres

1.1 Existing Documentation

The following relevant existing documentation has been referenced for the proposed design:

- Masterplan Options by Conrad Gargett Architects, dated 16st March 2021,
- Level and Detail Survey by LTS dated 23rd February 2021,
- Geotechnical Investigation Report 33942LTrpt2 by JK Geotechnics dated 21st May 2021,
- Site Selection Flood Assessment, NSW Health Infrastructure by Arup, dated November 2020,
- Eurobodalla Council Flood Study, provided 24th February 2021,
- Ecology & Bushfire Due Diligence Report AE21-2248-DDREP-ISS-1, by Adel Ecology, dated 3rd March 2021,
- Historical Existing Site information for surrounding area;
- Guiding Ecological Principles by Keystone Ecological, dated October 2007
- Flora and Fauna Impact Assessment by Keystone Ecological, dated October 2007
- Archaeological Subsurface test report by Julie Dibden, dated September 2005
- Heritage Assessment by City Plan Heritage, dated November 2005
- Bushfire Protection Assessment by Aust Bushfire Protection Planners, dated June 2006
- Flood Evacuation by Evans and Peck, dated October 2007
- Water and Flood Clarification by Evans and Peck, dated April 2008
- Hydrology Climate Change Response by Evans and Peck, dated September 2008.
- Stormwater Management Comment by Keystone Ecological, dated April 2008
- Groundwater Response by Evans and Peck, dated December 2008
- Soil Survey and Acid Sulphate Soil Invest by Sydney Environmental and Soil Lab, dated September 2006
- Riparian Corridors and contours by EDAW AECOM, dated June 2007

2 Site Description

2.1 Location

The proposed development is within the parcel of land identified as Lot 6, DP 1212271 located in Moruya NSW 2537. The site is bordered by Princes Highway to the south. The proposed site is located within Eurobodalla Shire Council Local Government Area (LGA). The locality map of the site is shown in Figure 2.1 below:

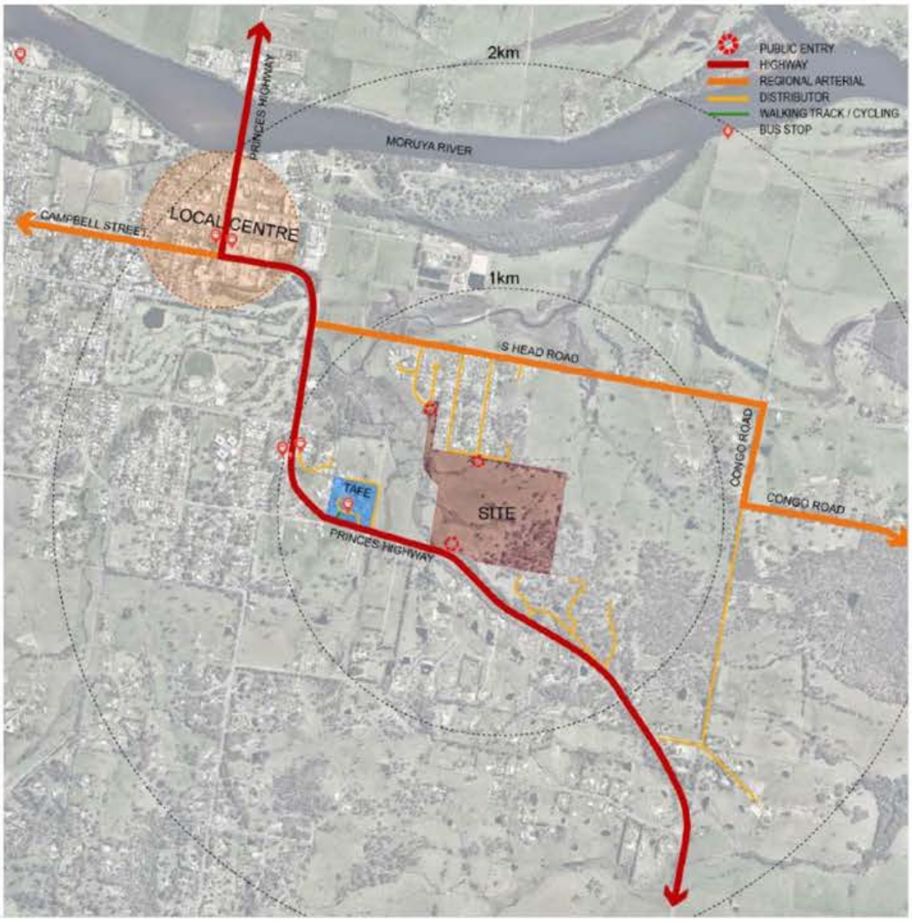

Figure 2.1: Site Locality Map (by Conrad Gargett)

2.2 Topography

The site is located on a localised crest. The proposed location of the earthworks and associated infrastructure sit on a local crest and generally fall to the west and south-west. Several natural watercourses run through the site as shown in the blue lines in Figure 2.2.1. A residential development is located to the north of the site. An aerial topography plan is also provided in Figure 2.2.2.

Figure 2.2.1: Basemaps Image (by Six Maps)

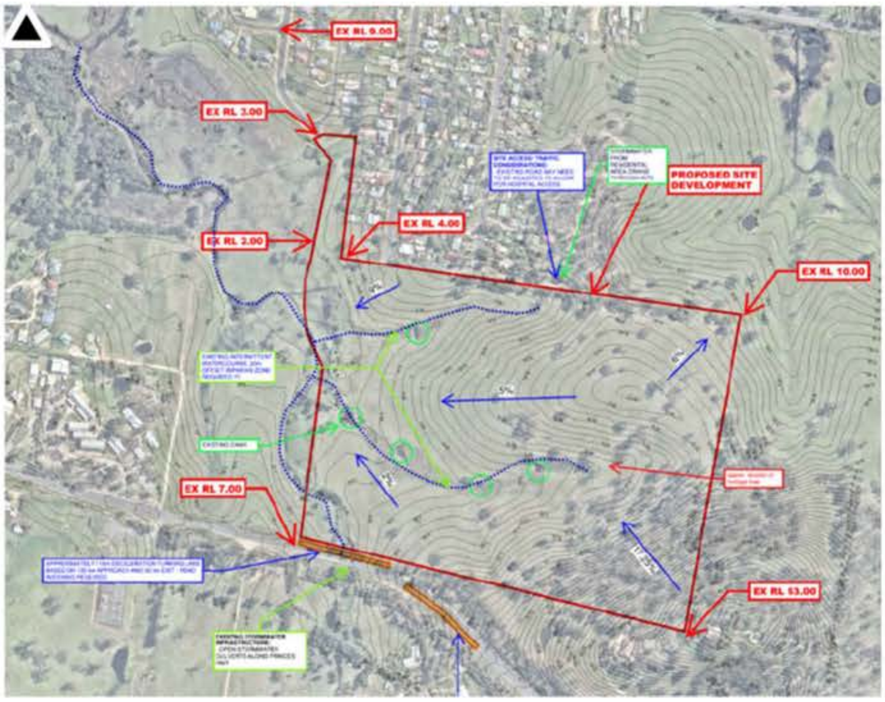

Figure 2.2.2: Site Topography

2.3 Preliminary Geotechnical Information

Geotechnical investigations have been carried out for this site to establish the existing subsurface profile conditions, and to provide recommendations for design of substructure elements, retaining walls, earthworks and pavements. Thirty-eight boreholes were drilled (with locations in Figure 2.3) with depths ranging from 1.85m to 21.5m. Groundwater was observed upon completion of augering in borehole BH34 at RL3.6m AHD and found to be dry in all other boreholes. Standpipes were installed in boreholes BH1, BH18 and BH27 for future assessment. BH34 is located downstream of the development, adjacent to Princes Highway and as such it is not expected that the groundwater table is likely to be intersected as a result of the works.

The general subsurface profile across the site consisted of topsoil, residual soils of silty sandy clay and weathered granite bedrock. Testing of soil samples indicate that the residual soils have moderate to high potential for shrink-swell behaviour. That is, significant volumetric changes in the soil are likely to be experienced as a result of changes to its moisture content. If uncontrolled this can lead to settlement of building structures and pavements, causing issues such as settlement of structural systems beyond serviceability state and/or cracking of pavements. The reactive nature of these soils suggest that additional consideration should be given with respect to the adequate design of substructure, pavements and providing adequate surface drainage for the existing soils in both the temporary (construction) and permanent conditions. Further, the weathered granite profile depth varies considerably across the site from low to high strength and is likely to be encountered during earthworks. Conventional earthmoving equipment is expected to be sufficient for excavation of the soils and extremely weathered granite. The less weathered granite bedrock excavation is expected to require the use of rock saws, rock grinders and/or hydraulic impact hammers attached to large excavators as noted in the Geotechnical report. This will be considered within the earthworks strategy to limit the amount of earthworks within this layer where possible. The subsurface profile of all boreholes is described in further detail in the borehole logs of the Geotechnical report.

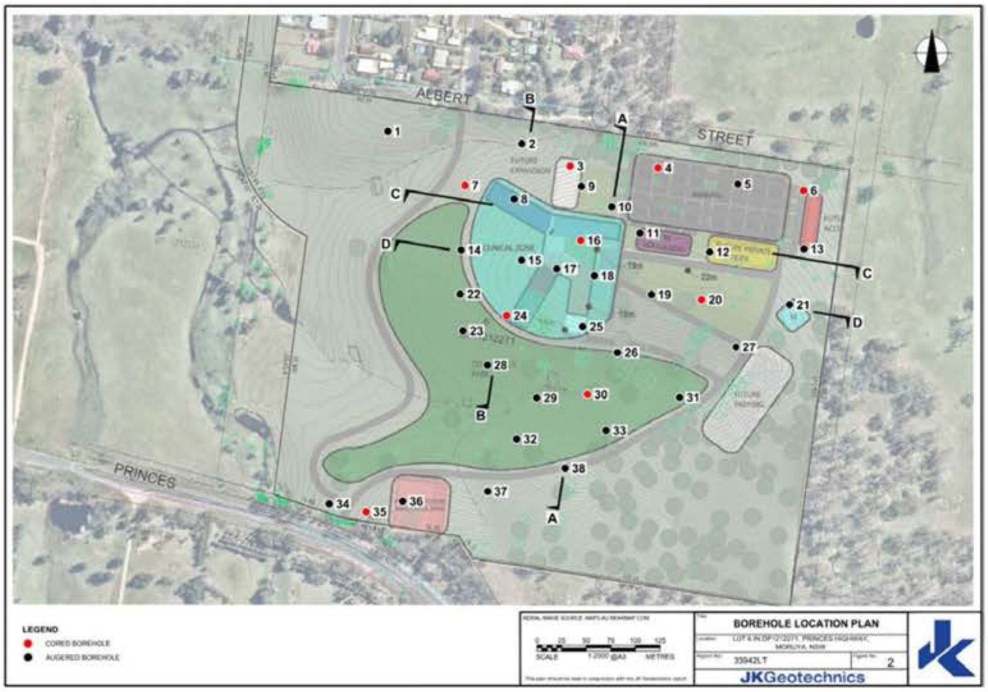

Figure 2.3: Borehole Locations (by JK Geotechnics)

2.4 Flooding

Eurobodalla Council flood studies have found that the western portion of the site is flood affected for 1% AEP and PMF events. See Figure 2.4 below.

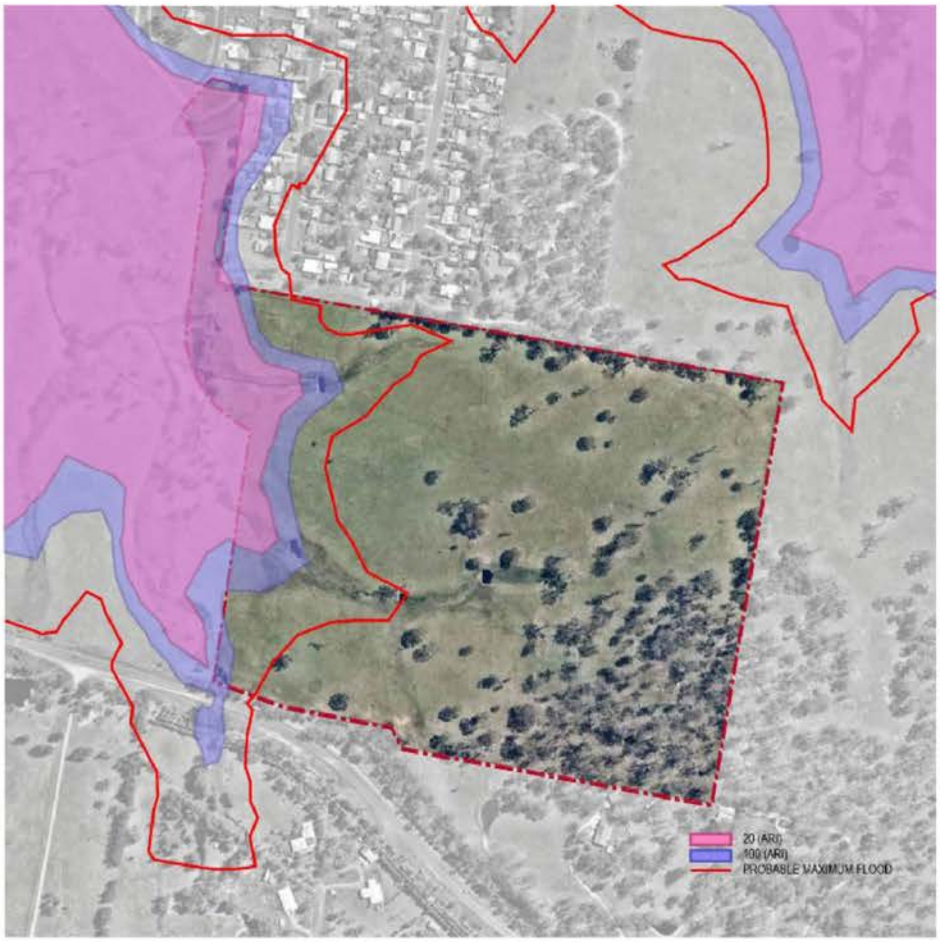

Figure 2.4: 1% AEP Flood Extent & PMF Level (by Conrad Gargett)

The areas which are flood affected are located within the existing environmental area along the western boundary of the site. The flood levels at the key location of the site are:

- 1% AEP 5.01m AHD
- PMF 8.97m AHD

2.5 Stormwater

The site does not currently have any formal stormwater systems in place. As a largely undeveloped grassy pasture, the landform is currently divided into a series of sub-catchments which drain to small dams and ponds. There is also an upstream catchment (Caswell Street) which discharges via a headwall at the northern boundary of the site.

3 Future Development

The site is intended to support the development of a new three level hospital building and surrounding carparks. The architectural site plan from Conrad Gargett, dated 21 June 2021 is shown in Figure 3.1 below. Provision for future expansion is also required. Proposed roads and civil infrastructure include provision for; ambulance access, loading dock access, carpark access, helipad connection as well as main hospital entry. The main site access will be from a new roundabout on Princes Hwy in the South West corner of the site. Alternative access is also proposed on the North boundary. This is likely to require road upgrades, further input from the traffic consultant will be required. Consideration also needs to be given to the future Moruya bypass.

Figure 3.1: Architectural Site Plan (by Conrad Garget dated 09 July 2021)

3.1 Substructure

3.1.1 Retention Systems

It is expected that soil will not be self-supporting therefore either retaining walls or permanent batters are to be utilised. To avoid the potential issues with long term performance of waterproofing systems, batters within subfloor spaces may be preferable where possible. The type of retaining wall will be governed by the height of the soil it retains. The detail and the extent of the retaining wall will be updated in the schematic design phase.

3.1.2 Foundations

It is proposed to found the main building structure on consistent material comprising of high strength rock. The geotechnical investigation performed by the JK Geotechnics (dated 21/05/2021) shows the site has silty sandy top soil followed by extremely weathered granite. The extremely weathered granite depth generally varies from 0.5m to 1.5m. The Geotechnical report proposed to adopt either pad foundation or bored pier footing. An anticipated settlement for the pad foundation is in the order of 20mm whereas the bored pier foundation would be in the order of 7-9mm. The anticipated differential settlement on the Geotechnical report is excessive for this small building and require excessive reinforcement and element sizes to accommodate the differential settlement. Therefore, it is proposed to adopt a uniform type of foundation. The proposed pad sizes for this type of building would be in the magnitude of 2m*2m and require excavation up to 2.5-3m. Therefore it is proposed to adopt pile foundation throughout the building with varying pile sizes to accommodate the load.

3.2 Super Structure

3.2.1 Structural Grid

The structure is generally to be based on a standard 8.4 x 8.4 grid in accordance with HI guidelines. In detail North wings have 8.4 x 8.4 longitudinal grids and South wings have 8.4 x 4.2m longitudinal grids.

3.2.2 Floor Systems

The floors are to be post tensioned concrete supported on reinforced concrete columns. Floors are to be designed to support the loads specified by AS1170.1. In addition, the floors are to be designed to limit accelerations due to vibration as specified by Health Infrastructure.

3.2.3 Structure Resisting Lateral Forces

Seismic forces specified by AS1170.4 and wind forces specified by AS1170.2 are to be resisted by reinforced concrete shear walls. Generally, these are to be incorporated into lift shafts and stair cores.

3.2.4 Importance Level

The building is to be considered as Importance Level 4 as defined by the NCC for the hospital building.

3.2.5 Structural Element Preliminary Sizes

For the purpose of setting floor levels and initial costing, following rates are proposed. The structural preliminary member sizes are attached in the Appendix D.

The slab on ground is designed as suspended slab with min 100 thick void former to accommodate movement of Class M or H1 reactive soil. The slab on ground is designed to take the construction loading of the upper floor, therefore a loading of SDL-10 kPa and LL-1kPa is adopted. An option of supporting the suspended slab on ground to the existing ground can be examined once the site excavation plan is fully finalized. If the clay is encountered a geotechnical engineer inspection and confirmation is required to finalise the slab on ground design, therefore a uniform approach of suspended slab on ground is adopted for CDR stage.

Item	Location	Size	Quantities	Notes
Columns	Generally on 8.4x8.4 grid	350mm x800 mm supporting 3 levels	Concrete varies N65 to N40	Avoid transfers unless they result in a cost saving.
Suspended floors	Clinical Theatres, Imaging	260mm slabs 450mm x 2200mm band beams	Concrete - S40 Reinforcement - 45 & PT - 24 kg/cum	Design for Rf =1
Suspended floors	IPU's	220mm slabs generally (260) bays) 400mm x2200mm band beams	Concrete - S40 Reinforcement - 45 & PT - 24 kg/cum	Design for Rf =2
Stair shafts	Generally	250mm tk. concrete walls	Reinforcement - 250 kg/m3	
Lift shafts	Generally	300mm / 250mm tk. concrete walls	Reinforcement - 250 kg/m3	
Shear walls	T.B.C - for 8.4m wall per on plan	250mm tk. average	Reinforcement - 250 kg/m3	
Roof	Over wards/ theatres/IPU's	Post tensioned concrete 220mm slabs generally (260mm end bays) 400mm x 2200mm band beams Provide metal deck roof over	Concrete - S40 Reinforcement - 45 kg/cum + SL82 mesh top throughout PT - 26 kg/cum	
Roof	Over plant	Structural steel Extend 400mm x400mm columns to roof	Allow 28 kg/sqm of steel	
Stairs	Internal	Reinforced concrete Throat thickness – 250mm	Concrete S32 Reinforcement - 150 kg/m3	
Stairs	External	Reinforced Concrete or structural steel depending on purpose		Avoid stair pressurisation if possible by making stairs "external"
Substructure		Bored Piers or Pad Footings	Concrete – N65	TBC with Geotech
Retaining walls	Building undercroft	250 thick reinforced concrete indicative depending on wall height	Concrete – S32 Reinforcement 150 kg/cum	
Retaining walls	External	< 2.4m - Blockwork 290mm 2.4m – 4.0m - Reinforced 350 tk.		

3.3 Flooding

As the western portion of the site is flood affected for 1% AEP and PMF events, appropriate flood controls need to be applied for the development. For critical developments such as hospitals, additional freeboard should be applied compared to residential and commercial developments. The lower ground floor level is sited at an approximate RL14m AHD, thereby providing approximately 5m freeboard to the PMF at RL8.97m AHD.

As the development floor is higher than PMF level and clear of the flood overlay, it is expected that a Flood Evacuation Strategy from the hospital will also not be required. However, access roads will need to be assessed to ensure continued access to and from the hospital is retained in the PMF event.

3.4 Bulk Earthworks / Soil & Water Management

Bulk earthworks for the proposed hospital development and associated infrastructure will be required. Preliminary earthworks models have been prepared for the current site plan and drawings can be seen in Appendix A. The proposed ground floor finished floor level adopted for the main building is at RL19.25m AHD.

The aim is to balance cut/ fill requirements where possible to avoid the cost of disposing of soil off-site. It is suggested to use the excess fill below the ground floor to act as formwork to support the suspended ground floor slab where appropriate. Unsuitable site-won materials, such as from soft/ heaving areas or areas near dams and natural watercourses are unlikely to be able to be used as engineered fill. This, along with any surplus excavated soil can be distributed around the site; particularly in landscaped areas and batters to reduce the amount of offsite disposal of material.

Based on a nominal bulk excavation of 300mm below finished floor level, the approximate cut volume is 20,600m3 and fill volume is 17,820m3. The earthworks plan further details the breakdown of cut/ fill quantities for the lower ground floor, carpark, access roads and detention basin areas. It is expected that there will be a surplus cut of 2,780m3. The quantities assume that all excavated material can be re-used on site. However, as the design continues to be refined, a key premise of the earthworks strategy will be to ensure that there is no requirement for imported fill to be brought to site nor any offsite disposal of material.

In areas where relatively deep excavations are required or where weathered granite is expected, additional treatment may be required to ensure particle size requirements are met to allow for their use as engineered fill. This is the same for the residual clays provided that they are appropriately compacted, moisture conditioned and allowances are given to limit shrink/ swell behaviour. Such allowances include inclusion of a capping layer (crushed rock) of low permeability and reactivity, or in-situ stabilisation of the residual clays.

Also assumed is a nominal 150mm surface stripping of topsoil (7,800m3). The Geotechnical report has confirmed that topsoil may be suitable to be redistributed in landscaped areas only where possible. Excavated rock is to be crushed to appropriate grade and reused on site as road base where suitable and general fill where appropriate.

Further refinement of earthworks quantities is expected pending detailed design, changes to the development layout and pavement design determining final bench levels for the carpark and access roads. Currently a flexible pavement is proposed for the access roads and carpark. A rigid pavement has been proposed for the loading dock area in accordance with HI design guidelines. Given the depth of fill required for the loading dock, consideration of a suspended concrete pavement (in lieu of an on-grade concrete pavement) may be required to minimise risk of settlement and associated defects.

The construction of a new roundabout to access the future hospital will also require additional earthwork activity. This involves new pavement constructed over landscaped areas, modifying the existing table drain to suit the new layout and a new culvert/ headwall system to convey runoff through the roundabout. The size and radius of the roundabout will be dependent on the Transport for NSW confirmation of the speed zone adjustment from the current 100km/hr zone. A 14m radius or 20m radius is required for a speed zone adjustment to 60km/hr or 80km/hr respectively. Conceptual plans for both options are shown in Appendix A. It is also noted that existing communications services adjacent to Princes Highway may be affected by the roundabout construction and that the necessary alterations are considered within the package of works.

As the site slopes, retaining walls are also nominated in areas of the carpark to compensate for level differences arising from providing accessible gradients. Batters will be used to tie in the developed areas with the existing surrounding areas. Consideration will need to be given to providing fencing barriers, balustrades or similar to demarcate paths of travel and for occupant safety.

Soil and water management of the proposed development will be implemented during construction. The design of these measures will be in accordance with the Landcom "Blue Book".

For soil and water management of the site, the following measures will need to be provided to minimise the risk of sediment being washed into neighbouring properties, receiving environmental areas and erosion of the site.

A sediment fence/catch drain (or diversion bund) around the site

Temporary access to site with shaker pad

Indicative stockpile areas with sediment fence around it during construction. The stockpile must be located out of water flow paths (and be protected by earth banks/drains as required).

A sediment basin is to be provided to capture runoff from the disturbed site. Upstream and undisturbed catchments should be excluded by providing diversion stormwater drainage lines (which bypasses the proposed site or sediment basin during the construction stage) to control stormwater quality in accordance with Soil and Construction Volume 1, March 2004 by Landcom

3.5 Stormwater Management

As the development is located in a rural area and in close vicinity of natural waterways, stormwater within the site will need to be managed both in terms of quantity and quality to ensure there is as little disturbance as possible to the existing natural environment. This will include swales to convey stormwater instead of pit/ pipe network for the permeable areas and bio retention basins instead of detention tanks.

The upstream catchment which currently discharges via headwall at the northern boundary will need to be collected and conveyed by a swale and diverted away from the proposed development and bio retention basin before discharging via an energy dissipator to ensure scour protection. See figure below for the location of the existing headwall.

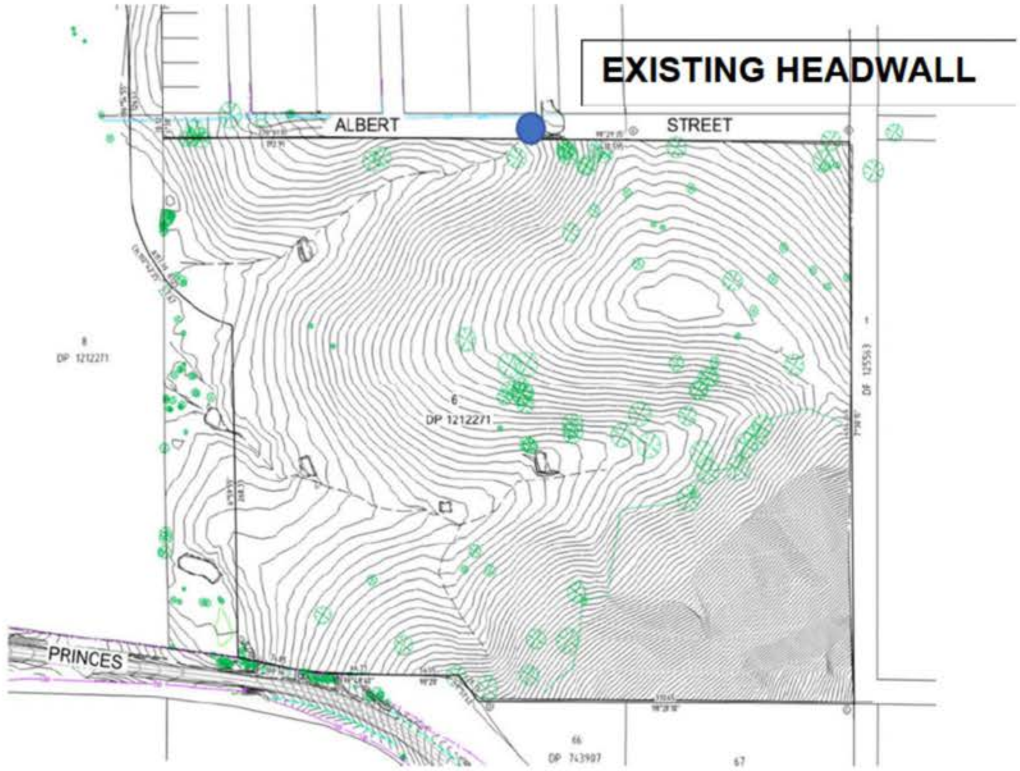

Figure 3.5: Existing Headwall Location (Survey)

A minor/ major system will be adopted where a pit/ pipe network will be sized for 5% AEP minor storm event, and overland flow path such as footpaths, swales and access roads will be sized to convey the 1% AEP major storm event.

Pit/ pipe network will be required for the roof and hardstand areas such as the car park and the access road.

The stormwater conveyed by pit/pipe network will discharge to wide swales as early as possible to limit the pipe run and emulate the natural flow as much as possible rather than a concentrated flow. The swale will then convey the stormwater to bio retention basins for water quality and quantity management. Bio retention basins will then discharge via headwalls and energy dissipators for low flow and via weirs for high flow.

3.5.1 Stormwater Management – Quantity

On-Site Detention system will be required to limit post-development flow to pre-development flow for all storm events up to and including 1% AEP. For the reason already stated in Section 3.5 of this report, bio retention basins are proposed instead of detention tanks.

Three detention basins have been apportioned based on the site catchments using DRAINS. A plan and typical section indicating the location and spatials of the basins are provided in Appendix B using 1 in 4 batters. It also recognises that further development may occur within the site, whereby the basins will be able to accommodate for these future expansions. These are generally located away from heavily populated areas to reduce the risk of falling. Further safety precautions considered included adopting a lower extended detention depth of 200mm and fencing off the basins subject to Council review.

The post-development discharge of the bio basins will be controlled to generally maintain the pre-development flows. This will be to minimise the basin storage requirements by providing the least disturbance to the existing conditions, and to emulate a dispersed sheet flow as opposed to a concentrated flow. A dispersion pipe detail has been described in Appendix B to spread the flow with the use of a slotted pipe. This will be applicable to the basins with a piped inlet and/ or outlet.

3.5.2 Stormwater Management – Quality

The Eurobodalla Shire Council Infrastructure Design Standard set targets for the reductions of water borne pollution being conveyed from the site through the stormwater drainage system and ultimately publicwaterways.
Stormwater quality requirements specified by Eurobodalla Shire Council are pollution load reductions:

- 80% retention of the typical urban annual load for Total Suspended Solids (TSS)
- 45% retention of the typical urban annual load for Total Phosphorus (TP)
- 45% retention of the typical urban annual load for Total Nitrogen (TN)
- 70% retention of the typical urban annual load for gross pollutants (litter)

Modelling for the determination of the mean annual loads of land uses has been undertaken using MUSIC software and in accordance with the associated WSUD Technical Guidelines. More stringent stormwater quality targets may be required as the site is close to natural waterways and will need to be assessed pending future discussions.

Further consultation with Council is required to discuss the extent of area the water quality targets apply to. As the majority of the site is untouched and retains the existing natural environment, there is a case for the water quality targets to apply to the developed area only.

A treatment train that models the Bio retention basins has been specified on MUSIC with the results shown in Appendix C. The results indicate that they exceed the pollution load reductions stipulated by Council. Rainwater tanks have been excluded from the modelling at this stage as further detailed design is required to determine the extent of roof area that can feasibly be connected to the rainwater tank/s. It should be noted that in any case rainwater tanks would have a positive effect on the MUSIC results. Additional proprietary devices such as OceanGuard litter baskets may be considered to capture gross pollutants within drainage pits to reduce pipe blockages and improve maintenance regimes.

Pollutant	% Target	% Reduction
Total Suspended Solids (TSS)	80.00	83.40
Total Phosphorus (TP)	45.00	58.20
Total Nitrogen (TN)	45.00	47.20
Litter	70.00	100.00

Table 3.5.2: MUSIC Pollutant Load Reductions

Wetlands are one of the treatment train options in lieu of the bio retention basin as these closely resemble the surrounding natural environment. However, it is much more complex and often more expensive than the bio retention basin. This requires further ecological analysis of the site and permanent ponding.

Further information on each element of the proposed treatment devices is provided below:

3.5.2.1 OceanGuard

OceanGuards (or other similar approved equivalents) provide effective removal of TSS and gross pollutants. OceanGuards are a filter cage system which are inserted into roadway gully pits to filter and remove pollutants before the water enters the piped drainage system.

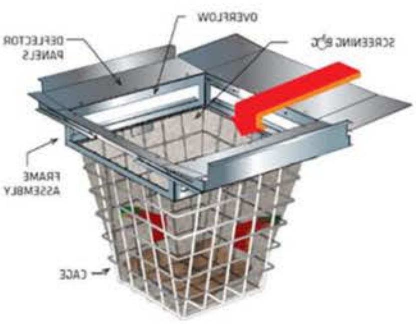

Figure 3.5.2.1: OceanGuard

3.5.2.2 Bio-Retention Basin

Bio-retention systems are vegetated areas where stormwater is passed through densely planted filter media (loamy sand) allowing the plants to absorb the collected and stored nutrients. Bio-retention basins utilise temporary ponding above the vegetated surface to increase the volume of stored water for treatment. Bio-retention systems can take a number of forms but all have common features including the extended detention depth above the media surface, the filter media and a low level drainage media and subsoil system. These are shown in Figure 3.5.2.2 below. The bio-retention basins will also be used to detain water for stormwater quantity purposes as discussed in Section 3.5.

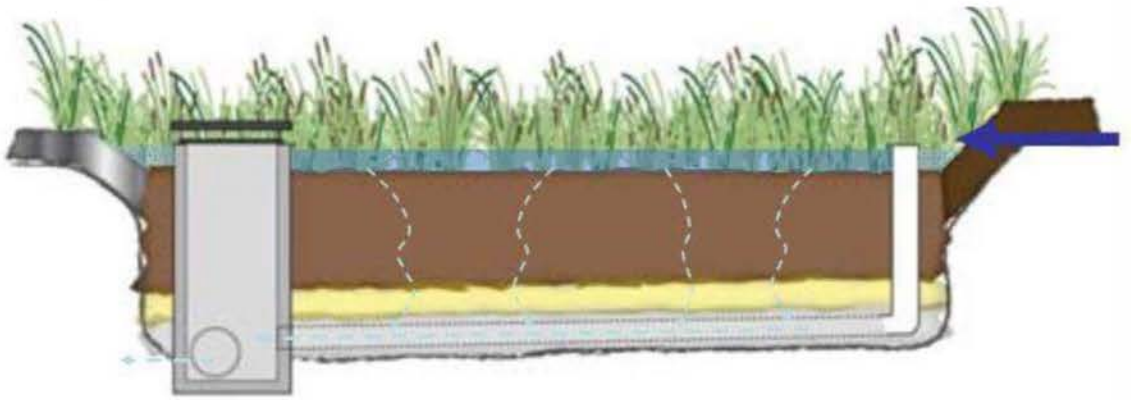

Figure 3.5.2.2: Bio Basin

3.5.2.3 Swale

Swales systems are vegetated channels where stormwater is conveyed from one location to another. Swales also provide water quality improvements by capturing total suspended soils and gross pollutants.

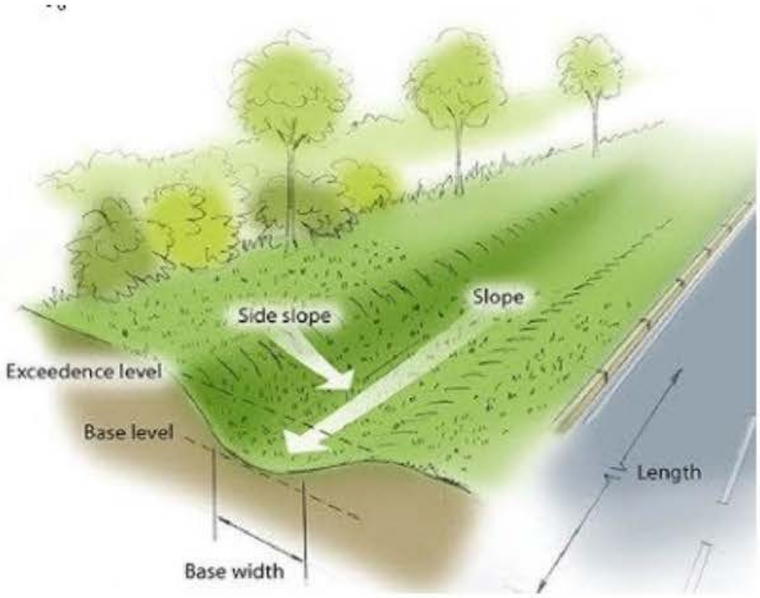

Figure 3.4.2.3: Swale

3.5.2.4 Rainwater Tank

Rainwater can be collected via a rainwater tank and be used for irrigation of landscape area and/or flushing of toilets. Inclusion of such tanks are beneficial from a water reuse and runoff minimisation perspective as they will contribute to reducing flow discharge into council stormwater system. When the tank is full, it will overflow into the pit/ pipe system.

Appendix A – Preliminary Earthworks Drawings

BULK EARTHWORKS DEPTH RANGE TABLE

Lower_value		Upper_value		Colour
-3.5	to	-3.0	2	
-3.0	to	-2.5	2	
-2.5	to	-2.0	2	
-2.0	to	-1.5	2	
-1.5	to	-1.0	2	
-1.0	to	-0.5	2	
-0.5	to	0	2	
0	to	0.5	2	
0.5	to	1.0	2	
1.0	to	1.5	2	
1.5	to	2.0	2	
2.0	to	2.5	2	
2.5	to	3.0	2	
3.0	to	3.5	2	
3.5	to	4.0	2	
4.0	to	4.5	2	
4.5	to	5.0	2	
5.0	to	5.5	2	
5.5	to	6	2	

GROUND LEVEL COURTYARDS TO BE ON SUSPENDED STRUCTURE - OPTIONAL TO FILL (APPROX 6,930m³)

EXTENT OF CUT FROM EXTREMELY WEATHERED GRANITE TO PROPOSED BULK EARTHWORKS - 7,100m³

ARCHITECTURAL LAYOUT AS PER DRAWING No. EHS-HI-AR-DWG-FD-10PW02_B (MASTERPLAN OVERALL - PROPOSED) DATED 09.07.21

Classification of Material Weathering

Rock Material Strength Classification

PRELIMINARY: BULK EARTHWORKS QUANTITIES SUMMARY (IN-PLACE)

150mm STRIPPED SURFACE = 7,800m³
(WITHIN PROPOSED WORKS ONLY. ASSUMED TO BE REMOVED OFF-SITE)

TOTAL CUT VOLUME = 20,600m³
VOLUME INCLUDES THE FOLLOW:
1. LOWER GROUND - 6,290m³ (RESIDUAL SOIL - 4,060m³)
2. CARPARK - 2,970m³ (RESIDUAL SOIL - 1,020m³)
3. ACCESS ROADS - 5,855m³ (RESIDUAL SOIL - 3,780m³)
4. HELIPAD - 10m³
5. BIO RETENTION BASINS - 5,475m (RESIDUAL SOIL - 615m³)

TOTAL FILL VOLUME = 17,820m³
(EXCLUDING OPTIONAL AREAS)
VOLUME INCLUDES THE FOLLOW:
1. LOWER GROUND - 185m³
2. CARPARK - 4,900m³
3. ACCESS ROADS - 9,000m³
4. COURTYARD EAST - 2,400m³
4. HELIPAD - 1,205m³
5. BIO RETENTION BASINS - 130m³

TOTAL EXCESS CUT VOLUME = 2,780m³
(VOLUME BASED ON ASSUMED 100% REUSABLE EXCAVATED MATERIALS INCLUDING RESIDUAL SOILS)

NOTES:
a. ASSUMED 500mm RESIDUAL SOIL DEPTHS FROM STRIPPED SURFACE TO EXTREMELY WEATHERED GRANITE SURFACE AT BASIN AND ACCESS ROADS WHERE BOREHOLE LOCATIONS HAVE NOT BEEN PROVIDED.
b. APPROXIMATELY 9,475m³ EXCAVATED RESIDUAL SOIL TO BE DISTRIBUTED TO LANDSCAPING BATTERS. RESIDUAL SOILS CAN ALSO POTENTIALLY BE USED BELOW DEEPER FILL AREAS (I.E. LOADING DOCK, CARPARK) PROVIDING MIN 1.0m GOOD QUALITY MATERIAL (I.E. ROCK) AS CAPPING LAYER OVER.

OPTIONAL FILL VOLUME = 10,160m³
VOLUME INCLUDES THE FOLLOW:
1. LOWER GROUND - 845m³
2. GROUND - 2,385m³
3. COURTYARD WEST - 6,930m³

[redacted]

NOTE
BOREHOLE LOCATIONS AND LEVELS INTERPOLATED FROM INFORMATION SUPPLIED BY "JACEOTECHNICS" PTY LTD REF: 33942, report DATED 21ST MAY 2021

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NSW GOVERNMENT | Health Infrastructure

MEINHARDT BONACCI

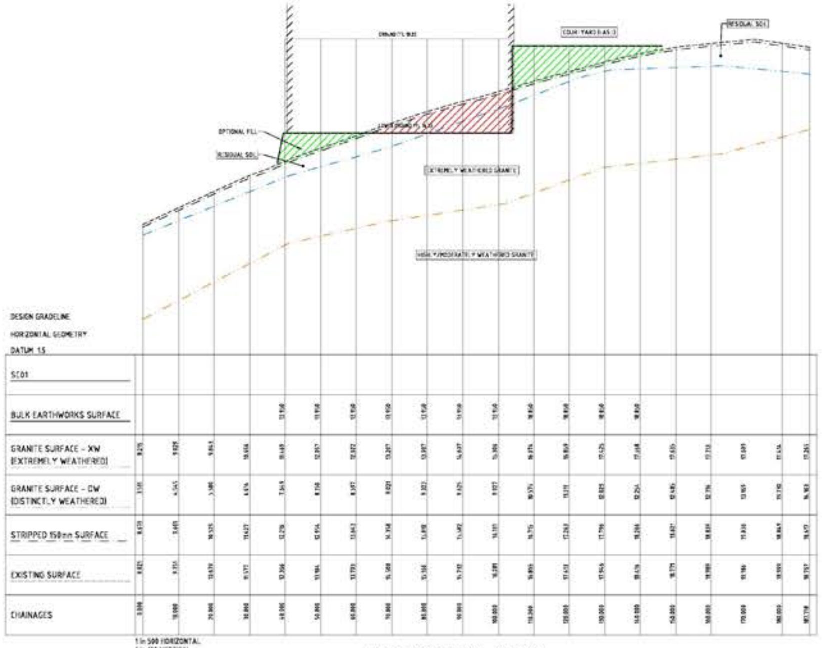
Project Name: EUROBODALLA HEALTH SERVICES

Drawing Title: CONCEPT BULK EARTHWORKS PLAN PRELIMINARY

PRELIMINARY

Scale: 1:1000 | Date: FEB 2021 | Sheet: A0

Project No.: 13086 | Drawing No.: SK006 | Rev: P4



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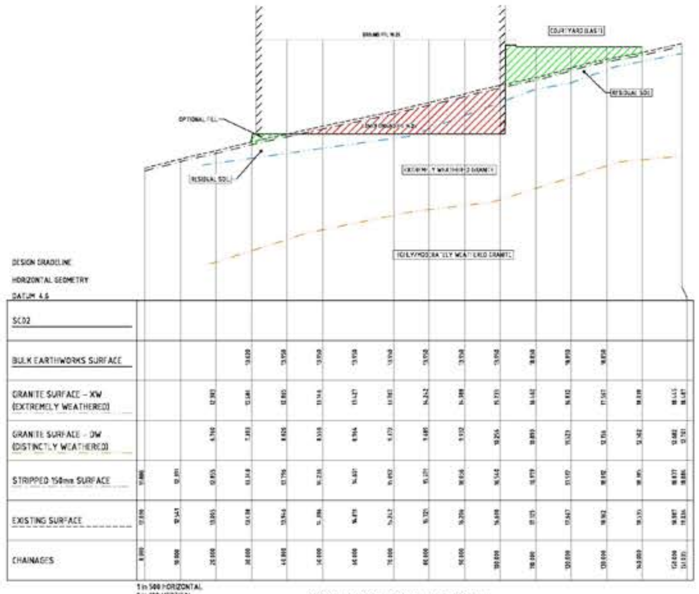

SC02 LONGITUDINAL SECTION

LEGEND

FILL FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

CUT FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

NOTES

1. EXISTING SURFACE LEVELS ARE INTERPOLATED FROM INFORMATION SUPPLIED BY "LTS" PTY LTD REFERENCE 51266 001DT ISSUE 1 DATED 23/02/21
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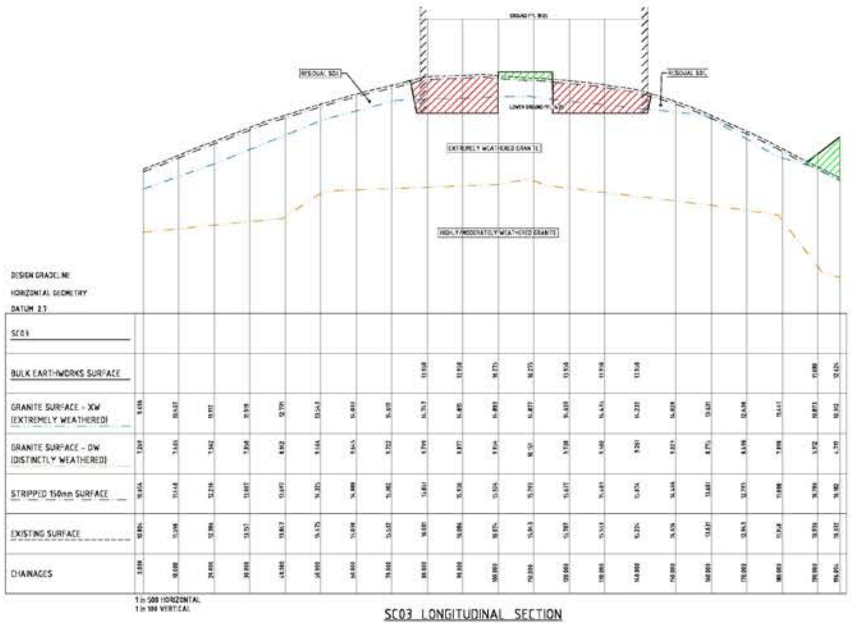

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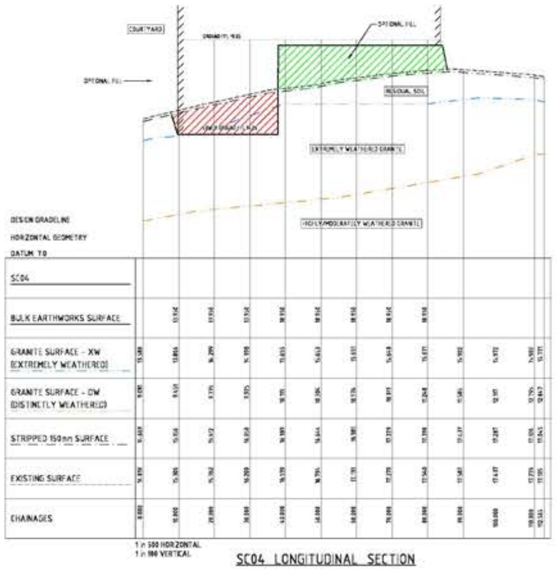

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P3	PRELIMINARY ISSUE
P2	PRELIMINARY ISSUE
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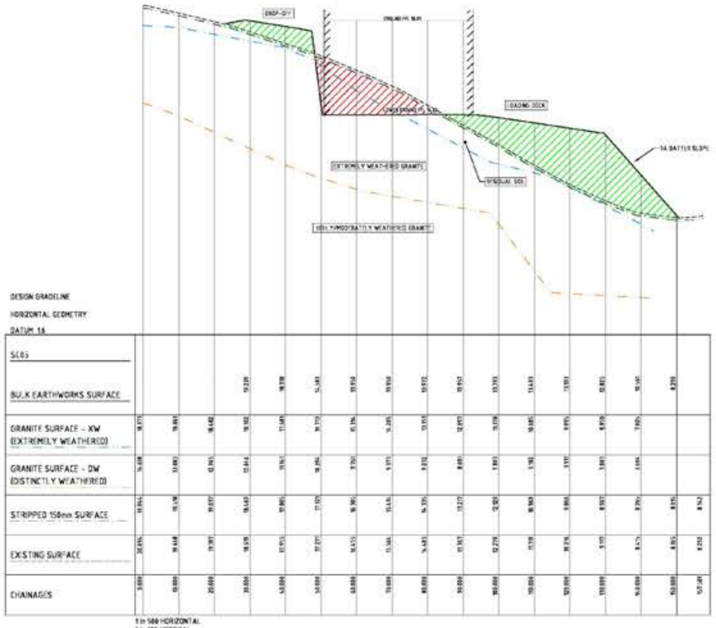
MEINHARDT BONACCI

Project Name	EUROBODALLA HEALTH SERVICES
Drawing Title	PRELIMINARY CONCEPT BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 1
Status	PRELIMINARY
Scale	AS SHOWN
Date	FEB 2021
Sheet	A0
Project No.	13086
Drawing No.	SK007
Rev	P4



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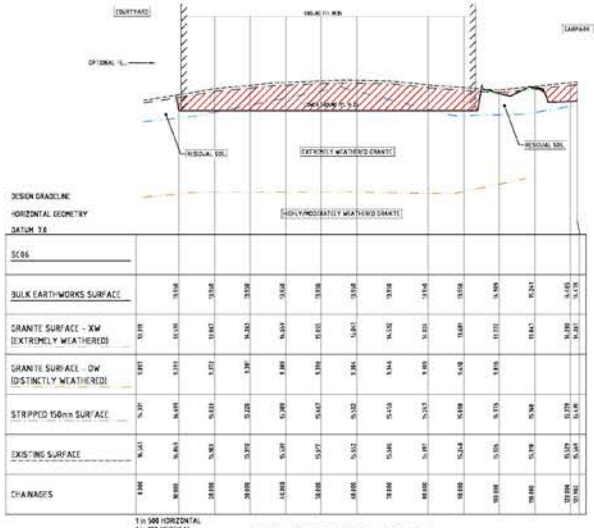

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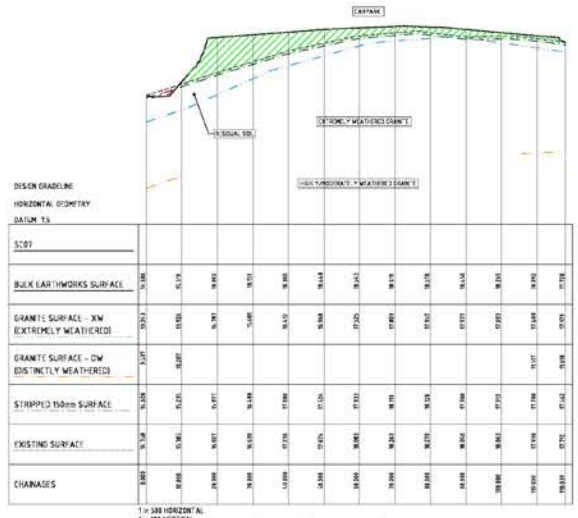

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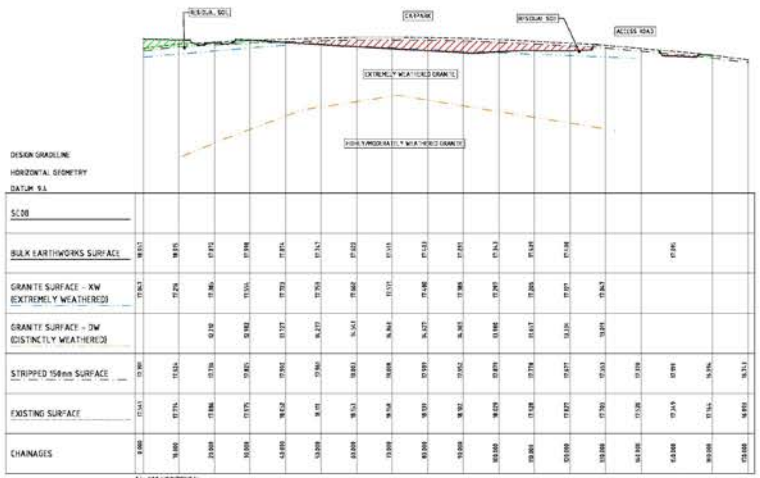

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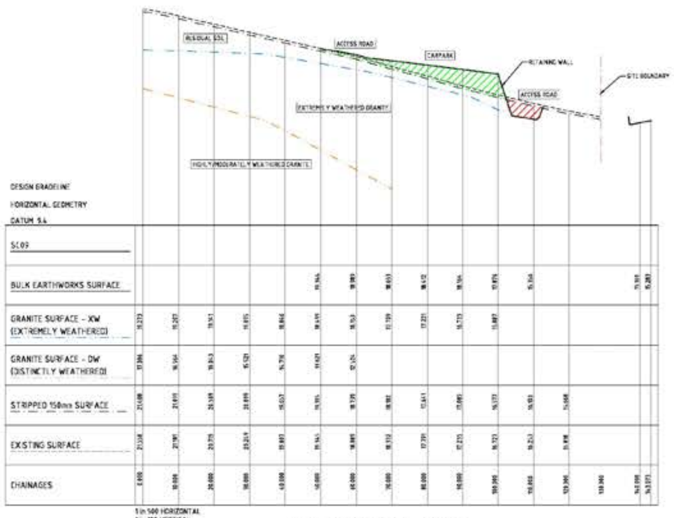

SC09 LONGITUDINAL SECTION

LEGEND

FILL FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

CUT FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

NOTES

1. EXISTING SURFACE LEVELS ARE INTERPOLATED FROM INFORMATION SUPPLIED BY 'LTS' PTY LTD REFERENCE 51266 001 31 ISSUE 1 DATED 23/02/21
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NSW GOVERNMENT Health Infrastructure

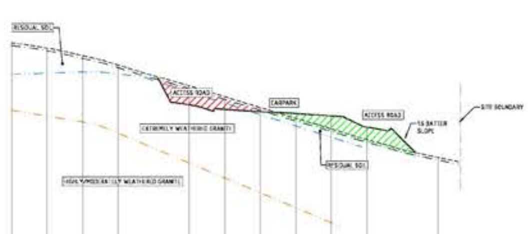
MEINHARDT BONACCI

Project Name: EUROBODALLA HEALTH SERVICES

Drawing Title: PRELIMINARY CONCEPT BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 2

PRELIMINARY

Scale: AS SHOWN
Date: FEB 2021
Sheet: A0
Project No: 13086
Drawing No: SK008
Rev: P4

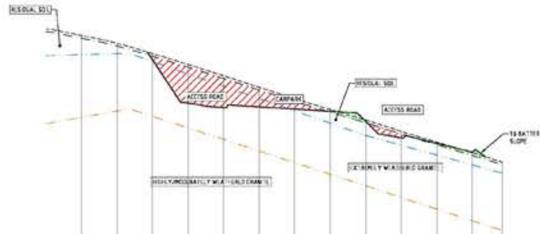


DESIGN GRADELINE
HORIZONTAL GEOMETRY
DATUM 9.4

SC10															
BULK EARTHWORKS SURFACE						18.610	18.155	18.029	17.928	17.293	17.155	16.447			
GRANITE SURFACE - XW (EXTREMELY WEATHERED)	20.968	20.285	20.279	20.154	19.787	19.147	18.587	17.867	17.225	16.586					
GRANITE SURFACE - DW (DISTINCTLY WEATHERED)	18.112	17.767	17.462	16.896	15.974	15.119	14.292	13.450	12.609	11.767					
STRIPPED 150mm SURFACE	21.760	21.667	21.838	20.489	19.902	19.337	18.726	18.112	17.508	16.911	16.307	15.731	15.302		
EXISTING SURFACE	21.910	21.977	21.988	20.638	20.052	19.487	18.876	18.262	17.658	17.061	16.457	15.881	15.452		
CHAINAGES	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	135.610

1 in 500 HORIZONTAL
1 in 100 VERTICAL

SC10 LONGITUDINAL SECTION



DESIGN GRADELINE
HORIZONTAL GEOMETRY
DATUM 8.4

SC11														
BULK EARTHWORKS SURFACE				20.052	17.863	17.425	17.455	17.328	17.204	16.642	15.707	15.480	14.903	
GRANITE SURFACE - XW (EXTREMELY WEATHERED)	20.334	20.190	20.445	20.086	19.102	18.430	17.918	17.226	16.516	15.843	15.212	14.743	14.189	13.721
GRANITE SURFACE - DW (DISTINCTLY WEATHERED)	18.508	18.865	17.229	16.922	16.248	15.607	14.984	14.312	13.659	13.007	12.164	11.782	11.349	10.835
STRIPPED 150mm SURFACE	21.681	21.496	20.874	20.300	19.690	19.051	18.407	17.772	17.153	16.559	15.921	15.299	14.723	14.187
EXISTING SURFACE	21.831	21.646	21.024	20.450	19.840	19.201	18.557	17.922	17.303	16.709	16.071	15.449	14.873	14.337
CHAINAGES	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	128.611

1 in 500 HORIZONTAL
1 in 100 VERTICAL

SC11 LONGITUDINAL SECTION

LEGEND

FILL FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

CUT FROM STRIPPED SURFACE TO UNDERSIDE OF BULK EARTHWORKS LEVELS

NOTES

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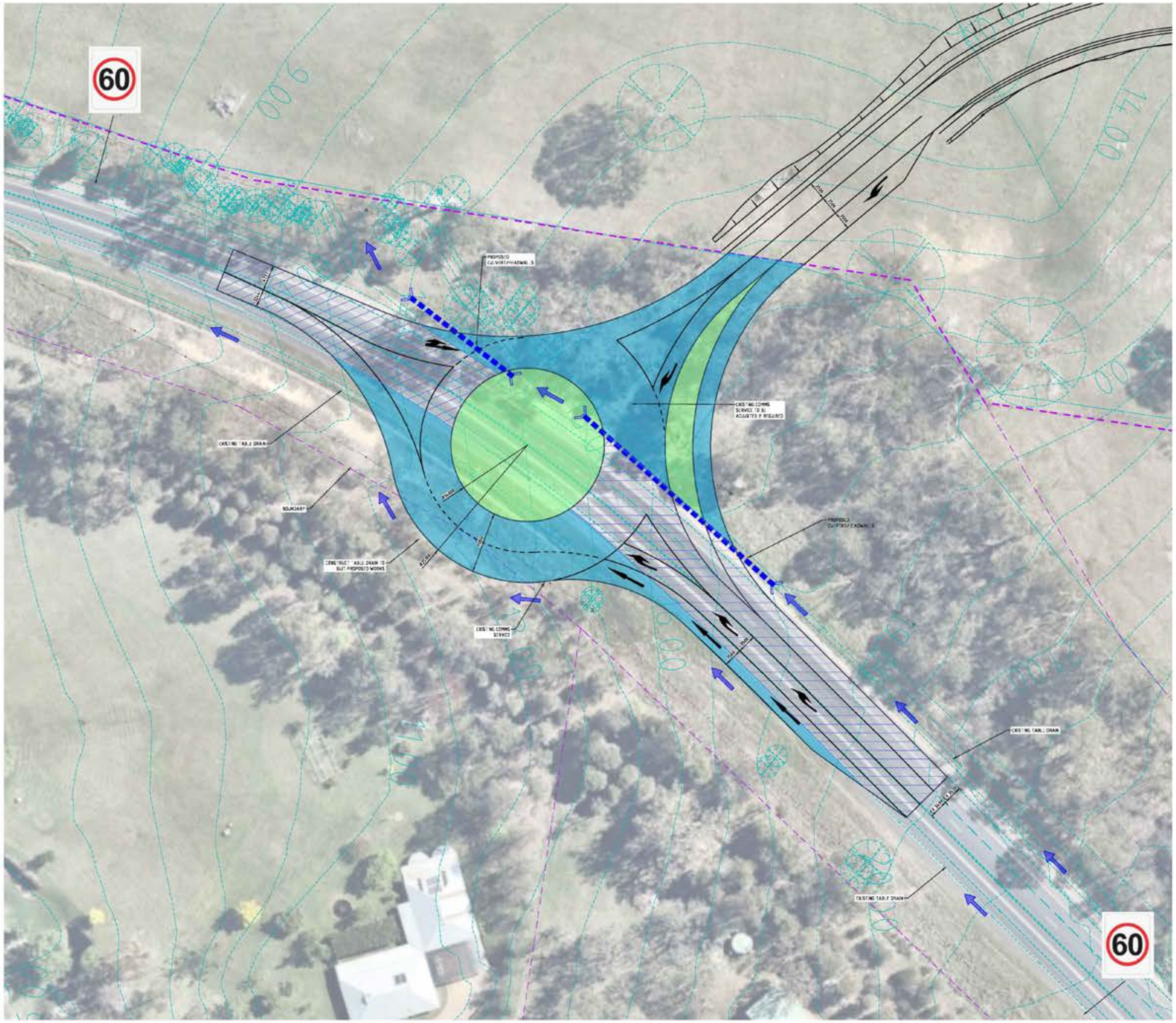
MEINHARDT BONACCI

Project: EUROBODALLA HEALTH SERVICES

PRELIMINARY

Drawing Title: PRELIMINARY CONCEPT BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 2

Scale: AS SHOWN
Date: FEB 2021
Project No: 13086
Drawing No: SK009
Rev: P3



PAVEMENT LEGEND

- PROPOSED ASPHALT PAVEMENT EXTENTS
- EXISTING ASPHALT
- PROPOSED LANDSCAPE EXTENTS

DRAINAGE LEGEND

- STORMWATER DRAINAGE CULVERT
- OVERLAND FLOW

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Date	JUNE 2021
Sheet	A3
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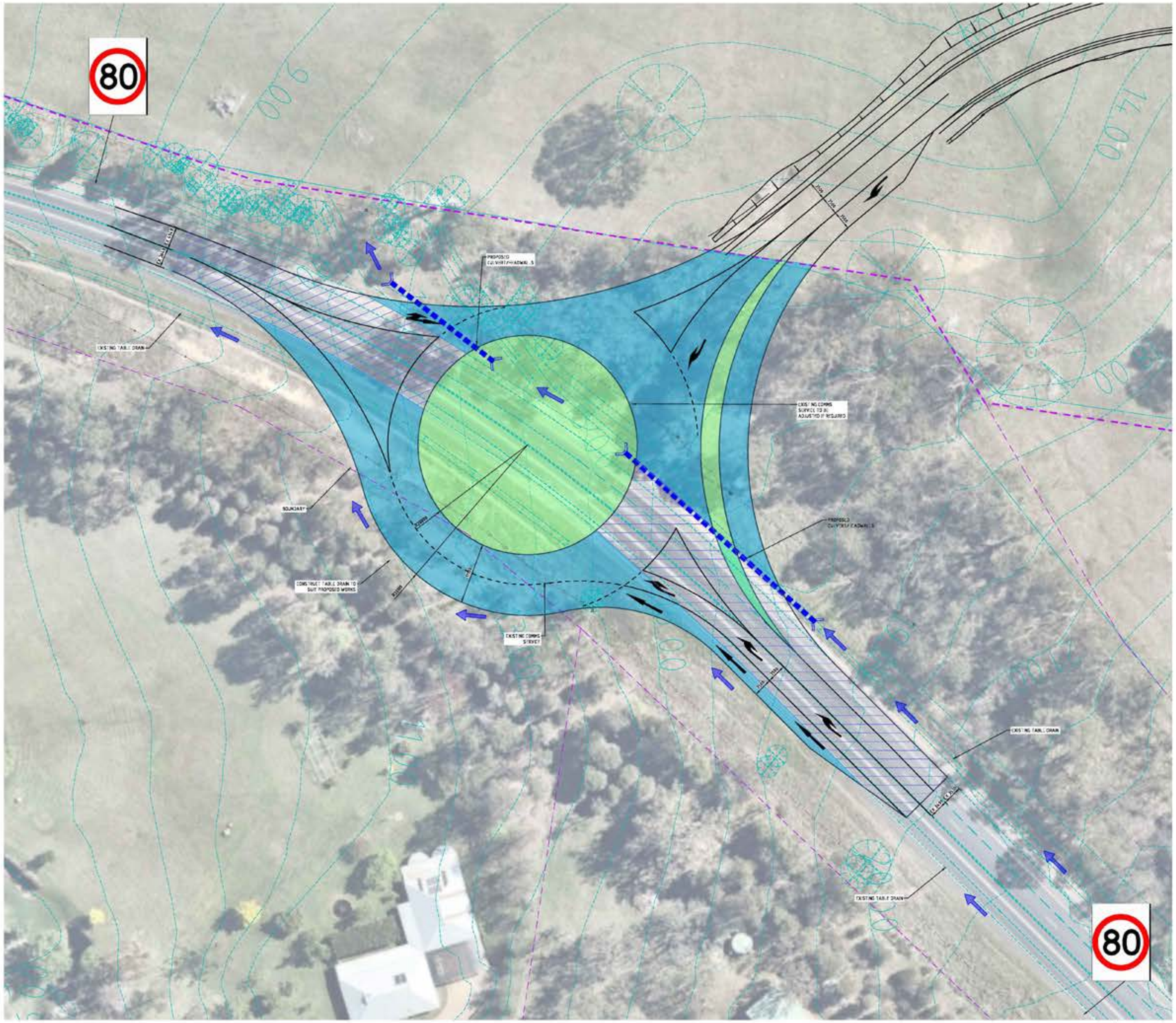
Rev	P2



PAVEMENT LEGEND

PROPOSED ASPHALT PAVEMENT EXTENTS (APPROX 2,480m²)

EXISTING ASPHALT (POSSIBLE RESHEET - APPROX 1,080m²)

PROPOSED LANDSCAPE EXTENTS (APPROX 144m²)

DRAINAGE LEGEND

STORMWATER DRAINAGE CULVERT

OVERLAND FLOW

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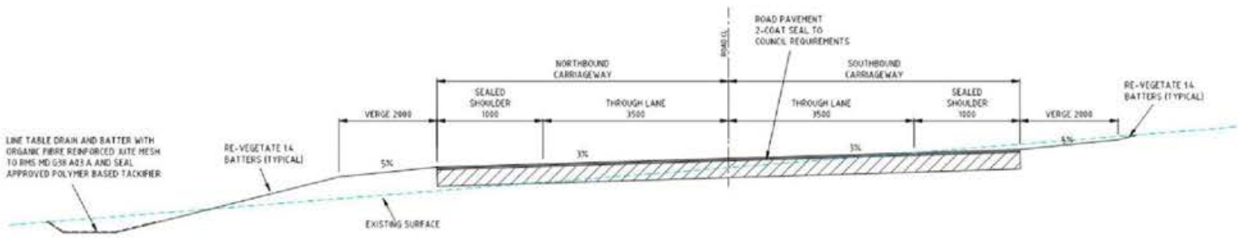
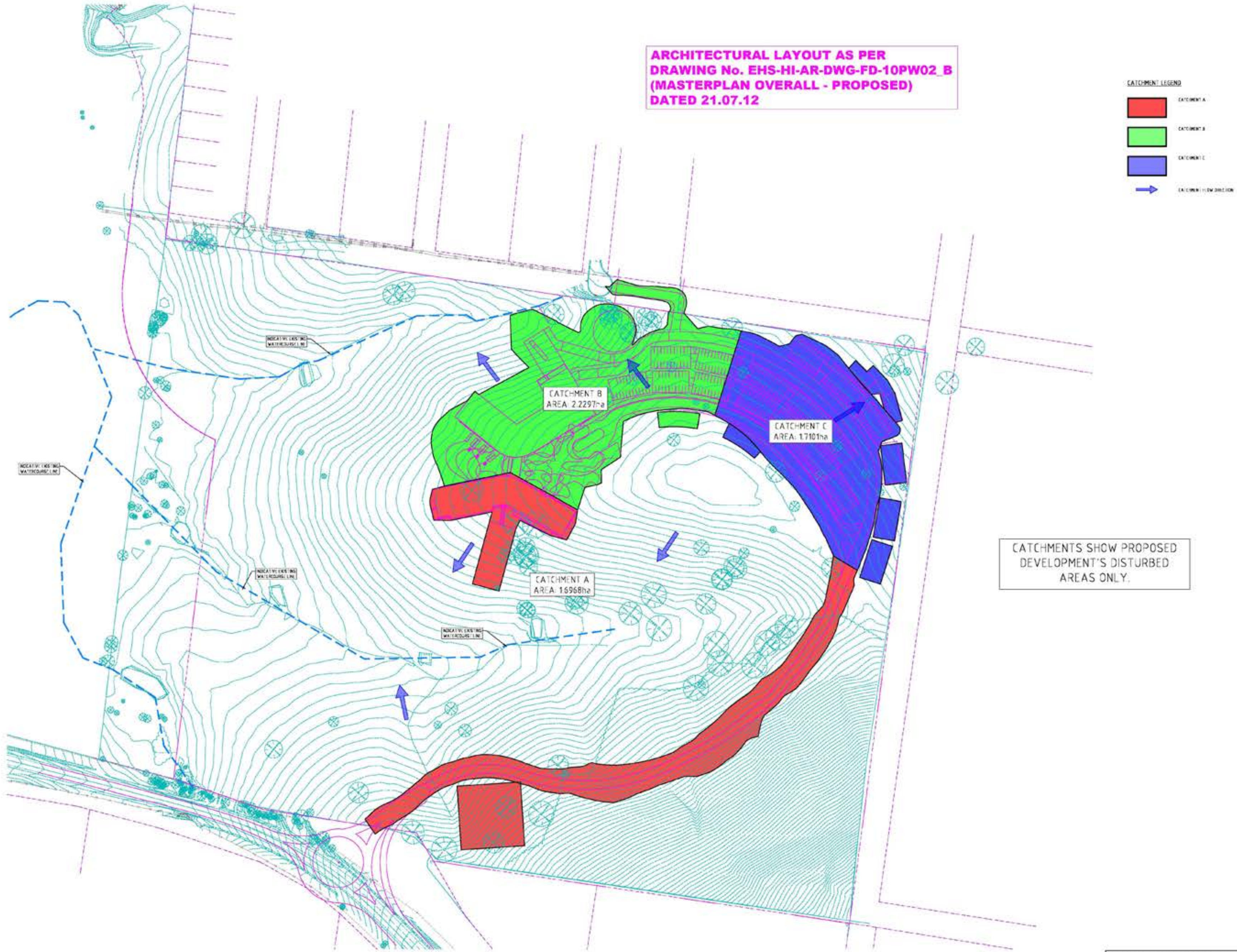


TYPICAL ACCESS ROAD CROSS-SECTION
(FROM PRINCES HIGHWAY)

MEINHARDT BONACCI

Appendix B – Stormwater Drainage Drawings



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NSW Health Infrastructure

MEINHARDT BONACCI

Project Name: EUROBODALLA HEALTH SERVICES

Drawing Title: BULK CATCHMENT PLAN

PRELIMINARY

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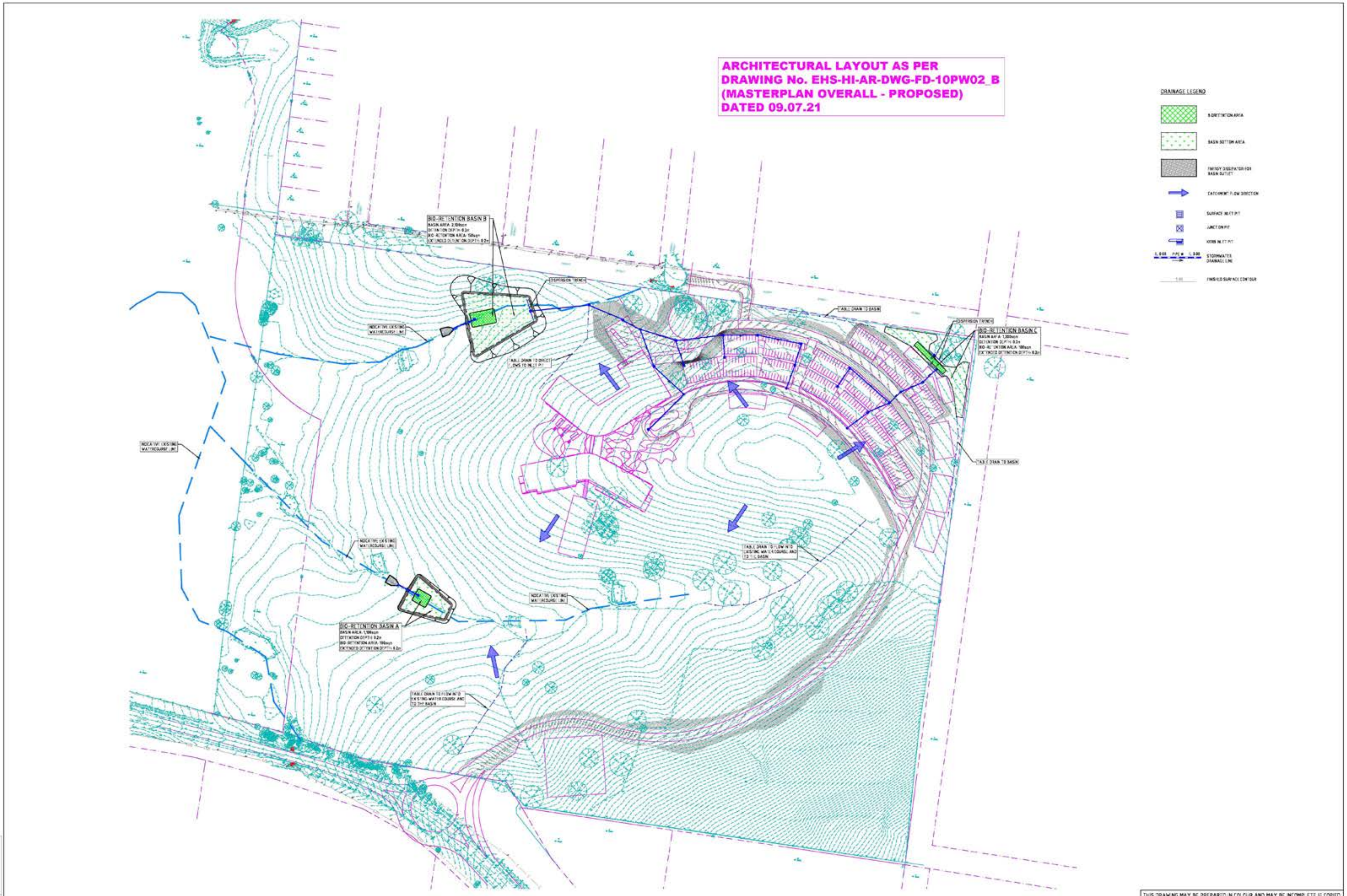
Drawn	AM	Drawing No.	SK011
Scale	1:1000	Rev	P3
Date	JUN 2021		
Sheet	A0		



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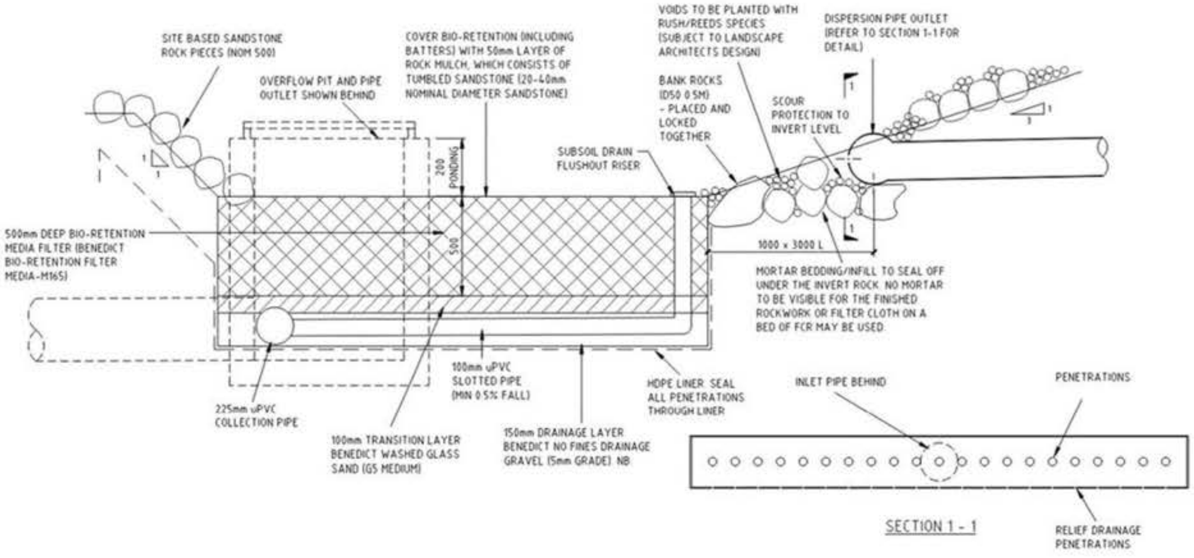
MEINHARDT BONACCI

Project Name: EUROBODALLA HEALTH SERVICES

Drawing Title: CONCEPT STORMWATER DRAINAGE PLAN

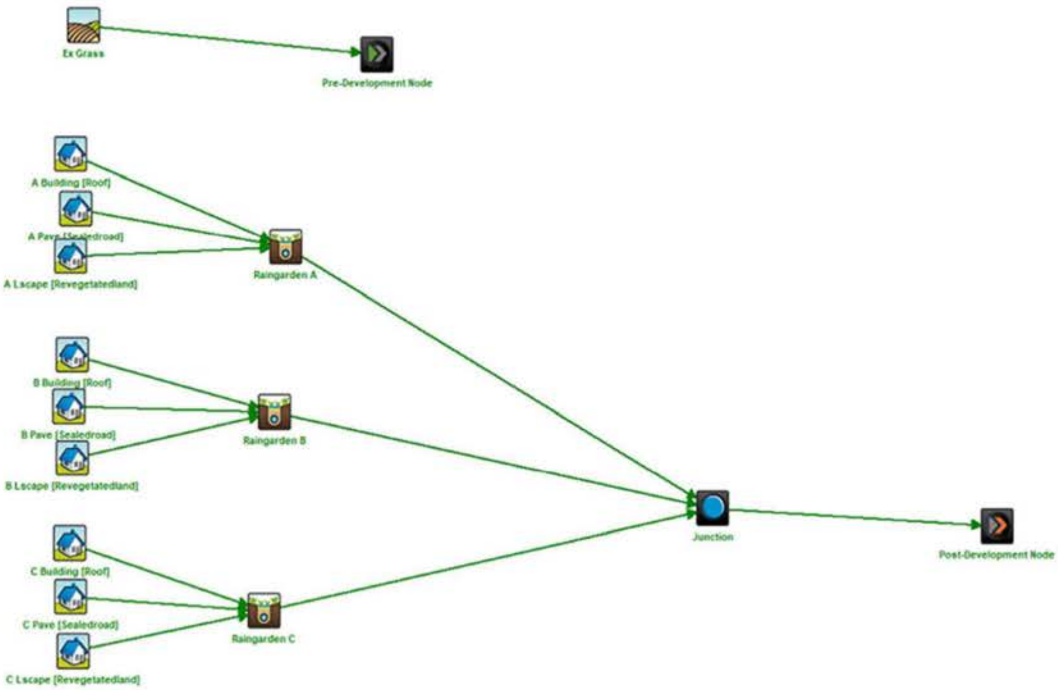
PRELIMINARY

Checked: AM	Date: JUN 2021	Project No. 13086	Drawing No. SK012	Rev P3
Drawn: AM	Scale: 1:1000			



TYPICAL BIO-RETENTION BASIN AND DISPERSION PIPE OUTLET DETAIL

Appendix C – Stormwater Quality Modelling



Treatment Train Effectiveness - Post-Development Node

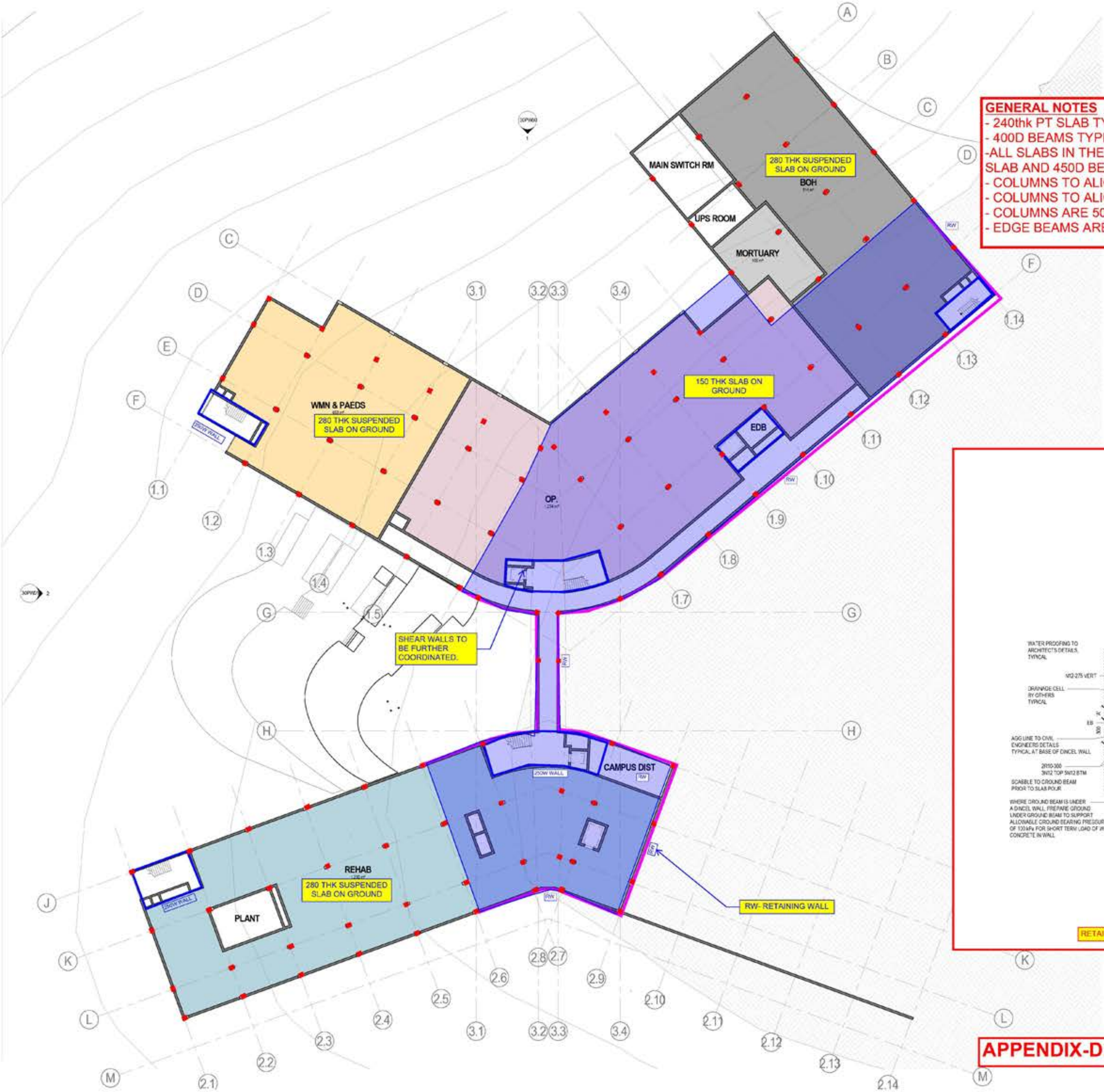
	Sources	Residual Load	% Reduction
Flow (ML/yr)	47.3	45.9	2.9
Total Suspended Solids (kg/yr)	9910	1640	83.4
Total Phosphorus (kg/yr)	18.9	7.9	58.2
Total Nitrogen (kg/yr)	105	55.6	47.2
Gross Pollutants (kg/yr)	1080	0	100

☐ Include Pre-Development

Pollutant	% Target	% Reduction
Total Suspended Solids (TSS)	80.00	83.40
Total Phosphorus (TP)	45.00	58.20
Total Nitrogen (TN)	45.00	47.20
Litter	70.00	100.00

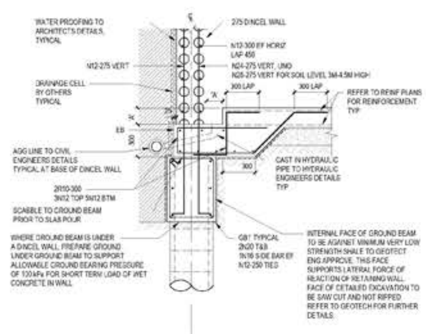
Appendix D – Structural Sketches

Conrad Gargett



GENERAL NOTES

- 240thk PT SLAB TYPICAL, U.N.O
- 400D BEAMS TYPICAL, U.N.O
- ALL SLABS IN THE PLANT OR HIGHER LOADING REGION TO BE 260D SLAB AND 450D BEAM.
- COLUMNS TO ALIGN CONCENTRICALLY TO AVOID TRANSFERS
- COLUMNS TO ALIGN ON GRIDS
- COLUMNS ARE 500*500SQ
- EDGE BEAMS ARE 1100 WIDTH AND INTERNAL BEAMS ARE 2200 WIDTH.



RETAINING WALL DETAILS, TYP

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Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	26.05.21	EA
C	Preliminary Issue	27.05.21	SH
D	Preliminary Issue	09.07.21	SH

Client

NSW Government Health Infrastructure

Project

Eurobodalla Health Service

Drawing

LOWER GROUND FLOOR GENERAL ARRANGEMENT PLAN

A1 Scale 1 : 250

Project 20 157

Issue D

PREL

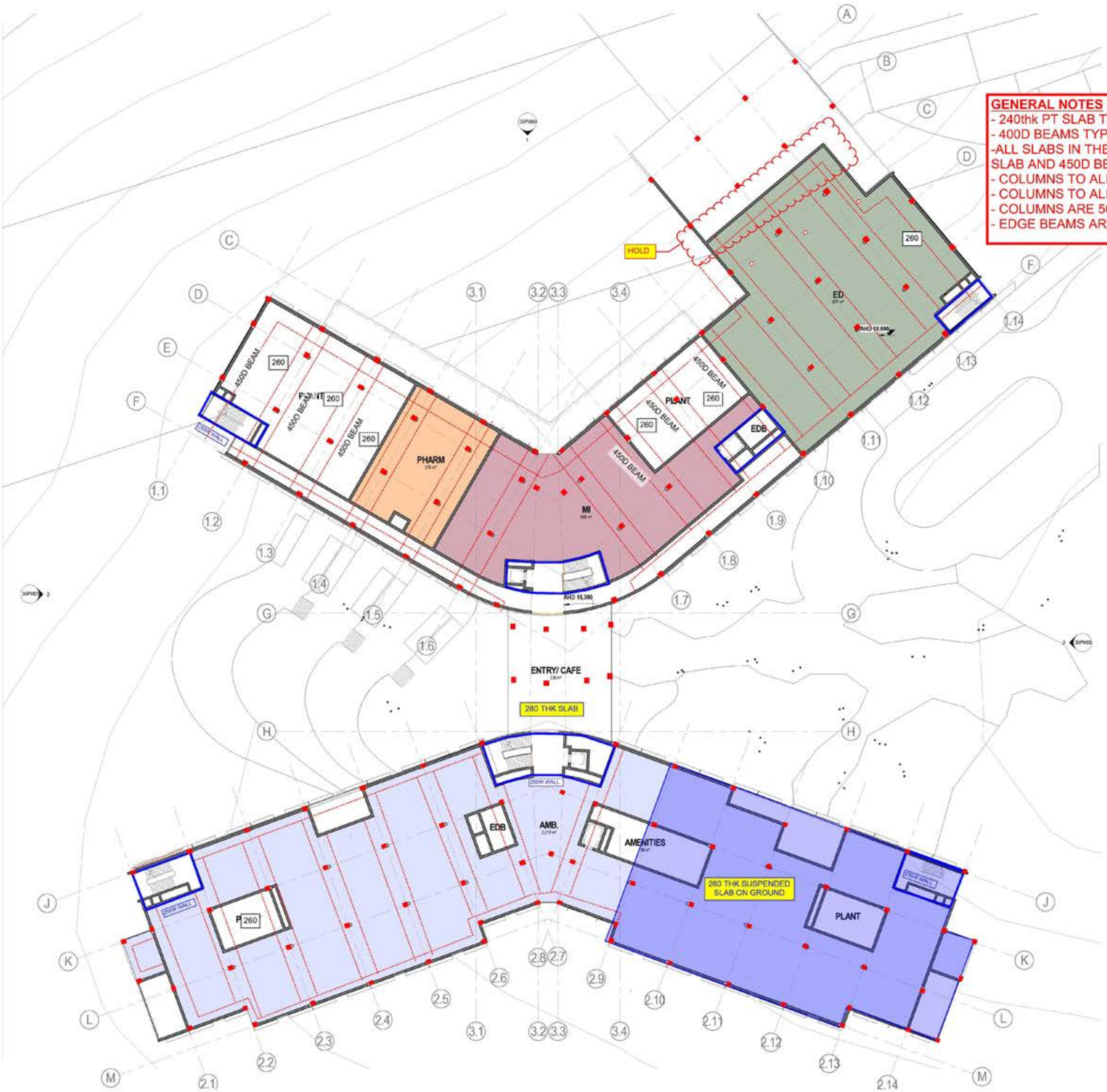
Number

EHS - HI - AR - DWG - FD - 200L00

Details

0mm 40 80mm

APPENDIX-D: STRUCTURAL PRELIMINARY SIZING



Conrad Gargett

GENERAL NOTES
- 240thk PT SLAB TYPICAL, U.N.O
- 400D BEAMS TYPICAL, U.N.O
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- COLUMNS TO ALIGN CONCENTRICALLY TO AVOID TRANSFERS
- COLUMNS TO ALIGN ON GRIDS
- COLUMNS ARE 500*500SQ
- EDGE BEAMS ARE 1100 WIDTH AND INTERNAL BEAMS ARE 2200 WIDTH.

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Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	20.05.21	EA
C	Preliminary Issue	27.05.21	SH
D	Preliminary Issue	09.07.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project
Eurobodalla Health Service

Drawing
GROUND FLOOR GENERAL ARRANGEMENT PLAN

PRELIMINARY

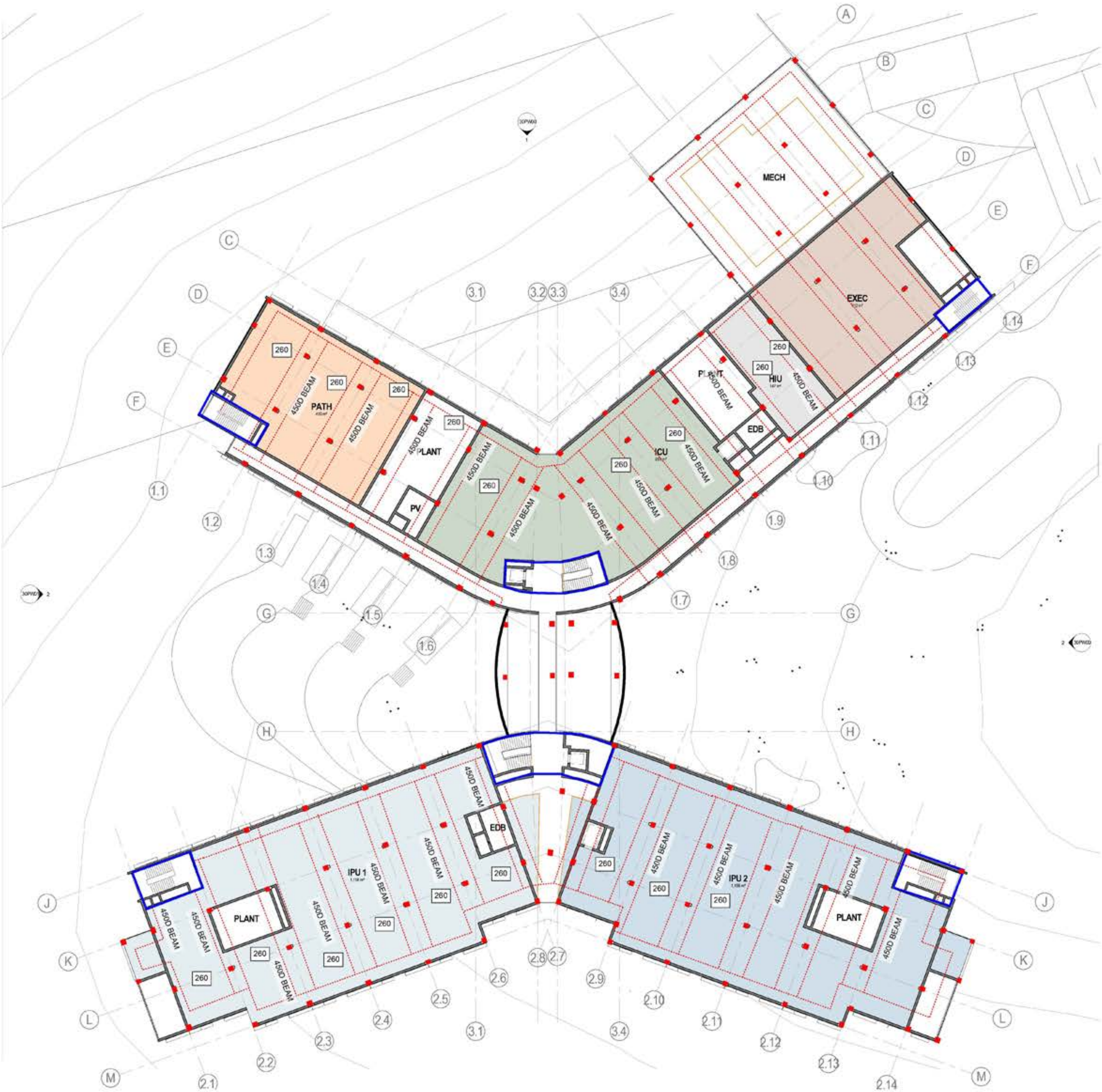
A1 Scale 1 : 250
Project 20 157
Issue D

Number
EHS - HI - AR - DWG - FD - 200000

Details

Do not scale this drawing and verify all dimensions and levels on site.
Nominated Architect : Lawrence Toaldo NSW Reg. 10255

0 mm 40 80 mm



Conrad Gargett

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Revision

REV	DESCRIPTION	DATE	INT
A	Preliminary Issue	19.04.21	SH
B	Preliminary Issue	20.05.21	EA
C	Preliminary Issue	09.07.21	SH

Client

NSW GOVERNMENT Health Infrastructure

Project
Eurobodalla Health Service

Drawing
LEVEL 01
GENERAL ARRANGEMENT PLAN

PRELIMINARY

A1 Scale 1 : 250
Project 20 157
Issue C

Number
EHS - HI - AR - DWG - FD - 200201

Details

0 mm 40 80 mm

11.6 Mechanical and Medical Gases CD Report

Eurobodalla

Health Services Building

Mechanical Services & Medical Gases

Concept Design Report

Prepared for: Health Infrastructure C/ Root Partnerships

Attention: [redacted], Root Partnerships

Date: 27 July 2021

Prepared by: [redacted]

Ref: 301350224

Stantec

Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
Tel: +61 2 8484 7000 Email: sydney@wge.com.au www.wge.com.au

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Stantec

Revision

Revision	Date	Comment	Prepared By	Approved By
1	16/06/2021	Preliminary Issue	JKE	EAG
2	23/06/2021	90% Draft Issue	JKE	EAG
3	27/07/2021	Final Issue	JKE	EAG

Contents

1. Executive Summary

This report aims to identify major project decisions that will affect the services budget and system design.

1.1 Mechanical and Medical Gas Services

The major risk items with respect to site infrastructure include:

- Medical gas and bulk oxygen supply to site.
- Location of the bulk oxygen store and medical gas store.
- Site climatic risks (flood, bushfire etc.)
- Electrification of HVAC services on site
- Future expansion provisions. Both soft expansion of clinical areas and Site expansion.

The major issues with respect to site wide infrastructure detailed in this report include:

- Medical gas early works and delivery requirements
- Access to site
- Staging of works
- Proposed Moruya Bypass works are not confirmed
- Implications of electrification for Heating plant

The major considerations for future planning for mechanical, medical gases and vertical transportation services on the new build in respect to infrastructure are:

- Future building extension of proposed Medical Liquid Oxygen reticulation
- Future building extension of proposed Nitrous Oxide reticulation
- Future building extension of proposed Medical Dry Air reticulation
- Future building extension of proposed Scavenge/Suction reticulation (as required)
- Future building extension of proposed Pneumatic tube system
- Introduction of new lifts
- Proposed Moruya Bypass
- Coordination of final helipad location and approach path with mechanical intakes and exhausts

The following systems are proposed for the HVAC systems:

- Water Cooled Chillers
- Cooling Towers
- Gas fired or electric Boilers for space heating
- Pumps for Heating Hot Water (HHW) and Chilled Water (CHW)
- Pumps for Condenser Water (CW)
- Air side Variable Volume (VAV) boxes
- Dedicated Multi-zone and Single zone Air Handling Units (AHU's)
- Dedicated Fan Coil Units (FCU's)
- Exhaust systems
- Zone Smoke Control Systems
- Stair Pressurisation Systems
- Suction Scavenge System
- Medical tool air system
- Pneumatic Tube system extension

Indiciative plant space has been nominated in the feasibility design stage and will be ongoing/further detailed in schematic design, particularly for locations that allow independent access for maintenance staff to avoid interruption to the ongoing running of the hospital. Plant will be located on either the roof, basement or perimeter areas to allow for future removal/replacement.

Measures to reduce energy costs will include:

- Connection of new plant to BMCS which allows for close monitoring and control of all major pieces of plant
- Utilising a BMCS that is both open sourced and open protocol (Protocol meaning the computer language is universal & Source meaning any independent controls contractor can be used)
- VSD on all major motors and fans
- Selection of chillers with good part load operational efficiency
- Utilising passive design best practice in relation to glazing, facades and the location of plant and non-conditioned spaces
- Other ESD initiatives further developed in SD

2. Introduction

Stantec in conjunction with Root partnerships (RP) and Conrad Gargett (CG), have been commissioned by Health Infrastructure (HI) to prepare a feasibility design for the construction of a new health services campus at Eurobodalla to expand and consolidate the existing health services in the area. The new Health Services Campus is proposed to be built on a "green field" site located approximately 1.5 km from the local centre of Moruya and adjacent the existing NSW Tafe facility (shown below).

The site does not contain any covered roads, with potential public access locations proposed via the nearby Hwy., Albert Street and Braemar Drive. On grade parking is proposed across the site to facilitate both staff and visitors.

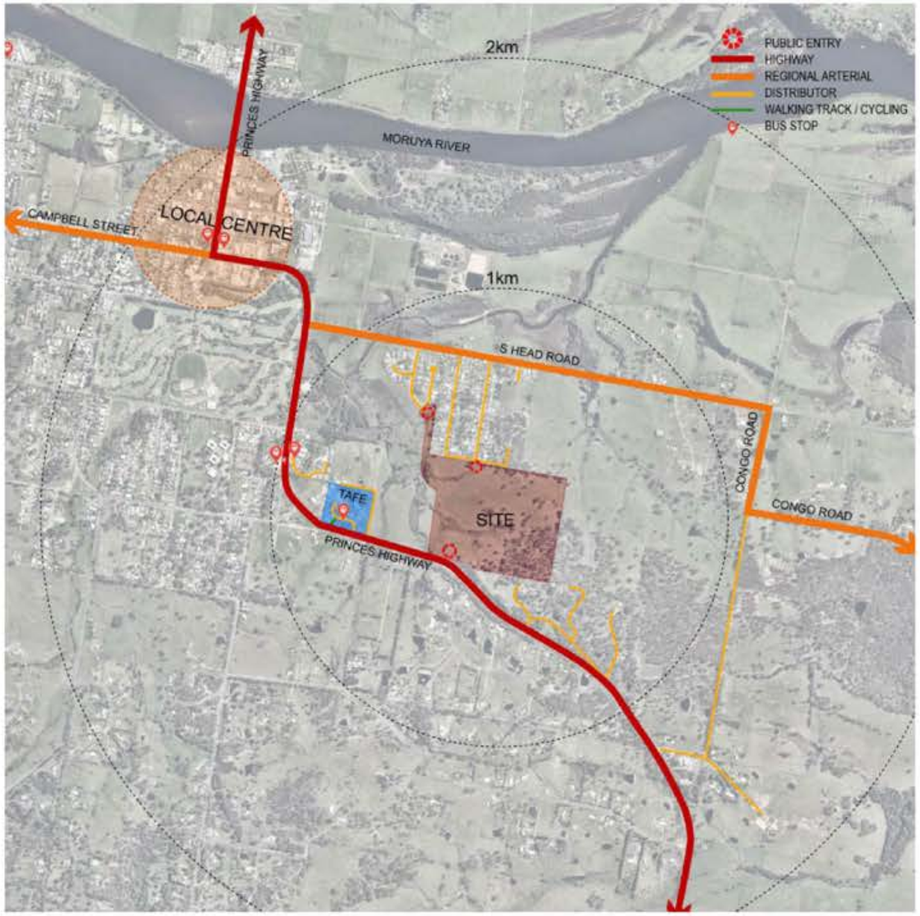


Figure 1 - Eurobodalla Hospital proposed site location - Moruya

The site is intended to be developed to enable the construction of emergency services, counselling services, acute and sub-acute services, operating theatres, palliative care, maternity/neonatal, community health and outpatient services, medical imaging services in order to provide improved health services to the Eurobodalla shire and its diverse community. The following list provides a high-level overview of the mechanical services requirements and scope for each department:

- Emergency Department, including Resus and Triage, is a critical area with a requirement for mechanical services capable of continuously functioning during power outages. This area is to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient and staff.
- Safe assessment rooms including forensic examination and crisis/emergency counselling will be conditioned to comfort levels with a requirement for priority mechanical services capable of functioning during site power outages. Anti-ligature fittings will be utilised to ensure the safety of patients.
- Acute medical wards including HDU/ICU are critical areas with a requirement for priority mechanical services capable of functioning during site power outages. Consideration of isolation rooms and their dedicated filtration and pressure requirements will be given at an early stage. Isolation rooms will be provided priority mechanical services capable of functioning during site power outages. Isolation room exhaust locations will be carefully considered and coordinated with potential helicopter flight path. Assessment of the ICU pandemic pod requirements as per HI design guidance will be conducted early in the design to ensure coordination of additional equipment and ductwork.
- Operating theatres to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient, staff and tools.
- Pre-admission and perioperative spaces are critical areas with a requirement for mechanical services capable of continuously functioning during power outages. These areas are to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient and staff. Anaesthetic waste gas exhaust will be considered in Recovery Stage 1 to provide increased protection to staff.
- Maternity and neonatal services will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of critical conditioning and pressurisation requirements of birthing rooms and neonatal spaces will be given at an early stage.
- Palliative care unit is a critical area with a requirement for priority mechanical services capable of functioning during site power outages. High levels of comfort will be provided by increased temperature control within the space.
- Sub-acute services such as renal, rehabilitation and chemotherapy will be conditioned to comfort levels. Consideration of apheresis areas and their dedicated filtration, pressure and humidity requirements will be given at an early stage.
- Community and outpatient services will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of dental chair suction and medical gas requirements will be given at an early stage.
- Medical Imaging is a critical area with a requirement for mechanical services capable of continuously functioning during power outages. Dedicated chilled water systems would be investigated for the MRI and CT Scan room(s) cooling in line with HI guidelines and recent changes in imaging supplier requirements. Additional systems such as MRI quench pipes and emergency exhaust systems would also be required.
- Mortuary will be conditioned to comfort levels and air balanced to ensure protection of staff. Ventilation and temperature requirements will be considered at an early stage. Cool room condenser locations will require early coordination.
- Air conditioning and ventilation to back of house areas consumer amenities, administration and accommodation.
- Pathology will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of fume cupboard exhaust location will be carefully considered and coordinated with potential Helipad locations.
- Pharmacy will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of fume cupboard exhaust location will be carefully considered and coordinated with potential roof Helipad. Pneumatic tube requirements for future proofing pharmacy transport will be developed with the SNSWLHD. Drug manufacturing space requirements such as aseptic suites will be confirmed early in design.

Additionally, non-medical department scope includes:

- Construction of new staff/public car park.
- Air conditioning and ventilation to back of house areas, parent facilities and consumer amenities.

2.1 General

The intent of this report is to cover the mechanical design options considered as part of the Feasibility Design. Stantec has been engaged by HI to prepare a Feasibility Design for the development of the "greenfield" Eurobodalla Campus, including investigation of the existing site constraints and to reporting on any latent conditions that may affect the cost of the proposed project. These feasibility design proposals have been developed in line with architectural and procedural developments and this report aims to identify key risks, positives and negatives for the proposed design so that buildability, cost, energy consumption and safety in regard to mechanical systems are not overlooked in the planning stage.

The report covers:

- HVAC systems
- Ventilation Systems
- Mechanical Switchboards and BMCS
- Medical Gases
- Suction/Scavenge
- Pneumatic Tube system

The following lists the impact to the proposed development of the feasibility design options on the site.

- Potential climatic risks including flood and bushfire zones
- Medical Gas and bulk oxygen delivery to site
- Location of VIE tank, this may require early works
- Potential electrification of heating services on site

It is envisaged that the new building will be classified as a Class 9a Building with a rise in stories of 2 with a sub level.

2.2 Report Basis

The Mechanical report has been based on the following:

- Design plans produced by Conrad Gargett Architects
- Feasibility Design documentation produced by Conrad Gargett Architects
- Site visits carried out by Stantec
- Meetings held to date
- Draft Bushfire and Ecology Due Diligence Report
- Bushfire protection zone drawings

2.3 ERG and Engineering Workshops

- EHS design team Workshops
- 05.05.21 – meeting to close out Masterplan ERG

2.4 Limitations of the Report

This report is based on site visits carried out by Stantec, contract documentation and information provided by Conrad Gargett architects. Stantec have based our report on the assumption that the information provided can be taken at face value and in general terms accurately reflect the installation on site.

Stantec's site visits involved walks around the site, and overall visual inspections. As such, this report should be read with the limitation of such site visits in mind. Only items visible were considered and any neighbouring boundaries assessed from visual inspection only.

2.5 Items requiring further consideration

The following items will require further consideration and ongoing design:

- Review of the external ambient temperatures recorded at Moruya is required. Recent year peaks have exceeded the AIRAH DA9 design temperatures significantly, raising concern over plant sizing being sufficient for future peak days.
- Location and sizing of plant to suit future expansion areas including site wide and soft expansion of the clinical areas. Stantec have proposed the option to have centralised plant serving the main hospital building. A detailed assessment of the future expansion areas will need to be undertaken to assess feasibility of serving these from the central plant or to provide local HVAC plant to future areas.
- Confirmation of heating strategy on site. The analysis of gas vs electric on site infrastructure will be required to assess the final HVAC configuration and spatial allowances.

3. Existing Site Considerations

3.1 Authority Infrastructure

The site is serviced by potable water and power which will be utilised by the mechanical plant for the provision of HVAC services. The provision of gas to site is to be confirmed.

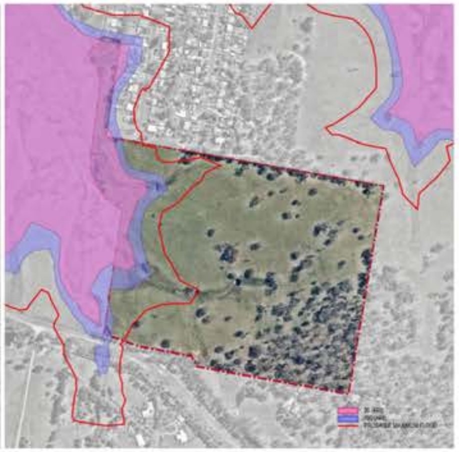
3.2 Climatic Risks

This section details the inherent climatic risks of the site that may impact mechanical systems in the development. The site is located within regional NSW adjacent the Moruya river and surrounded by varying levels of vegetation.

3.2.1 Flood zones

The site has a varying elevation of about +20m in the East to west direction and approx. +14m in the South to North direction, with the lowest point on site to be approximately 2m. The proposed options for the location of the new building and associated infrastructure are currently outside the determined 100-year Average Recurrence Interval (ARI) and the Maximum probable flood plain and therefore any on-site or internal mechanical/med gas services infrastructure will not be at considerable risk.

Site Topography



Site Flood plane

The Installation of external mechanical/med gas systems will require early review to ensure the locations are not affected by the flood plain. While it is not anticipated future works will involve the addition of services within the flood plain this will need to be considered.

3.2.2 Bushfire Assessment

The NSW rural fire service has identified the surrounding TAFE and residential areas as non-bush fire prone areas. Abel Ecology have undertaken a due diligence report to assess the threat of bushfires to the site. From the assessment it is expected that the site will be identified as a bushfire prone area as there is a reasonable amount of vegetation to the South East of the site which may justify a heightened risk of bushfire to the area. Figure 4 below outlines the extent of the bushfire asset protection zone as described in the due diligence report.

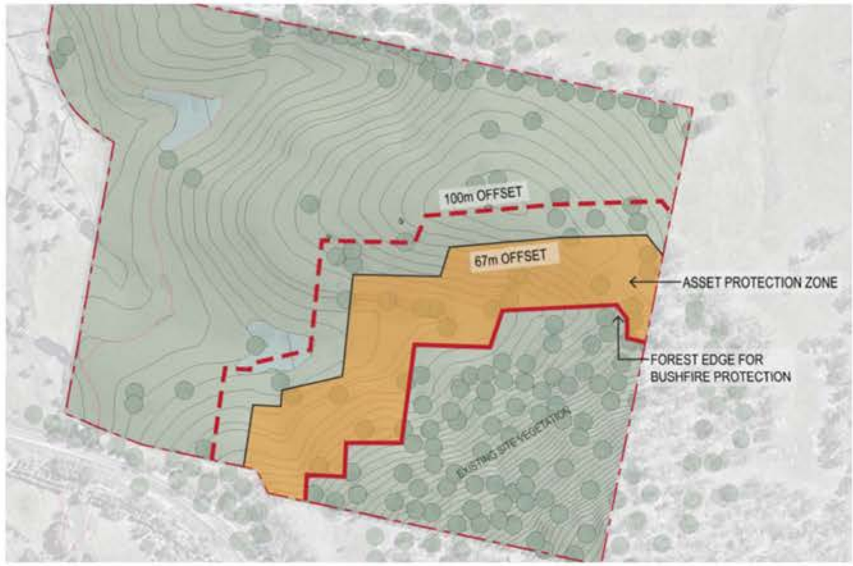


Figure 4 – Bushfire Protection Zone

Stantec understand that any element constructed within the 100m offset from the forest edge shall be constructed as required for a Bushfire Attack Level (BAL) of 12.5. This classification is based on information from the NSW rural fire service and describes the level of bushfire risk as primarily from potential embers during a fire, as outlined below.

Bush Fire Attack Level

BAL	Description of risk
BAL – LOW	Lowest risk from a potential fire.
BAL – 12.5	Risk is primarily from potential embers during a fire.
BAL – 19	Moderate risk, particularly from embers and burning debris.
BAL – 29	High risk, particularly from embers, debris and heat.
BAL – 40	Very high risk. Likely to be impacted by embers, debris, heat and potentially flames.
BAL – FZ	Extreme risk. Directly exposed to the flames of a potential fire front.

NSW RFS Bushfire Attack Level Classifications

Due to the increased risks of bushfire to the site, Stantec have outlined some bushfire smoke infiltration mitigation strategies, shown in ME-MEMO-001 for review and assessment. An formal bushfire assessment will be required at later stages to identify any potential risks associated to the mechanical systems.

3.3 Medical Gases Infrastructure

3.3.1 Existing health services

The current Eurobodalla Health Service is spread over three campuses, with one hospital located in Moruya (approx. 3km away from site), a hospital in Batemans Bay (approx. 25km away from site) and community health service located in Narooma (approx. 35km away from site).

Moruya hospital is currently operating as a 66-bed hospital offering emergency services, inpatient acute medical and general surgery, inpatient rehab and palliative care, maternity, home and renal care. Batemans Bay hospital is currently operating as a 37-bed hospital offering emergency services, inpatient acute medical, inpatient day only surgery, home, inpatient rehab and palliative care.

The hospitals are currently supplied by Coregas for the oxygen and medical gas services. Coregas delivery frequency to the area is 21-days or as needed.

3.3.2 Oxygen Services

Moruya - Main Plant

Moruya Hospital is currently served by one Primary VIE oxygen tank and back up bottles for redundancy. Oxygen is currently delivered on a 21-day frequency.

Batemans Bay – Main Plant

Batemans Bay Hospital is currently served by one Primary VIE oxygen tank and back up bottles for redundancy. Oxygen is currently delivered on a 21-day frequency.

3.3.3 Medical Gas Services

Main Plant

The existing health services in the Eurobodalla region offer the following services regionwide:

- Emergency services
- Inpatient acute medical
- General surgery
- Inpatient day only surgery
- Inpatient rehab
- Palliative care
- Maternity
- Home
- Renal care
- Community health

These are services are divided across all three campuses and in some cases duplicated. Based on the individual requirements of each service it is anticipated that the following gases are required to be supplied to site by Coregas:

- Tool air
- Nitrous Oxide
- Suction/Scavenge
- Medical Air
- CO_2

The list above is currently under review with Coregas. It is anticipated that the new development will require delivery of all or most of the medical gases listed above and stored on site. The required gas usage is under review and increased load to be confirmed with Coregas for delivery to site.

4. Impact of New Building on Existing Site

4.1 Mechanical Services

Stantec anticipate that the mechanical services infrastructure for the new building will affect the existing site and surrounding properties, however this is anticipated to be minor and not adversely impact the existing site. Any issues that are likely to arise from the installation of mechanical services can be mitigated by the inclusion of best practice design standards throughout the design (E.g. Acoustic attenuation and the like). To be further investigated in Schematic Design.

4.2 Exhaust discharge

Various clinical areas proposed within the development require specific exhaust requirements as defined in the NSW HI guidelines. The discharge of these specialised areas may contain contaminants with the potential to have an adverse effect on human health. AS1668.2 details the recommended exhaust system requirements to safely discharge to the atmosphere. The potential to discharge these contaminants into the neighbouring properties is very low.

5. Proposed Infrastructure

5.1 Smoke Hazard Management

While the rise in stories is anticipated to be 2, Stantec understand that the building may have a rise in storeys that is greater than 2 therefore requiring stair pressurisation to fire isolated stairwells. Fire stair arrangement needs to be determined early on to provide spatial allowance.

Relief air will be provided by way of dedicated relief air riser adjoining the fire stair.

Stantec understand that the building will have an effective height not more than 25m and it is a sprinklered building and therefore zone pressurisation is not required. AHUs and FCUs serving the fire affected compartment will shut down on fire trip with the exception of areas serving critical care areas which will run until such time as smoke is detected in the supply air ductwork.

5.2 Building Management & Control System BMCS

It is envisaged that the new development will incorporate DDC units using the BACNet protocol integrated onto a site-wide BMCS. The BMCS will provide facility management control and monitoring of all new major mechanical plant as well as lighting, and major hydraulics plant.

The BMCS will be implemented in such a way as to achieve:

- Integration with a future site wide system
- Optimisation of plant scheduling
- Electrical load shedding
- Data logging of plant run hours
- Data gathering to optimise the building energy performance and building tuning
- Prioritised fault alarms
- Lighting and movement detection
- Security

Studies have shown that building tuning is one of the most effective ways of reducing energy use. Hospitals are traditionally very high users of energy and a robust BMCS system that will allow ongoing building tuning is of paramount importance.

5.3 Medical Gases Scope

Medical gases will be provided in line with requirements of HI Engineering Guidelines and room data sheets.

It is anticipated that as part of schematic design, and once final usage demands are calculated, the local connection points for the relevant gases can be incorporated into the design.

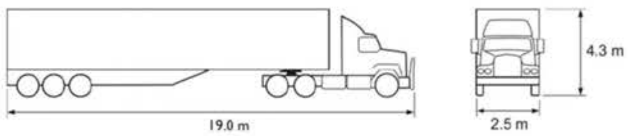
5.3.1 Oxygen Services

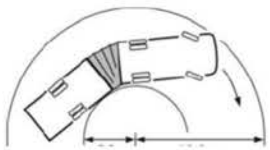
Main Plant

Following preliminary discussions with Coregas regarding present oxygen delivery rates to the existing hospital campuses and the proposed bedding plan, Stantec believe that a 10,000L VIE tank with 12 pack back-up bottles will be required. This assessment is subject to final hospital bed numbers and detailed review. Remote fill points are not recommended due to additional safety concerns. An emergency fill line, located within the depot, can also be utilised to maintain oxygen supply, where required.

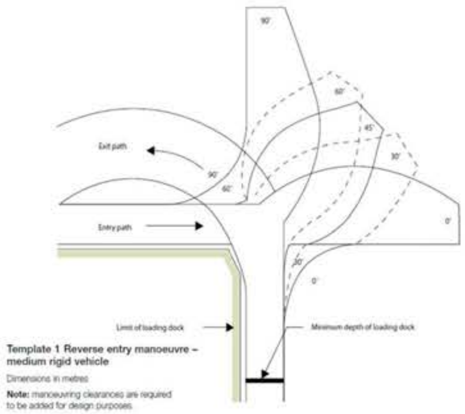
The VIE tank and medical gas compound details will be required at an early stage of works to ensure adequate spatial allocation and structural design. ME_MEMO_002 outlines a proposed preliminary medical gas compound arrangement with indicative spatial allowances, based on advice obtained to the date of this document. Additionally, ME_MEMO_002 outlines the preferred truck access and locations of the compound on site.

The new vessel will need to be installed in a location with appropriate access by the delivery truck to an appropriate fill point. The spatial requirements for the turning circle of the medical gas delivery truck (19m) are detailed below and in ME_MEMO_002 appendices. Note, heavy vehicle turning pathway does vary on the length of the trailer and the axle configuration, however, the general rule is for a full-length trailer is that the area required is 15 meters and for the smaller trailer around 9 meters.





The general rule is for Rigid trucks is that they are able to conduct a three-point turn to manoeuvre in tight places. A one-point turn takes 15 meters, a three-point turn can reduce the turning circle to within the length of the vehicle.



A solution to avoid delivery truck turning circles is for the oxygen delivery truck to pass through the compound when refilling the vessel and exit through the secondary access. Truck access will be reviewed at the schematic design stage.

Early discussion between Stantec and the traffic consultants has indicated that the preferred method of entry and exit onto site is via the highway only. This delivery method is outlined in ME_MEMO_002 and will require the use of a turning bay to manoeuvre the truck on site. A traffic study will be required to finalise the truck delivery requirements on site.

Site Reticulation

In order to serve the development, Stantec propose extending an oxygen ring main within the new building. The proximity of the oxygen store to the building will be investigated in terms of cost, future expansion (site wide and soft expansion) and ease of maintenance. This solution allows for flexibility of future works, which can be conducted in segments by isolating parts of the ring main without losing oxygen supply to remainder of the building/s. Furthermore, the future extension of the ring main, if required, can be conducted with limited disruption to any existing site operation. Following final oxygen consumption estimation of the building, an assessment into future ring main pipe size capacity will be undertaken. We expect this assessment to occur at schematic design.

5.3.2 Nitrous Oxide Services

Main Plant

The nitrous oxide supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at the SD stage.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

5.3.3 Tool Air

Main Plant

The tool air supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at the SD stage.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

5.3.4 Medical Air

Main Plant

Medical air compressor capacity and location will be reviewed in detail during schematic design. Investigation will include review of redundancy via manpacks.

Site Reticulation

In order to serve the development, Stantec propose extending a medical air ring main within the new building. This solution will offer the building with medical air supply into the building, consistent with the oxygen supply site arrangement. Works can be conducted in segments by isolating parts of the ring main without losing supply to remainder of buildings. Furthermore, the future extension of ring main, if required, can be conducted with limited disruption to any existing site operation. Following final consumption estimation of the building, an assessment into future ring main pipe size capacity will be undertaken. We expect this assessment to occur at schematic design.

5.3.5 Carbon Dioxide

Main Plant

The carbon dioxide supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at the SD stage.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

5.3.6 Suction Scavenge

Main Plant

Stantec propose to utilise a vacuum pump system to serve the site. Medical air compressor capacity and location will be reviewed in detail during schematic design

Site Reticulation

Site reticulation shall be as per Medical Air supply.

5.4 HVAC Scope

5.4.1 Design Criteria

The design criteria for the Mechanical services are as outlined in Health Infrastructure Engineering Guidelines - August 2016 as follows:

External Conditions (Comfort)

Review of the external ambient temperatures recorded at Moruya (BCA climate zone 6) is required. Recent year peaks have exceeded the AIRAH DA9 design temperatures significantly, raising concern over plant sizing being sufficient for future peak days. To be further investigated during SD.

Summer : 26.7ºC Dry Bulb

: 22.5ºC Wet Bulb

Winter : 3.2ºC Dry Bulb

External Conditions (Critical)

Summer : 32.5ºC Dry Bulb

: 23.4ºC Wet Bulb

Winter : 3.2ºC Dry Bulb (Only comfort data available for heating)

Internal Conditions

SERVICES REQUIREMENTS FOR AREAS AFFECTING PATIENT CARE HOSPITALS AND OUTPATIENT FACILITIES		
Area Designation	**Relative Humidity (%)**	**Design Temp (Degrees C)**
Surgery & Critical Care		
Operating Theatre	35-60	16-27
Birthing Room or Delivery Suite	35-60	20-23
Setup Room and Sterile Store	35-60	20-23
Recovery Room	35-60	21
Intensive Care	35-60	21-24
Neonatal Intensive Care	35-60	22-26
Burns	35-95	21-32
Treatment Room		24
Resuscitation Room	45-60	21-24
Anaesthesia Gas Storage		
Endoscopy Room	35-60	20-23
Bronchoscopy, Sputum Induction and & Pentamidine	35-60	20-23
Emergency Department and medical Imaging Waiting Room	35-60	20-23
Emergency unit Triage	35-60	20-23
Nursing		
Patient Room		21-24
Toilet Room/En-suite		
Newborn Nursery Suite		24
Protective Environment Room		24
Class n Isolation Room		24
Isolation Alcove or Anteroom		
Patient Corridor		
Diagnostic and Treatment		
Consult Room		24
Medication Room		
Treatment Room		24
Physiotherapy & Hydrotherapy		24
Disposal Room		
Clean Workroom or Clean Holding		
Haemodialysis		20-25
Ancillary Radiology		
Radiology (Surgical/Critical Care & Catheterisation)	30-60	21-27
Radiology (Diagnostic & Treatment)		21-24
Darkroom		
Laboratory		
General		24
Biochemistry		24
Cytology		24
Glass washing		
Histology		24
Microbiology		24
Nuclear medicine		24
Pathology		24
Serology		24
Sterilising		24
Autopsy room		
Non refrigerated body holding room		21
Pharmacy		
Sterilising and Supply		
Sterilising Room		24
Sterilising Equipment Room		
Central Medical & Surgical Supply		
Disposal Room		20-23
Clean Workroom	30-60	
Sterile Storage	Max 70	
Service		
Food Preparation		
Dish/Pot Washing		
Dietary Day Storage		
Laundry General		
Soiled Linen (Sorting and Storage)		
Clean Linen Storage		

Other Areas and areas not specifically referenced above:

Cooling : 23ºC Dry Bulb

: 40 - 60% relative humidity anticipated by virtue of cooling coil performance.

Heating : 20ºC Dry Bulb

Control Tolerance: Plus or minus 1.0ºC at the point of control for heating and cooling.

Population

Generally : As per Room Data Sheets

Office Areas : One person per 10 m²

Lobby Areas : One person per 5 m²

Ventilation

SERVICES REQUIREMENTS FOR AREAS AFFECTING PATIENT CARE HOSPITALS AND OUTPATIENT FACILITIES						
Area Designation	Air Pressure Relationship To Adjacent Area	Minimum Air Changes Of Outdoor Air Per Hour	Minimum Total Air Changes/Hour	All Air Exhausted Directly To Outdoors	Filtration Efficiency	Re-Circulated By Means Of Room Units
Surgery and Critical Care						
Operating Theatre	Positive	AS 1668.2 (3)	20	50%	G4-F8 HEPA (1)	No
Birthing Room or Delivery Suite	Negative	5	20		G4-F9	No
Setup Room and Sterile Store	Positive	AS 1668.2 (4)	15		G4-F8 HEPA	No
Recovery Room	Positive	AS 1668.2 (5)	10		G4-F8	No
Intensive Care	Positive	2	6		G4-F8	No
Neonatal Intensive Care	Positive	2	6		G4-F8	No
Burns	Positive	3	10		G4-F8	No
Treatment Room	Positive	2	6		G4-F8	
Resuscitation Room	Positive	3	15		G4-F8	No
Anaesthesia Gas Storage	Negative	2	8	Yes	G4-F8	No
Endoscopy Room	Negative	2	6		G4-F8	No
Bronchoscopy, Sputum Induction and & Pentamidine	Negative	3	12	Yes	G4-F8	No
Emergency Department and Medical Imaging Waiting Room	Negative	2	12	Yes	G4-F8	No
Emergency Unit Triage	Negative	2	12	Yes	G4-F8	No
Nursing						
Patient Room	Positive	2	6		G4-F8	
Toilet Room/En-Suite	Negative	2	10		G4-F8	
Newborn Nursery Suite	Positive	2	6		G4-F8	
Protective Environment Room	Positive	AS 1668.2 (4)	12		G4-F8 HEPA	
Class N Isolation Room	Negative	AS 1668.2 (4)	12	Yes	G4-F8	No
Isolation Alcove Or Anteroom	Neg or Pos	AS 1668.2 (4)	12		G4-F8	No
Patient Corridor		2	6		G4-F8	
Diagnostic and Treatment						
Consult Room		2	6		G4-F8	
Medication Room		2	6		G4-F8	
Treatment Room		2	6		G4-F8	
Physiotherapy & Hydrotherapy	NEGATIVE	2	6		G4-F8	
Disposal Room	NEGATIVE	2	10	Yes	F4	No
Clean Workroom Or Clean Holding		2	6		G4-F8	
Haemodialysis		2	6		G4-F8	No
Ancillary Radiology						
Radiology (Surgical/Critical Care & Catheterisation)	POSITIVE	3	15		G4-F9	No
Radiology (Diagnostic & Treatment)		2	6		G4-F8	
Darkroom	NEGATIVE	3	10	Yes	F7	No
Laboratory						
General		2	6		F7	
Biochemistry	Positive	2	6	Yes	F7	No
Cytology	Negative	2	6	Yes	F7	No
Glass Washing	Negative	2	10	Yes	F7	No
Histology	Negative	22	6	Yes	F7	No
Microbiology	Negative	2	6	Yes	F7	No
Nuclear Medicine	Negative	2	66	Yes	F7	No
Pathology	Negative	2	6	Yes	F7	No
Serology		2	6		F7	No
Sterilising	Negative	2	10	Yes	F7	No
Autopsy Room	Negative	AS 1668	12	Yes	F7	No
Non-Refrigerated Body Holding Room	Negative	3	10	Yes	F7	No
Pharmacy		2	6		G4-F8	

Note:
Where a positive or negative pressure is specified a minimum of 5 Pascals difference to the adjacent zones is required.

Lighting & Equipment

Heat Gain From Equipment		
Department	**Lighting W/m²**	**Power W/m²**
Medical Surgical Wards	12	5
Orthopaedic	12	5
Paediatric	12	5
On-Call Accommodation	12	5
Rehabilitation	12	5
Allied Health	12	5
Psychiatric	12	5
Oncology	12	5
Bio-Medical Engineering	12	10
Medical Imaging – an assessment is also required of point loads that may be generated by specialist medical imaging equipment. These loads can be high and need supplementary cooling.	12	10
Emergency	15	10
Medical Records	12	5
Pharmacy	12	10
Nuclear Medicine	12	10
Pathology	15	10
Blood Donor Unit	12	5
Medical Library	12	5
Day Procedures	12	10
Operating Suite	35	40
Intensive Care Unit	15	10
Coronary Care Unit	15	10
Mortuary	10	5
Linen Handling	10	5
Regional Store	8	2
Engineering & Maintenance	8	5
Kitchen	10	-
Staff Cafeteria	12	10
Education	8	5
Main Entrance & Foyer	8	5
Admission/Discharge	12	15
General Administration	12	15
Staff Amenities	8	-

5.4.2 Exhaust Design

Exhaust systems that have similar effluents can be combined into a common system as and considered as a value engineering option. These system groupings are detailed below, all systems not listed are to be provided exhaust as per HI guidelines.

Exhaust group 1:

- Toilet exhaust
- Cleaners exhaust
- Dirty utility exhaust

Exhaust group 2:

- Storage exhaust
- Waiting room exhaust

Exhaust group 3:

- Disposal
- Garbage Rooms

Exhaust group 4:

- Recovery anaesthetic exhaust
- Anaesthetic induction room exhaust
- Anaesthetic store room exhaust

5.4.3 Chilled and Heating Water Plant

A preliminary selection of chilled and heating water plant has been investigated to assist in electrification of site studies at this stage. Provisionally, the intent is to serve the development with water cooled chillers complete with cooling towers. Condensing boilers or electric air sourced heat pumps will provide the heating hot water, pending confirmation of strategies outlined in ME-MEMO-03. The boilers will be gas-fired provided LPG is provided on site, otherwise electric type boilers will be considered as an alternative solution. Estimated sizing and system arrangement has been provided as a provision, however further development and detailing of plant will be undertaken at schematic design stage.

5.4.4 List of areas to be served by HEPA filters

- CSSD Clean/Packaging room
- CSSD Sterile/Store room
- Sterile Stock Stores
- Operating Theatres
- Procedure rooms

5.4.5 Energy Saving Initiatives

The BCA requires that any air-conditioning system greater than 2000 l/s must have an outdoor air economy cycle. Stantec propose to also provide an outdoor air economy cycle to all air-handling units. This will allow for more economical energy use when outside air conditions are sufficiently cool, and hence reduce annual operating costs due to lower electrical energy consumption.

5.4.6 Proposed Generator Backup to Mechanical Systems

It is proposed that the several items of plant be powered from the generators in the event of power failure. This back up power is intended to not only serve life safety systems but also to power areas that always require air pressure regimes to be maintained. It is also intended to provide these important areas with air-conditioning at this stage. A summary of these areas is listed below:

- All Comms Rooms & UPS room
- Operating Theatres & Emergency Department
- Sterile Stock Stores
- Recovery, ICU and CCU wards
- Medical Imaging Department
- Isolation Rooms
- Fume Cupboards
- The items of plant that are required to condition these areas are generally as follows:
    - AHUs and return air fans serving the corresponding areas.
    - FCUs serving the respective areas
    - Exhaust and Outside air fans serving the respective areas
    - Chillers, Cooling Towers, Boilers, Pumps as required

5.4.7 Pandemic area considerations

At this stage it is suggested that the consideration of several items of plant be powered from the generators in the event of power failure to allow pandemic ward capabilities. This back up power is intended to not only serve life safety systems but also to power areas that always require air pressure regimes. To be further investigated in the schematic design stage.

5.4.8 Legislative Design Requirements.

The building is designed to comply with the Building Code of Australia 2019, and all other relevant statutory requirements including Australian Standards:

AS 1228 (2006) Pressure Equipment Boilers

AS 1324.1 (2001)

AS1668.1 (2012), AS 1668.2 (2014), AS 1668.3 (2012) and AS 1668.4 (2012)

AS/NZS 1677 (2002)

AS 1940 (2006) The storage and handling of flammable and combustible liquids

AS 2107 (2000)

AS 2243.3, AS 2243.6, AS 2243.8, AS 2243.9 Safety in Laboratories

AS 2252-5

AS 2896 (2021) Medical Gas Systems

AS 2982.1 (2010) Laboratory Design and construction

AS/NZS 3000 (2009)

AS/NZS 3666 Part 1 (2011)

AS/NZS 3666 Part 2 (2011)

AS/NZS 3666 Part 3 (2011)

AS3892 (2001) Pressure Equipment installation

AS 1940 (2006)

AS 4187 (2014)

AS 4254 (2002)

AS 4260 (1997) HEPA Filters- Classification, Construction and Performance

AS 4273

AS 4332 (2005)

AS 4326 (2008)

AS 4426 (1997) Thermal insulation of Pipework, ductworks and equipment selection, installation and finish

AS/NZS 5601 (2013)

ISO 14644

NSW HI Engineering Guidelines 2016

5.4.10 New Building Mechanical Scope

HVAC Item	Description
Cooling Infrastructure	The Cooling Plant capacity and arrangement will be further developed during the schematic design stage.
Heating Hot water plant	The Heating Plant capacity and arrangement will be further developed during the schematic design stage and following direction from ME-MEMO-03.
Air Handling	All areas will be supplied via multi zoned air handling units, complete with Variable Air Volume Boxes (VAVs) modulating the required supply air rate to respective rooms Isolation rooms will have dedicated FCU's or dedicated AHU systems, pressurization and outdoor air as required by 1668.2 and NSW HI guidelines. Operating theatres, and all areas that prohibit recirculation will have dedicated AHUs. An outdoor air economy cycle will be provided to all AHUs in accordance with BCA requirements. Ductwork traversing fire and smoke walls has been avoided to minimize capital costs of fire and smoke dampers and recurrent costs of maintenance inspections.
Ventilation	Exhaust Ventilation will be provided to: Toilets, Disposal Rooms, Clean Utilities, Dirty Utilities, Isolation Rooms, Cleaners Store, Plant rooms, Photocopy rooms, Fire control rooms, Areas using aesthetic gas, Fume cupboards, Clinical Engineering, Plaster rooms, Ancillary areas requiring exhaust Ductwork traversing fire and smoke walls has been avoided to minimize capital costs of fire and smoke dampers and recurrent costs of maintenance inspections.
Smoke Management	In Fire mode all automatic Stair pressurization systems and their respective relief air systems will operate. Stair pressurization is provided by a dedicated fan per stair drawing air into a dedicated stair pressurization riser. The stair pressurization riser has openings into the stairwell on every second level to allow the pressurization of the stair. Relief of stair pressurization will be provided by dedicated relief air systems complete with fans mounted on the roof exhausting vertically, drawing air from the fire effected floor via a dedicated riser. Mechanical ventilation and air-conditioning equipment serving areas with critical pressure regimes or critical cooling will continue to operate until smoke is sensed in the ductwork or in the room. All other mechanical ventilation and air-conditioning equipment not required to operate in fire mode will shut down.
Building Management and Control System BMCS	Monitor and control all mechanical plant Time clock functions for lighting On / Off Fault monitoring of hydraulic plant/ pumps etc. After hours A/C control Low level interface with security and fire system. Data logging of plant run hours Data gathering to optimise the building energy performance and building tuning Refrigeration leak detection
Restricted Ceiling Voids	Risers, bulkheads will be detailed following confirmation of final FFL's and plant space layout.

5.4.11 Medical Gases Scope

Item	Description
Oxygen VIE	A new VIE tank and storage compound will be provided to serve the new site. Sizing will be further investigated as part of the schematic design stage. Provide reticulation to new building/s and terminal points as required.
Medical Air	New dedicated medical air compressors will be provided to serve the new building and will be investigated as part of the schematic design stage.
Scavenge/Suction	Install dedicated suction pumps and reticulate as required
Nitrous	Nitrous manpacks will be provided within a centralised gas bottle storage compound to serve the new building. Sizing and consumption will be investigated as part of the schematic design stage. Nitrous bottles will be stored in dedicated location and reticulated as required.
Medical gas pipework reticulation	Med gas pipework to be installed to reticulate gases from plant to new MSPs

5.4.12 Pneumatic Tube Scope

Item	Description
End Stations	Install new end stations to suit new building layout.
Pneumatic Tube	Install pneumatic tube between end stations and diverters, to reticulate back to the pneumatic tube head end.
Diverters	Install diverters as required to connect multiple end stations back to the head end.
Turbine/head end	Install new head end as required to serve site.

6. Memorandum Items

6.1 ME_MEMO_001A – Bushfire Smoke Infiltration Mitigation

6.2 ME_MEMO_002A – Medical Gas Considerations

6.3 ME_MEMO_003B – Electrification Feasibility Plan

7. APPENDIX

Stantec

ME-MEMO-001_A

Enquiries: [redacted]
Project No: 301350224

To: [redacted]

From: [redacted]

Date: 17/03/21

Subject: Bushfire Smoke Infiltration Mitigation

Summary: *The purpose of this memo is to outline the bushfire protection options for the Eurobodalla development.*

1. Introduction

Abel Ecology have undertaken a due diligence report to assess the threat of bushfires to the site. From the assessment it is expected that the site will be identified as a bushfire prone area as there is a reasonable amount of vegetation to the South East of the site which may justify a heightened risk of bushfire to the area.

The increasingly prolonged and intense bushfire seasons have raised into question the protections provided for Hospital outside air intakes. In 2019, AQI levels reached the hazardous category (with an AQI greater than 200) on a total of 115 days. This is highlighted by Figure 1 below demonstrating the impacts that hazard reduction burns and bushfires have to the NSW region AQI. While there's no safe level of air pollution, bushfire smoke is particularly hazardous because of the large quantity of particulate matter (PM) 0.3 – 0.5 microns in size which pose a critical health risk. In addition to particulates, bushfires also produce odorous gases such as oxides of nitrogen (NOx) and volatile organic compounds. As of November 2020 AQI is no longer being used for reporting methods and as such this data should be used for reference only. Figure 2 below outlines the new reporting methods for air quality, as AQC (Air quality categories).

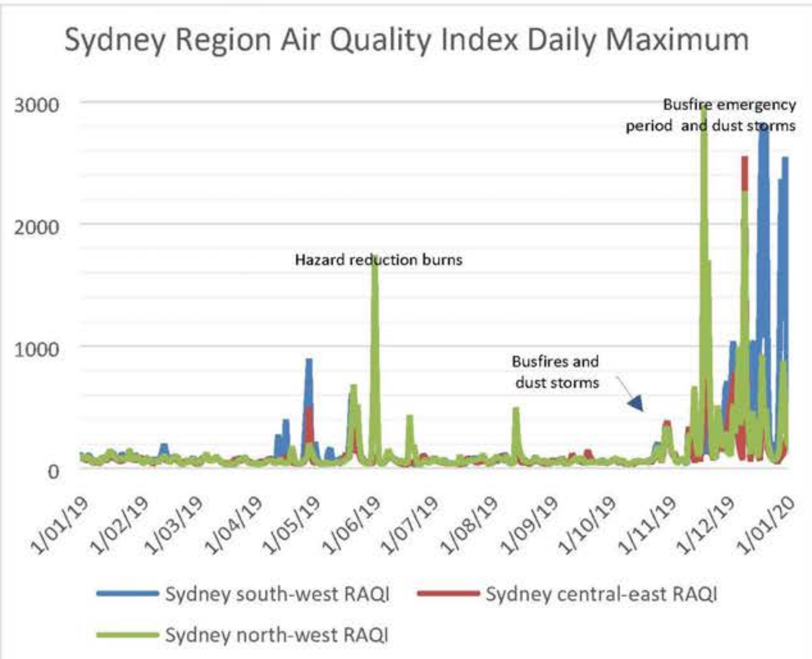


Figure 1 Sydney AQI 2019

Conditioned supply air within a Hospital typically includes a mixture of outside and recirculated air proportioned based on occupancy and usage. Typically, outside air will be 1/3 of the supply air to a clinical space. The NSW Health Infrastructure Engineering Services Guidelines 2016 (ESG) typically requires air handling units (AHUs) serving clinical spaces to be provided G4 and F8 filters, these have a <20% and 65-80% estimated smoke filtration efficiency respectively.

The stringent high levels of outside air and air changes lead to fast infiltration of smoke into the hospital. This poses health impacts as well as potentially impacting the hospital function and equipment.

There are multiple options to mitigate the smoke impact on the hospital including filtration and control functionality. These will be further detailed.

			Air quality categories (AQC)				
Air pollutant	Averaging period	Units	GOOD	FAIR	POOR	VERY POOR	EXTREMELY POOR
Ozone O_3	1-hour	pphm	<6.7	6.7–10.0	10.0–15.0	15.0–20.0	20.0 and above
	4-hour rolling	pphm	<5.4	5.4–8.0	8.0–12.0	12.0–16.0	16.0 and above
Nitrogen dioxide NO_2	1-hour	pphm	<8	8–12	12–18	18–24	24 and above
Visibility Neph	1-hour	bsp	<1.5	1.5–3.0	3.0–6.0	6.0–18.0	18.0 and above
Carbon monoxide CO	8-hour rolling	ppm	<6.0	6.0–9.0	9.0–13.5	13.5–18.0	18.0 and above
Sulfur dioxide SO_2	1-hour	pphm	<13.3	13.3–20.0	20.0–30.0	30.0–40.0	40.0 and above
Particulate matter < 10 µm PM_{10}	1-hour	µg/m³	<50	50–100	100–200	200–600	600 and above
Particulate matter < 2.5 µm $PM_{2.5}$	1-hour	µg/m³	<25	25–50	50–100	100–300	300 and above

Figure 2 Sydney AQC categories

The AQC provides an efficient way to signify when the air quality is not adequate to be used as an outdoor air source. With regards to bushfire prevention and contaminant levels, it allows a qualitative assessment of when bushfire mitigation is required. For example, a poor AQC rating could be used to alert staff when to use bushfire mitigation strategies as further detailed below.

2. Mitigation Options

2.1 Recirculation

The first option to reduce or delay smoke infiltration is to close outdoor air intake motorized dampers and for the air system to recirculate the air on floor. This will stop any outdoor air pollution from entering the clinical spaces however over time CO2 and airborne contaminates will build up. A time limit for recirculation will be set for each system based on system air volume and estimated CO2 generation. When this limit is exceeded the outside air dampers will reopen and recirculation mode stopped. An alert will be sent to maintenance staff when this occurs.

When a system enters recirculation, it is unable to maintain a positive pressure differential to adjacent spaces. This makes it unsuitable for areas with critical pressure control.

This option is the lowest cost and typically will not require any additional spatial requirements.

2.2 Filtration

The ESG typically requires G4 and F8 filters for clinical spaces which have a <20% and 65-80% estimated smoke filtration efficiency respectively as shown in table 2. HEPA (H14) filters are 99%+ effective at removing smoke, these are installed in sterile areas such as operating theatres, sterile stock stores, central sterile services departments and sterile stock stores and protective environment rooms (positive pressure isolation rooms) as standard practice shown in table 1 extracted from the ESG below.

Table 1 ESG Extracts from Matrix of Requirements

Building Services and Environmental Design	
AREA DESIGNATION	FILTRATION EFFICIENCY
Operating Theatre	G4-F8 HEPA
Birthing Room or Delivery Suite	G4-F9
Setup Room & Sterile Store	G4-F8 HEPA
Protective Environment Room	G4-F8 HEPA

HEPA filters have a high cost and pressure drop, making them not suitable for general application. Stantec do not recommend that they be installed broadly to prevent smoke infiltration in general clinical spaces.

Non-clinical spaces such as lobbies and office areas do not have a filtration requirement in the ESG. Stantec propose that due to this staff traffic between areas that they be provided with G4 and F8 filters as per clinical spaces.

Stantec recommend that spatial and fan static provision for F9 filters be provided in all AHUs in addition to the existing filters can be considered. This will increase the overall smoke filtration efficiency to approximately 90%. These filters can be stored on site and placed in the units during poor air quality days or installed permanently.

Table 2 Airepure Filter Estimated Smoke Filtration Efficiency

Filtration Standard Used				Estimated Smoke Filtration Efficiency (%)
AS1324.1 (2001)	EN779 (2012)	ASHRAE 52.2 (2017)	EN1822 (2009)	
F4/F5	G4	MERV7-9	N/A	<20%
F5	M5	MERV10	N/A	20-35%
F6	M6	MERV11-12	N/A	35-50%
F7	F7	MERV13	N/A	50-65%
F8	F8	MERV14	N/A	65-80%
F9	F9	MERV15-16	N/A	80-90%
N/A	N/A	N/A	E11	95-98%
N/A	N/A	N/A	H14	99%+

The odorous gases generated by bushfires are often bound to smoke particles, allowing a significant amount of them to be removed along with the particles with effective filtration. However, to ensure full odor, control carbon filters would be required. These are significantly more expensive and are only recommended for highly sensitive and vulnerable populations or procedures with high outside air quantities such as respiratory wards and operating theaters. Stantec recommend that spatial and fan static allowance for carbon filters within the AHU or outside air louvre to be considered for these critical spaces. The carbon filters will only be installed when air quality is hazardous to minimize cost impact.

2.3 BMS Connectivity

To detect poor or worsening outdoor air quality, sensors can be located on the roof or air intakes. In addition, the BMS can be connected to the Air Quality forecast, alerting staff when filters are to be placed in units or when the outdoor air quality reaches hazardous levels. Forecasts are produced and distributed by the NSW Department of Planning, Industry & Environment with options to receive daily SMS or email updates. If BMS connectivity was not pursued, hospital engineers and maintenance staff could still receive SMS notifications alerting them to action the mitigation plan.

3. Recommendation

Based on the Due diligence report issued by Abel ecology, it is expected that the current development will be located in a bushfire prone area. Stantec recommend that provision for F9 filters be installed in all clinical and non-clinical AHUs. Where poor air quality is reported the AHUs are to enter recirculation where allowable until the air quality improves, or time exceeds the allowable limit.

Where there are particularly compromised or sensitive populations carbon filters are to be allowed for in the AHU and fitted by maintenance staff on hazardous air quality days.

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ME-MEMO-002_C

Enquiries: [redacted]
Project No: 301350224

To: [redacted]

From: [redacted]

Date: 27/07/21

Subject: Medical Gas Considerations

Summary: *The purpose of this memo is to outline the requirements of the medical gas services for the site. The advice is based on preliminary bed numbers and advice obtained from suppliers. These sizes will be reviewed as more information becomes available.*

1. Introduction

The new Eurobodalla Health Services campus is proposed to be built on a "green field" site located approximately 1.5 km from the local centre of Moruya. The site is intended to be developed to enable the construction of emergency services, counselling services, acute and sub-acute services, operating theatres, palliative care, CSSD, maternity/neonatal, community health and outpatient services, medical imaging, pathology and pharmacy services. Based on the individual requirements of each service it is anticipated that the following gases will be required:

- Bulk Oxygen
- Tool air
- Nitrous Oxide
- Suction/Scavenge
- Medical Air
- CO_2

The means of delivery and storage of medical gases to the site, requires careful consideration to ensure safety, functionality and accessibility of these services is retained. Coregas are the local gas supplier in the area and currently services the existing Batemans bay and Moruya campuses. The advice in this memo is based off the CSP Version 3, March 2020 document and preliminary information provided by to Stantec from Coregas.

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2. Estimated Medical Gas Requirements

The preliminary medical gas plant consumption rates identified are based on the following projected bed numbers, AusHFG medical gas requirements and AS2896 plant diversities.

	Preferred Service Configuration			
Patient Space Type and Service	Eurobodalla Health Service			
	Overnight	Day Only	Variance to existing capacity	Variance to proposed
Acute Overnight Beds				
Surgical	10	8		-3
Medical + Surgical	5		13	-4
Medical	45			-3
HiTH ****	12	8		0
ICU/COU	8		8	-2
Renal Dialysis Chairs*		12	0	-3
Oncology *		10	0	0
Paediatric	2	2	2	-2
Maternity	3		3	-1
Neonatal Care	2	2	2	0
Birthing Room*	2		2	0
Total Acute Overnight Beds *	**87**	**20**		**-18**
Sub-Acute Beds				
Rehabilitation/GEM	30		9	-13
Palliative Care				
TACP*	20			
Total Sub-Acute	30			-13
Totals	**117**	**20**		
Total Overnight & Day Only Beds **	**137**		**26**	**-31**
Emergency Department				
Treatment Spaces		13		
Resuscitation Bay		3		
Total ED		**16**	**6**	
Operating Theatres/Procedural				
Operating Theatres + Procedure Rooms		3	0	
Ambulatory Spaces				
Oral Chairs		5		1
Ambulatory Care ***		50	-4	-20

Table 3 excerpt from EHS Service Configuration V3.0

3. Medical Gas Services Infrastructure

3.1 Bulk Oxygen Services

Based on preliminary consumption calculations, using the data in section 2, Coregas advise that a 10,000L VIE vessel should be allowed to serve the projected site. This sizing allows for 21-day deliveries and ~20% constant fill level. Coregas also propose that the site is served from one primary vessel with a 1x1 Medical oxygen 12 pack back up supply.

A 10kL tank will be approximately 5.75m high, have a diameter of 2.2m and weigh around 27 tonnes. As a preliminary guide the oxygen compound will require an 8m x 4.8m area to house the VIE tank, vapouriser, cylinder packs and associated controls, shown in Figure 1 below. The compound is required to be located externally and requires a dedicated water and power supply.

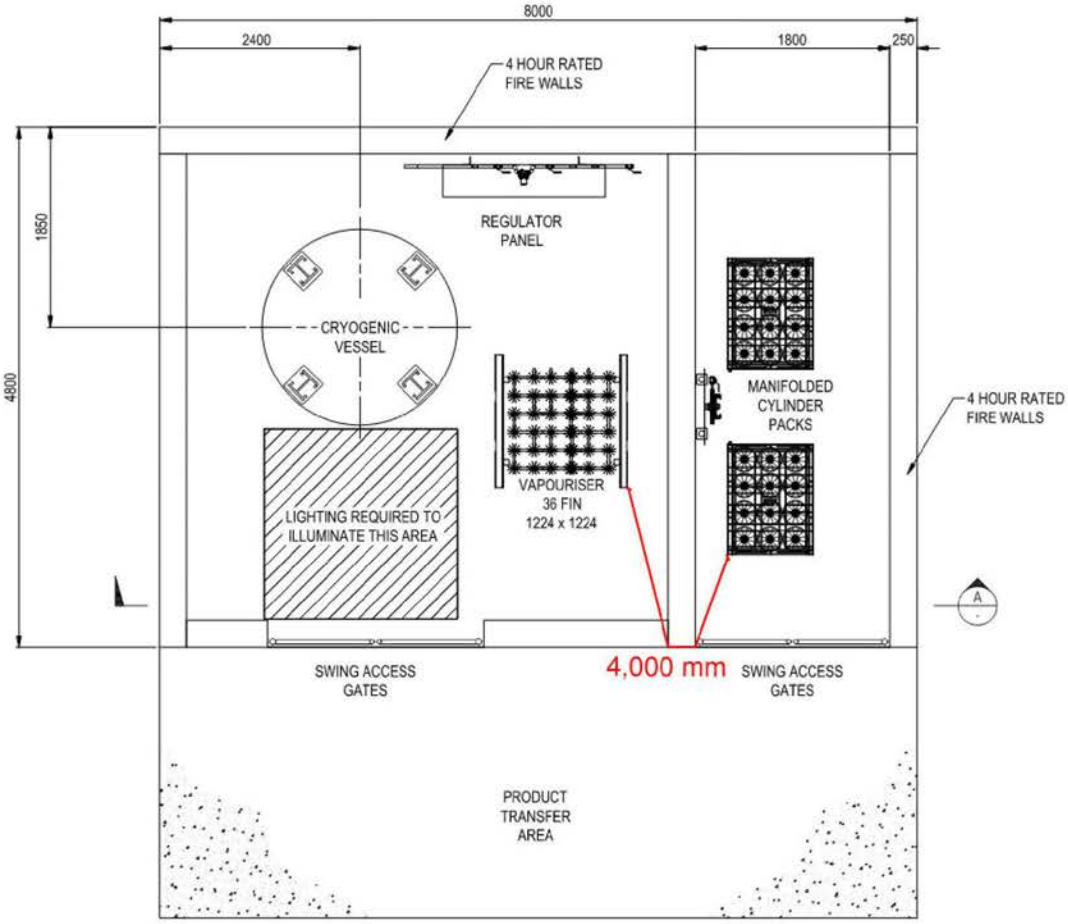
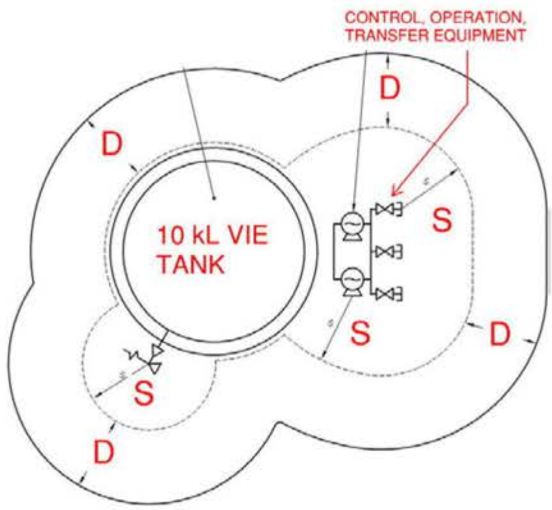


Figure 1 – Typical bulk oxygen compound plan (without gas bottle store adjacent)

AS1894-1997 nominates the required clearances from the VIE tank fill point to surrounding areas based on the usage of that area (see Table 4.1 and Figure 4.1). The distances are measured from the highest leak point on the vessel in a horizontal direction and the most direct path ("stringline"). Vertical separation may be required.



AS1894 Figure 4.1 – Separation distances

Group No.	Item(s) from which separation is required	Minimum separation distance for 10kL tank, m		
		Distance '*S*'	Distance '*D*'	Total
I	• Continuous section of pipeline containing flammable gas or liquid, not interrupted by fittings, e.g. valves, unions, flanges • Building or structure with non-combustible exterior, or sprinklered building of other construction	2	2	4
II	• Property boundary • Street, road boundary or car park, other than for authorized vehicles • Areas where open flames, smoking or sources of ignition are permitted • Fixed installations of gases in cylinders • Other dangerous goods stores of other classes or subsidiary risks†	2	2	4
III	• Medium or high voltage electrical equipment greater than 415 volts, e.g. substations, transformers or motor control centres • Building or structure with combustible exterior • Process equipment and machinery that is not part of the installation • Fittings, e.g. valves, unions, flanges, in pipeline containing flammable gas or liquid • Openings to underground drains, pits, ducts, surface water drains, or openings or systems below ground level • Openings in walls of adjacent buildings or structures	2	3	5
IV	• Areas where personnel can congregate, e.g. offices, lunchrooms • Compressor or ventilator air intakes	2	5	7
V	• Places of public assembly • Areas of buildings where patients are confined to bed • Solid combustible material	2	10	12
(AS1894 Table 4.2 excerpt)	• Flammable and combustible liquid storage • Flammable gas storage	-	-	15

AS1894 Table 4.1 – Separation distances

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The location of the VIE tank will be such that the separation distances above are adhered to. For the concept design stage this can be assumed as worst case 12m separation from the proposed building (group V above) and 15m from flammable liquid/gas stores. AS1894 nominates several concessions to reduce the distances mentioned above, such as fire rating of the enclosure and screening, however these should be further investigated if the tank cannot be accommodated within a proposed location on site.

3.2 Bottled Gas Services

Based on preliminary consumption calculations, using the data in section 2, Coregas advise that a bottle gas store can be utilised to serve the site with the following packs:

- 2 x (12 Man Pac) Nitrous Oxide
- 2 x 2 (bottles) Tool air
- 2 x 2 (bottles) CO_2

This sizing allows for 21-day deliveries. Medical air and suction/scavenge compressors have not been accounted for in this compound, instead being proposed within the main plant room and to be further investigated at the nest stage.

As a preliminary guide the bottled gas compound will approximately require a 6.5m x 7.5m area to house the proposed cylinder packs, spare cylinders and allow storage of empty cylinders. Based on initial calculations, it is assumed the cylinders within the store will be classified as minor storage which is described in Table 2.1 of AS4332 (see below). The gas store can contain a maximum water aggregate of 2000L with a max of each subclass as defined below. Further investigation will be required at the next stage to determine bottle water aggregate and class.

Class of gas	Applicable gases within store	Maximum aggregate water capacity, L
2.1	NA	500
2.2	CO2, Compressed air, Medical air	2000
2.2, with Class 5.1 Subsidiary Risk	Oxygen, NO	1000
2.3	NA	50

AS4332 Table 2.1 – Classification as minor storage

The maximum separation requirement of minor gas stores from adjacent areas is 3m and will should be used at this preliminary stage. Internal segregation of Class 2.2 and 2.2/5.1 is not required as per AS4332.

3.3 Collocated services

The VIE tank and gas compound can be located adjacent to each other in an external location with the oxygen back-up cylinders integrated into the gas store, provided this does not increase the total water aggregate above acceptable levels. This solution would require a 14m x 7.5m compound with the additional spatial requirements as outlined in Appendix A. Separation distances of each compound as outlined above still apply to this solution.

4. Medical Gas Delivery and Storage Location

The key design considerations used to determine the preferred VIE location and delivery process are:

- Unobstructed entry and exit to the fill point, ideally by way of pass-through (i.e. drive in and drive out option without the requirement for a turning circle)
- Designated no parking zone or closure during delivery with minimal disruption to regular traffic
- Allowance for safe operation of plant for driver during delivery
- Location of compound to reduce reticulation of medical gas pipework to building
- The oxygen fill-point should ideally be located close the primary VIE vessel and bottle back-up

Based on preliminary consumption calculations, using the data in section 2 and advice from Coregas regarding delivery practices within the area, a 19m delivery truck will be utilised to make bulk oxygen deliveries. A typical 10 Pallet truck will be used to provide bottled gas deliveries.

Section 4.2 below outlines the design considerations of the preferred option.

4.1 Delivery Truck Details

Liquid Oxygen Tanker – 19m

The liquid oxygen deliveries will be made via a 19m truck, as specified by Coregas. Refer to Appendix B for typical 19m truck turning circles. Additional details for the tanker are outlined below:

- Tanker Height: 4.3m
- Tanker Full Weight with Liq O2: 43.5t (23t of this is on the rear tri axle)
- Tanker Empty Weight: approx. 22t
- Tanker Fill Location at the rear

Bottled Gas truck - 10 Pallet truck

The information below is based on a 10 Pallet truck for bottled gas deliveries. Details below:

- Truck Length: 11.6m
- Truck Height: 2.6m
- Turning Circle: 16.3m
- Gross Vehicle Mass: 10400kg

The intent would be for the truck to deliver bottled gases via the same process of oxygen delivery.

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4.2 Medical Gas Delivery and storage

The proposed location of the medical gas compound on site is within the loading dock. Site access will be via the Highway to the South. The loading dock location has been identified to the North of the site for each concept design stage as below in Figure 2.

The current option assumes that the compound will be collocated as described in section 3.3 and Appendix A, however, the medical gas compound could be separated and integrated into the building if required. Considerations for the proposed location are outlined below.

The liquid oxygen fill-point should ideally be located close the primary VIE vessel and bottle back-up. This allows the delivery driver to isolate the tank during the filling process. Remote fill points are not recommended at this stage. Note that the fill point is to be aligned with the rear of the truck.

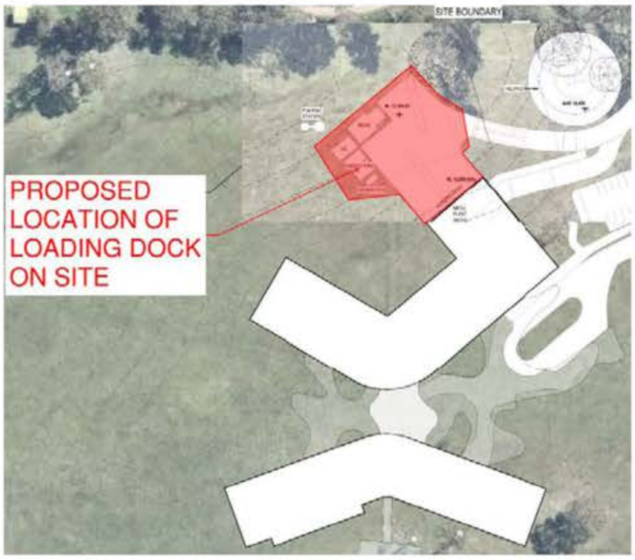


Figure 2 – Loading dock location

This option (See Figure 3) is located on the Northern side of the proposed development and assumes the VIE tank is located alongside the loading dock. The design considerations with this strategy are:

- Access would be via the Southern access road with the truck pulling up adjacent the compound to complete the fill process. Once complete the truck can exit via the southern access road to the Highway.
- Allowance should be made for the truck to pull up alongside the compound. Refer to appendix B for turning circle requirements.
- Location will require some trenching of medical gas pipework to serve the building. Trenching required will be minimal (~50m) and required to be through unobstructed area.
- Location is currently below indicated helicopter flight path. This will need to be further reviewed by design team

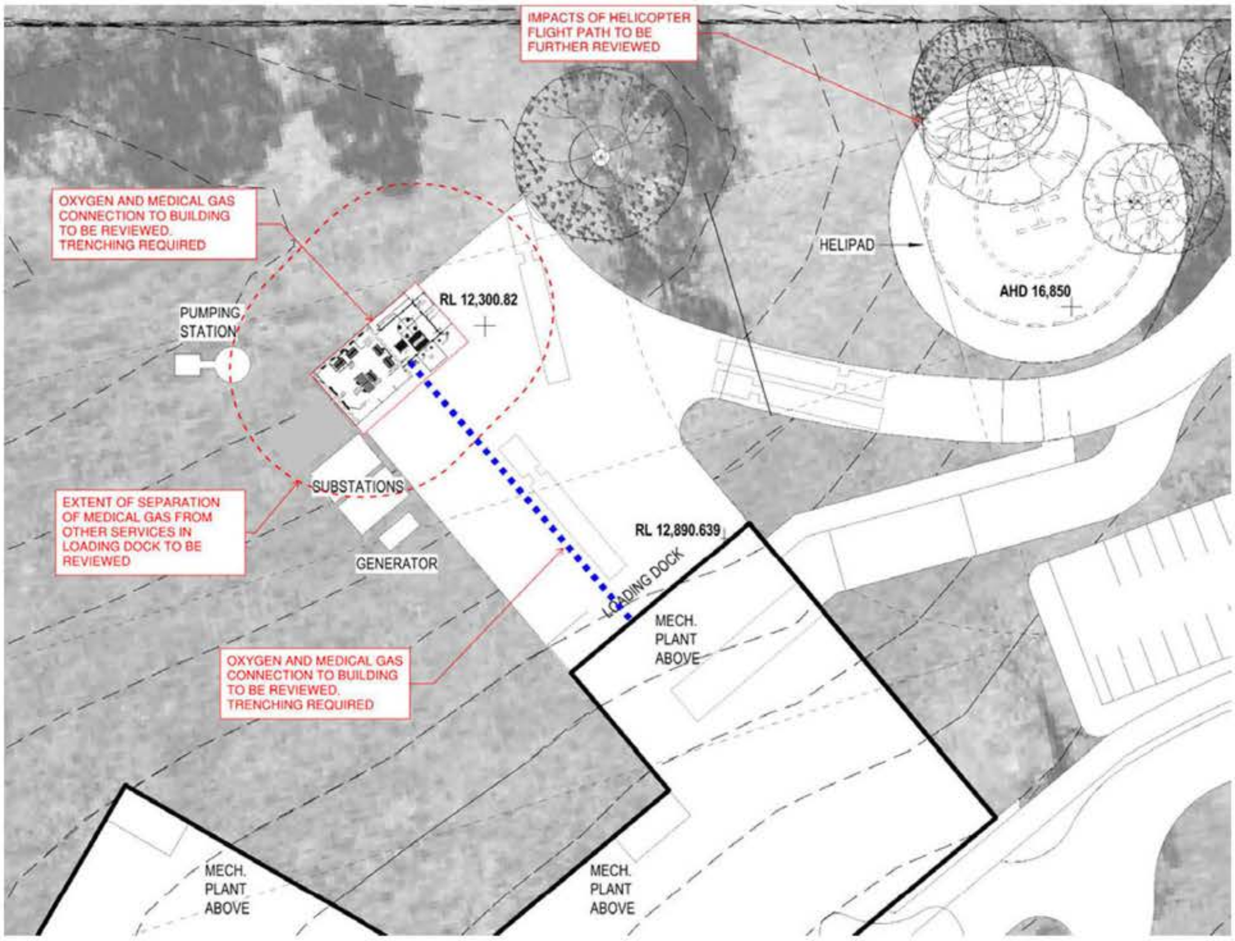


Figure 3 – Loading dock configuration

5. Summary

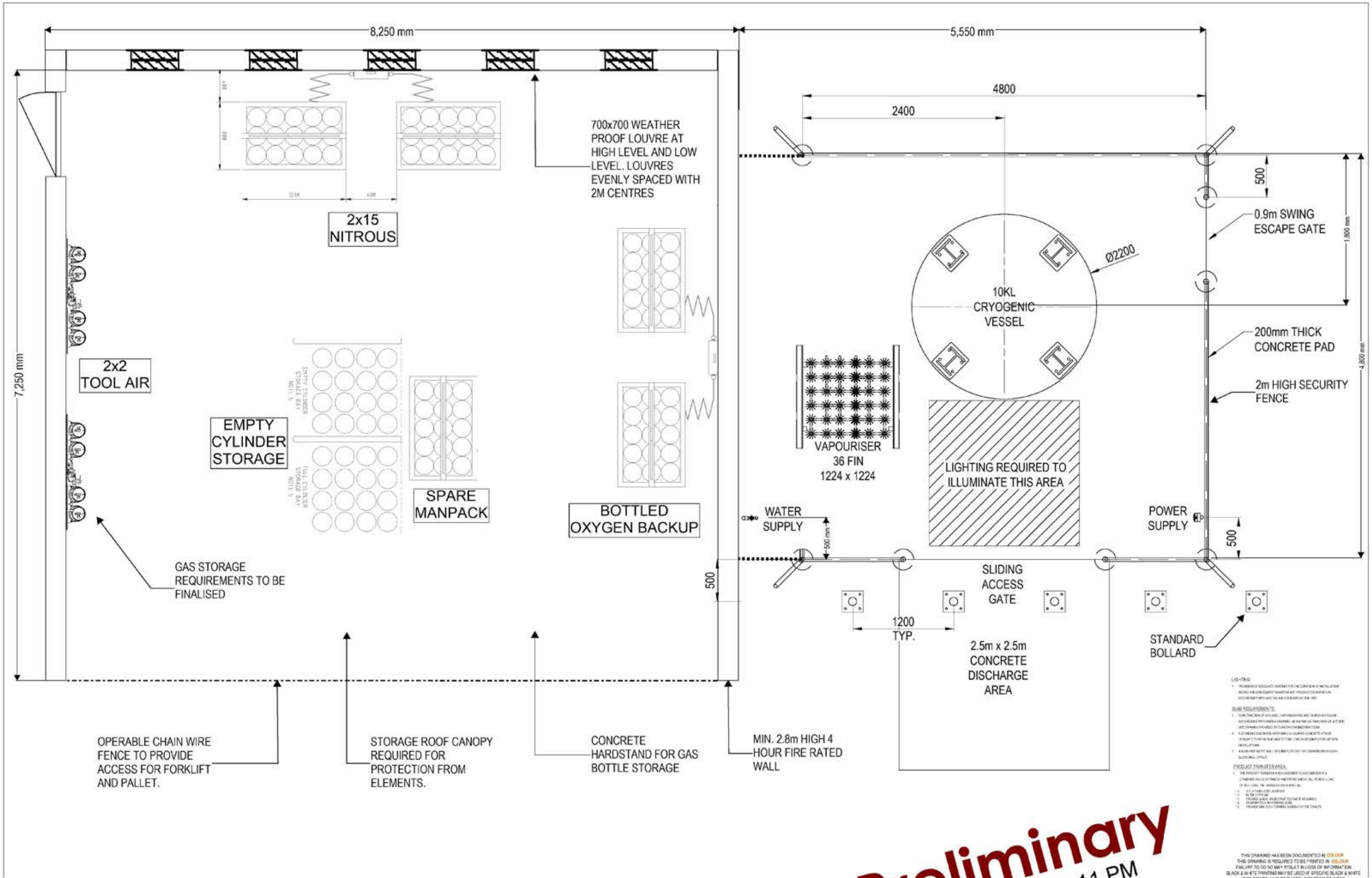
Following preliminary discussions with the local gas supplier (Coregas) the initial medical gas requirements are outlined as above for consideration.

Other services may be collocated on site with the medical gas storage provided the above spatial considerations are met. Both master plan options 1 and 4, offer very similar site arrangements in terms of delivery access. For both options Stantec would not recommend option 2 due to the additional cost associated with trenching back to the main building.

Appendices

Appendix A – MG-SK-001 – Medical Gas Compound

Appendix B –19m Tanker Turning Radius



Preliminary
10/03/2021 4:53:11 PM

REV	DESCRIPTION	DRAWN	APPD	DATE
A	FOR INFORMATION	JKE	EG	10/03/21

ARCHITECT/CLIENT

PROJECT: EUROBODALLA HOSPITAL

Stantec

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No.	DRAWING No.	REV
1:20	301350224	ME-SK-MG COMPOUND	A

AUSTROADS

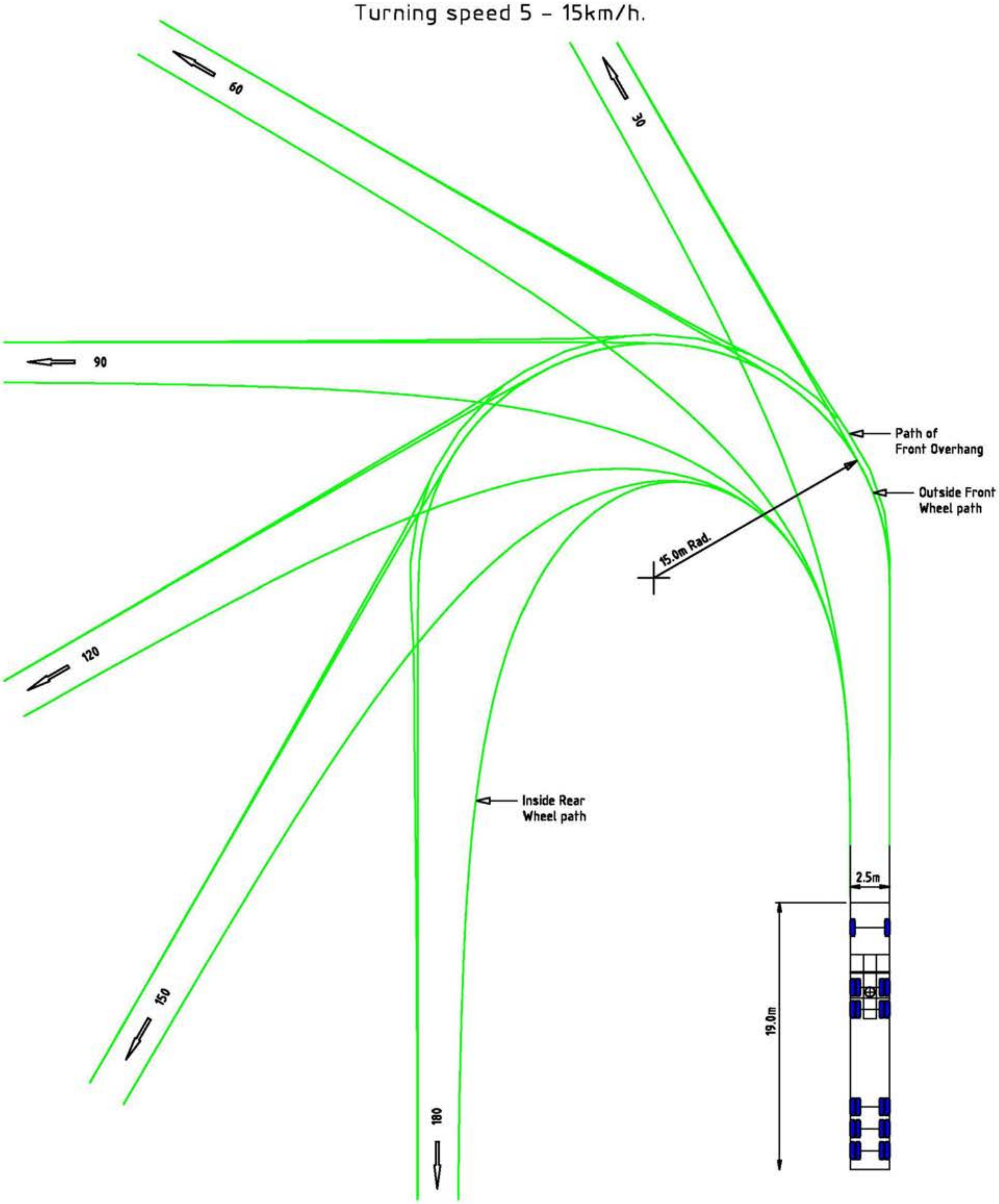
Combination (19.0m)

SCALE 1 : 250

Radius 15.0m

DESIRABLE MINIMUM RADIUS

Turning speed 5 - 15km/h.



Notes:-

1. Locate face of kerbs at least 0.6m clear of wheel paths
2. Allow 0.6m clearance outside path of overhang and ensure that this area is kept free of road furniture.

Stantec

ME-ME-003

Enquiries: [redacted]
Project No: 301350224

To: [redacted]

From: [redacted]

Date: 01/06/21

Subject: Site Electrification – Mechanical Option Review

Summary: *This memo provides a summary of the mechanical options for consideration for the implementation of a building electrification strategy at the Eurobodalla Hospital Site.*

1. Introduction

Globally, the ever-increasing need to lower greenhouse gas emissions and look for cleaner energy provisions has led to the emergence of alternative heating solutions that try to shift from conventional combustion technologies. As Eurobodalla is a greenfield site there is currently no provisions of electrical or gas infrastructure to service the installation of HVAC services. Outcomes from early discussions with stakeholders and the design team have raised the possibility that electrification of these services could be achieved. The mechanical plant will either utilise a conventional combustion system served by on site LPG gas storage or via electrification technologies as further detailed below. Both options, electric vs gas, provide a suitable heating solution o the site however the spatial allowances, electrical loads and cost benefits of each will need to be assessed to determine final feasibility. These considerations are outlined below.

2. Electrification Technologies

Heat pumps are the enabling technology of widespread building electrification. Unlike conventional furnaces or boilers, which burn fuels to produce heat, heat pumps use electricity to send heat where it's needed or remove it from where it's not, much like a refrigerator. Heat pumps can either expel heat from the indoors during the cooling season or capture heat outdoors from the ground or air to be used for heating. As such, they offer a two-for-one benefit: heating and air-conditioning from the same equipment.

In a fully electrified building, furnaces, and boilers that today run-on LPG, natural gas, propane or heating oil can be replaced with ground- or air-source heat pumps. Gas-powered water heaters can be replaced with heat pump water heaters. While, in the kitchen, gas-powered ovens and burners can be replaced with electric ranges and induction cooktops.

3. Heating hot water options

The options for the provision of heating hot water are outlined in this section

Stantec note that electric boilers could be considered as an alternative option for an electrification strategy, however the efficiency of these systems is low and considerably less than the anticipated COP of around 3.2 of the alternative heat pump solutions and therefore will not be considered in this memo.

LPG Gas boiler – Option 1 (Base Case)

Stantec propose that 2x648kW condensing boilers are provided on site to meet the preliminary site demand based on provisional calculations. Condensing boilers utilize two separate heat exchangers: one to heat the water before it goes out to the field, and another to reheat water returning. The exhaust gases are used to preheat the return water to the boiler, which provides a much higher efficiency when compared to non-condensing boilers. The boilers will be fed by on site LPG storage facilities. The boilers will also be required to service domestic and other hot water services, however these have not been allowed for in the above proposal.

Air to water heat pumps – Option 2.1 and 2.2

Option 2.1 - heating and cooling heat pump

Stantec propose that 2x550kW Air to water heat pump is provided on site to meet the preliminary site heating demand. Due to the heating load on site and the efficiencies of the systems available a heating OR cooling air to water heat pump will be utilised. The final configuration, number of and turn down of units is to be confirmed in schematic design. Typically, air sourced heat pumps are limited in size (approx. 1.5MW in heating) and as such may not be scalable for future expansion of the site without an additional unit to meet heating additional loads on the system. This type of heat pump is reversible and as such can provide heating or cooling, however not both simultaneously.

This system operates on the assumption of three scenarios as described and illustrated below.

Cooling only – 2 NO. water-cooled chillers will take most of the cooling load within the building with the heat pump operating in cooling mode to cater for any additional load above the chiller's capacity.

Cooling and Heating – The water-cooled chiller will take all of the cooling load within the building with the heat pump operating in heating mode to cater for any heating load.

Heating only - The heat pump will operate in heating mode to cater for the heating load.

Option 2.2 - heating only heat pump

Stantec propose that 3x350 kW Air to water heat pumps are provided on site to meet the preliminary site demand. The smaller units will provide heating only, with chillers catering for the cooling load. The smaller heat pumps will provide a 50-60°C supply temperature for the heating hot water.

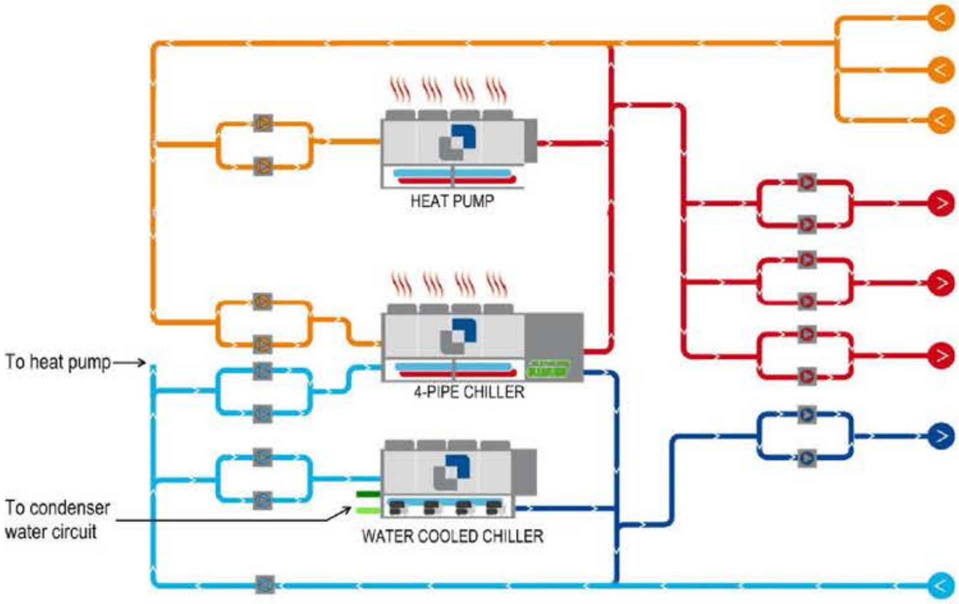
Heat Recovery Chiller + Air to Water Heat pump – Option 2.3

This option investigates the combined use of a water-cooled chiller, an air to water heat pump and a 4-pipe chiller to reclaim some of the heating from the building. This system operates on the assumption of three scenarios as described and illustrated below.

Cooling only – The water-cooled chiller will take most of the cooling load within the building with the heat pump operating in cooling mode to cater for any additional load above the chiller's capacity

Cooling and Heating – The 4-pipe unit will turn on to cater for 30% of the maximum heating load and will also be capable of producing an equivalent cooling capacity. From experience and existing hospital usage profiles this percentage of heating provides the most efficiency from the heat reclaim system. If additional Heating or Cooling is required the Heat pump (in heating mode) or the chiller will turn on to provide the required capacity. The heat pump can run in heating OR cooling mode at any one time and therefore max heating and cooling loads can not be met at the same time, however this is an unlikely scenario.

Heating only - The heat pump will cater for most of the heating load, with the 4-pipe chiller to turn on if more heating than the nominated 30% above is required.



Typical Heat reclaim system

4. Gas Boilers vs Heat Pumps

Traditional Combustion Technology LPG Boilers		Electrified Technology Heat Pumps		Electrified Technology Heat recovery chiller	
Pros	Cons	Pros	Cons	Pros	Cons
Can have relative high efficiencies (up to 95% for condensing type boilers)	Requires coordination of flue for exhaust gases	No exhaust required for the system	Increased pipework size due to lower temperature differentials	Can be used to reclaim some heat from the cooling circuit	Low efficiency when used for heating or cooling only
Smaller plant footprint	Requires connection/coordination of gas pipework and regular filling of LPG gas Tank.	May be used for partial cooling load when design conditions are favourable (depending on unit used)	Requires larger pumps due to increased flow rate	Can be used to do part loads within the building	Payback period of the additional unit is heavily dependent on design conditions
Cheaper capital cost	Carbon emissions	Low carbon footprint, although often offset by incoming power source	Short Economic lifespan		High Capital Cost

Provisions	CAPEX[1]	OPEX[2][3]	Space Required (total)			Weight	Expected life	COP	Power Consumption	Gas consumption
15000m² Site	($)	($)	Width (mm)	Depth (mm)	Height (mm)	(kg)	(Years)		(kWh)	(MJ/hr)
Option 1	$ 90,000	$ 799,319	3500	4000	2000	1400	20	-	0.8	2400
Option 2.1	$ 415,000	$ 444,756	15100	6260	2600	13868	15	3.18	361.9	0
Option 2.2	$ 420,000	$ 333,198	11000	9400	2600	2950 x 3	15-20	3.05	113 x 3	0
Option 2.3	$ 355,000	$ 351,873	12000	11000	2600	11946	15-20	3.16	358	0
21000m² Site										
Option 1	$ 108,000	$ 959,183	3500	4000	2000	1680	20	-	0.96	2400
Option 2.1	$ 500,000	$ 533,707	15100	6260	2600	16642	15	3.18	434.28	0
Option 2.2	$ 560,000	$ 444,265	11000	11600	2600	2950 x 3	15-20	3.05	151 x 3	0
Option 2.3	$ 426,000	$ 422,248	12000	11000	2600	14335	15-20	3.16	429.6	0

(1) – Cost of Equipment only
(2) – Cost per year (based on 24hrs/day, 180 days/yr (heating days), $0.2844/kWh, $0.0385/MJ). Prices taken from Origin.
(3) – Assumes 20% saving from Heat recovery

Warranties

To accurately assess the whole of life of either system, it is important to understand the maintenance and warranty regimes offered by manufacturers as in reality the unit will be in commission much longer than these nominated periods. Below is an outline of the warranties offered for each of the options based on input from several suppliers:

Option	Warranty offered
Option 1	2 years nominal parts and service, extended parts for 1 year. Service from local partners if required at premium
Option 2.1	1-year parts and labour, extension to 5 years possible at premium
Option 2.2	2 years major parts, 1-year minor parts and 1 year labour, program offered giving ongoing extensions to warranty based on service/maintenance.
Option 2.3	1-year parts and labour, extension to 5 years possible at premium

5. Considerations

Spatial Considerations

Option 1 has less overall plant space in comparison to the others. The amount of ancillary plant (pipework, pumps, expansion tanks etc.) that has not been considered for each of the options is anticipated to be the same except for the pipework serving the heat pumps as this will be increased due to lower flow/return temperatures being used. Given the current phase of the project and considering the increased plant weights required for heat pumps, implementing a building electrification plan may require significant redesign of the building's structure. This will need to be identified prior to schematic design as it could have flow on effects to the rest of the building's design.

Electrical Considerations

Based on the table above, implementing a building electrification plan would add a minimum 400 kW of electrical load onto the building's electrical infrastructure when compared to traditional combustion technologies. The final plant arrangement and quantities is still to be determined as the design develops which may increase the total electrical demand from above. This increased load will need to be identified prior to schematic design as it could increase the overall substation requirements on site.

Cost Considerations

Option 1 has less capital cost than the other options, however it has an increased operational cost when comparing the price of gas vs electrical usage. The operational costs above do not allow for the whole of life cost, which would typically involve planned maintenance and replacement costs. Heat pumps if not subject to routine maintenance will age faster than combustion technologies and therefore may incur a larger overall LCC.

6. Recommendation

Stantec recommend that the electrical, hydraulics, ESD consultants and QS review the above with regards to the HVAC heating hot water design to accurately assess the economic implications of proceeding with electrification of the site. It is also recommended that a WOL (whole of Life) cycle cost analysis is undertaken. Consideration should be given to the benefits of electrification and reduction of greenhouse gas emissions, recognizing that future targets for cleaner grid power may provide greater benefits than current trends.

11.7 Electrical, ICT and Security CD Report

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ELECTRICAL, ICT AND SECURITY CONCEPT REPORT

STEENSEN VARMING

Eurobodalla Health Service
Electrical, ICT and Security Concept Report

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Document Revision and Status

Date	Rev	Status	Notes	Checked	Approved
18-06-21	A			MH	MH
23-06-21	B			MH	MH
16-07-21	C	Final		IM	MH

Sydney, 16th July 2021
Ref. No. 207183 REP-E001

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1.0 Executive Summary

1.1 Introduction

Steensen Varming have been engaged by Health Infrastructure to undertake the design and documentation of Electrical, ICT, Security and Lighting services of the new Eurobodalla Health Precinct. This report has been developed to provide information on the various engineering arrangements associated, with electrical, communications and security services and how these systems would best suit the functional clinical requirements and the buildings that accommodate them. Existing & Proposed Site Infrastructure, Proposed Services Summary and Project Risks are summarised below.

1.2 Site Infrastructure

Systems / Utility Providers	**Description**
Essential Energy	There is an existing Zone Substation and associated High Voltage cabling near the proposed site supporting the district including the TAFE facility to the west.
National Broadband Network (NBN)	No existing National Broadband Network (NBN) assets are near or on the site.
Telstra	DBYD and site investigation confirms that there are existing Telstra network cables on Princess Highway and in the north servicing residential properties.
Optus	Based on DBYD, it is noted that Optus Fibre Optic Telecommunications cables exist in the vicinity of the site.

Systems / Utility Providers	**Description**
Essential Energy	2 x High Voltage feeders – High Reliability Loop In and Loop Out with RMU using separate ducts within the same route. Separated at exit points with connecting ability to switch from one zone network to the other. Final solution pending Essential Energy Design Brief.
National Broadband Network (NBN)	The site is not in a fixed wire area but is within wireless area, with capacity built into the tower system to allow for new connections to be added for internet services. No fixed wired links are proposed at this stage. The speed and performance of the wireless network is pending further investigation and negotiation.
Telstra	Telstra is Infrastructure Provider of Last Resort' (IPOLR) of phone services for new the facility. It is anticipated that the adjacent underground network will be used to support the new facility. The cable on the Princess Highway may need to be lowered to allow the construction of the new entry roadway. The site shall be supported by two telecommunication Lead-in connections.

1.3 Proposed Services

Systems / Utility Providers	**Description**
ESD	The work will be fully coordinated with the ESD consultant's work and fully comply with the HI "DGN 058" document and the NSW Govt. Architect's integrated design policy for the built environment- "Better Placed" and NSW Govt. Dept. of Planning, Industry and Environment's "Net Zero Stage 1: 2020-2030 as part of the Climate Change Policy Framework 2016". The work will be completed in a collaborative manner with the wider team to identity good design and ESD drivers that both support the ESD objectives and the Clinical Health Plan and vision, such as; ▪ Responsibly sourced materials ▪ Sustainable supply chains ▪ Peak Electricity Demand Reduction ▪ Degassing of the site with electrification for hot water and HVAC hot water ▪ Solar Photovoltaics ▪ PVC minimisation ▪ Smart Building metering and interfaces
Substations	It is proposed that pad mount substations shall be provided based on preliminary maximum demand calculations. Final quantity and size pending further demand assessment and supply authority requirements. At this stage the Maximum Demand exceeds the capacity of a 1000kVA substation and therefore 1500kVA Substation is proposed with space for an additional 1500kVA Substation to cater for possible future master plan and electrification of hot water systems. Details of the preliminary sizing with respect to the base load, future load and degassing option of the site is included within the report. The solution caters for the possible future expansion and optional electrification of the hot water and HVAC hot water systems. Final solution pending Essential Energy Design Brief.
Switchboards	It is proposed that two Main switchboards Sections shall be provided in the Main Switchroom located close to the pad mount substation. New custom-built main switchboards be provided to a minimum of Form 4a, complete with insulated busbars to supply the electrical requirements of the building.

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Systems / Utility Providers	Description
	The switchboard will incorporate a non-essential section and a life safety section / business critical section that will be supported by a standby alternative power source, as well as facility for connection of a mobile generator. The solution caters for the possible future expansion and optional electrification of the hot water and HVAC hot water systems.
Generators	It is proposed that one standby diesel generators sized approx. 1,000kVA shall be provided to accommodate the diversified standby power load of the new development, located with 24/7 access for maintenance and refuelling. It is proposed that the generators be supported by the provision of a 24-hour bulk storage fuel tank. The testing facility for the generators is to be determined (either synchronised with grid or load bank). In the next design phase further work will be completed on the final sizing with detailed costing on the impact an option for larger capacity generator system which would support additional air conditioning loads, facilitating appropriate environment conditions for occupants and for working staff in the event of a prolonged outage and future requirements.
UPS	It is proposed a centralised 150kVA UPS system with N + 1 configuration shall be provided to support critical items of equipment as identified within the Engineering Services Guidelines and the approved Room Data Sheets (Australian Health Facility Guidelines) to maintain power supply to critical items of equipment.
Renewable Energy Photovoltaics	Renewable energy can be produced on site and or purchased from Energy Retailers. The use of Photovoltaics is the most appropriate source for on-site generation. Where used, they should be integrated such that they also provide another use such as shading or reduce heat load on the building. The LHD also has the option to purchase green energy from the Energy Retailer under the 777 Contract.
Communications	It is proposed that 2 off combined campus &building distributors and Floor Distributors shall be provided as per relevant NSW Health ICT Standards. It is proposed that voice and data services be provided as per relevant standards. New and enhanced models of patient care are advancing, and with it demands a higher level of power and ICT usage, and also need for reliability. Using the experience and lessons learnt in ICT Strategy Planning and Digital Hospital Briefing works completed for other facilities such as the Central Coast LHD and at Northern Beaches Hospital, technology and high-quality system design topology will be applied to support VC, eHealth, Telehealth/ Healthnet, eMedical Records and the like in a safe and reliable manner. The application of 'Smart Building' will be applied to ensure that the functional requirements of the modern health service is facilitated with a robust reliable inclusive of all relevant interfaces, this will involve close coordination with the BMS scope and coordination & collaboration with the LHD ICT strategy including: - ICT Infrastructure (Integrated Structured Cabling, etc) - ICT Functional Systems (security, BMS etc) - ICT Business Systems (Software & servers, databases).

Systems / Utility Providers	Description
	A clear understanding of the procurement 'grouping' will be defined to ensure cost & interfaces are included. Detailed briefing and consultation sessions will be held in the next design phase to finalise briefing and requirements
Distributed Antenna System (DAS)	It is proposed that the new facility shall incorporate an active Distributed Antenna System for Mobile Phone Coverage.
Wireless Systems	To be provided as per NSW Health Wi-Fi Standard
Security	It is proposed that the new development be provided with an IP security system comprising access control, intruder alarms, duress alarms, CCTV system, PA systems, paging systems, hearing augmentation and intercom systems. Detailed briefing and consultation sessions will be held in the next design phase to finalise briefing and requirements
Nurse Call	A new IP based nurse call system is proposed for the facility. The nurse call system shall be capable of being expanded to accommodate future Stages of developments. The nurse call system shall incorporate all outlets, indicator lights, cabling, terminations, control units, power supplies and system interfaces to complete the installation.
Audio Visual	The Audio-Visual systems, include Public Address, Hearing Augmentation, Meeting Room systems with Sound Reinforcement to special Operating Theatre systems for educational purposes where warranted. The works will be coordinated with the acoustic and lighting designs, addresses the DDA, and include best practice in terms layout and line of sight to monitors and access to controls and ensure that systems are set up in an intuitive manner which are easy to use.

1.4 Project Risks

With a rare green field opportunity, the risks presented for the Eurobodalla Redevelopment are not like those of other hospitals, which typically relate to existing site conditions, and interface with engineering systems. Our risks relate more to process, procurement, information flow and communication; these risks though different, still need to be carefully managed to ensure our great opportunity is leveraged to the best of the team's ability.

The following key project risks have been identified together with our proposed methodology to manage these risks.

- **Obtrusive Light** – Engage Specialist Lighting Design to ensure all external lighting complies with relevant standards and avoid environmental and community concerns.
- **Covid-19** – The design to be in accordance with guidelines.
- **Road Works** – Design to be coordinated with Major NSW government road works.
- **Procurement** – Ensure that the commercial aspects of the contract consider the technical and quality requirements.
- **Concept planning Flexibility** – The design at this stage must allow for flexibility in clinical care and engineered solutions. For example, the extent of the facility health care accommodation and the types of energy used for heating and hot water. Manage the solution to enable scalability.

1.5 Local Health District Overview

Southern NSW Local Health District (SNSWLHD) provides health services for about 200,000 residents and additional visitors in the Southeast of NSW. SNSWLHD has a population of approximately 200,000, as of June 2016. This is expected to grow to around 245,000 by 2026. Projections to 2026 indicate the fastest growing age groups will be those 65 years and over. In the 2011 about 3.5% of residents identified as Aboriginal and/or Torres Strait Islander.

The District is continuing to improve the quality and access to health services, including continued development of capital upgrades, extension of population health activities and community engagement.

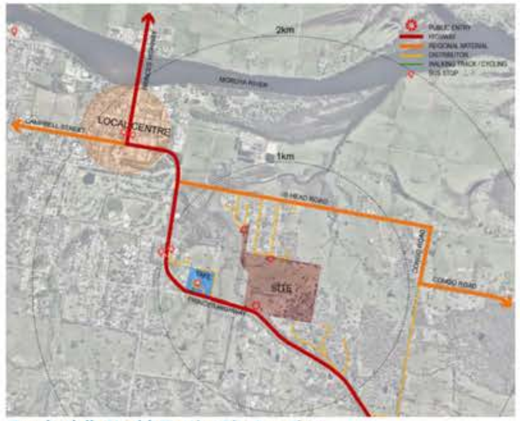
The adjacent map shows the location of public hospitals only.

Image: LHD Facilities

1.6 New Eurobodalla Health Service

The Eurobodalla Health Service will provide a new facility that services Moruya, Batemans Bay and surrounding towns.

Several sites were considered for the new green field facility, with an area just outside of the Moruya adjacent to the TAFE being selected.



Eurobodalla Health Service Site Location

The project will deliver new contemporary medical, surgical, allied health and mental health infrastructure along with the required support services for the local and surrounding communities including the Bugelli-Manji and Yuin first nation people.

The Eurobodalla Health Service is a rare opportunity to provide a state-of-the-art hospital on a greenfield site. Key to the success of the project is providing a scheme that can adapt over time, meeting the needs of the Clinical Services Plan long into the future. It is also important to provide flexible building services that can deliver against environmental targets, meeting the LHD's sustainability ambitions, and the decarbonisation of the health estate. Noting the regional setting, delivering a reliable and maintainable system with local skills in mind will be key.

For the new development, there are key considerations related to block and stack selection, massing, land use distribution and design that can support the wider sustainability strategy for the site now and to the future.

There is a separate package of state government road work planned, being the Moruya Bypass Project, which may present traffic management and coordination challenges which must be dealt with early in the project to ensure the best outcome is achieved.

The options presented in concept design planning have been designed for two strategies. Day one masterplan which is based upon SOA V2.7 from the CSP V3.0 with an area of ~15,322sqm and the Final CSP Concept Design which needs to take into consideration expansion to reach SOA based on CSP V2.0 with an area of ~ 20,128sqm plus consideration to separate Ambulance Station and Private facility.

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2.0 Electrical, ICT Security and Lighting

2.1 Key Engineering Design Principles

It is important that the building services form an integral part of the overall new hospital building concept at an early stage in the design process. If services are not considered until a later stage, problems which could have been overcome by simple measures may require a more complex solution.

Our approach to electrical, security and ICT design follows a 'top down' design principles approach. The 'top down' design principles firstly take a holistic view of the project site infrastructure, future expansion, on-site generation, site networks and building networks and assesses these design inputs against the design principles of capacity, robustness, reliability, adaptability and maintainability. Once the above design principles are considered for each electrical, security and communications system, then the design can progress in an informed manner.

DESIGN PRINCIPLES

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The following design principles will form the basis of determining the optimal electrical services design to support the Refurbishment.

Resilience / Redundancy
The engineering services must be designed and installed to provide systems that satisfy the design requirements and meet the need of the building users with the highest attention to staff and patient welfare and system reliability possible.
Providing key equipment with backup capacity allows for unexpected extended maintenance on the equipment or replacement of major components during peak loads without impacting patient care and facility operation.

Service and Maintenance
The engineering services must be designed and installed to provide adequate and appropriate space and access, to all systems, that permits repair or replacement of equipment. The more limited the access space, the less likely it is that equipment will be properly maintained and therefore proper space planning is an important element of the early design process. In addition to this the choice of equipment must be made with reliability and minimal maintenance as key considerations.

Standardisation
The engineering services system components and methods of installation will be documented as being the same wherever practicable.

Flexibility / Expandability
Departmental functional areas will be provided with separate services, where reasonably possible, so that isolation for repair or failure of the services in one area won't affect other areas.

The engineering services must be designed with an understanding of the expected growth plans for the facility so that adequate future capacity can be integrated into the design, if required.

Comfort
Beyond the reliability and safety of the hospital occupants, the next priority of the engineering services will be to provide systems that meet or exceed all the requirements of the staff and patients in terms of comfort.

Energy
The extent to which cost / energy is used for the intended purpose. There are also several other general principles that will come into play as future discussions occur with other disciplines. Principles such as capital cost investment, relevant costs, facilitation of early enabling works and aligning with the masterplan vision will be central to future discussions to assist in developing the optimal solution for the Refurbishment works.

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2.2 Design Criteria

The Electrical, ICT and Security services Concept Design has been prepared in accordance with Australian and AS/NZ Standards referenced in the National Construction Code of Australia or with other approved standards where the Australian Standards are not applicable.

All works shall be in accordance with this specification and the current Australian Standards and standards detailed within.

Except where the specification required a higher standard, the work is to be carried out in strict conformity with the provisions of all relevant Authorities and Councils such as:

- The local Council, Eurobodalla Shire Council;
- Essential Energy;
- NSW Fire and Rescue;
- NSW Rural Fire Service;
- NSW Environment Protection Authority (EPA);
- Safe Work NSW;
- NSW Police;
- Any other Authority having jurisdiction over the installation to ensure that the machinery and installation will comply with the Rules and Regulations.

Guidelines and Standards not limited to the following:

Health

- NSW Health Infrastructure Engineering Services Guidelines
- NSW Health Southern NSW LHD Guidelines
- NSW Health Infrastructure Design Guidance Notes
- Australian Health Facilities Guidelines
- Green Guide for Healthcare
- NSW Government Facilities Energy Efficiency Guide
- NSW Health Design Guidance Notes

Electrical

- NSW Service and Installation Rules
- AS/NZS 3000 SAA Wiring Rules
- AS/NZS 3003 Electrical installations – Patient Areas
- AS/NZS 3009 Electric installations – Emergency power supplies in hospitals
- AS/NZS 3010 Electrical installations – Generating sets
- AS/NZS 3008 Selection of Cables
- AS/NZS 61439 Switch and Switchboard Construction
- AS/NZS 1768 Lightning Protection Systems
- AS1428 Design for Access and Mobility
- AS/NZS 3013 Electrical Installation - Classification of the fire and mechanical performance of wiring system elements.
- BSRIA Power Quality Guide – Application Guide AS 2/2000
- ENA Guidance on Electrical Installation Practices to Reduce EMF from Low Voltage Wiring
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).
- CIBSE Guide K Electricity in Buildings

Lighting

- AS4282 Control of Obtrusive Effects of Outdoor Lighting
- AS/NZS 60598.1 Luminaires, general requirements, and Tests.
- AS/NZS 2293 Emergency and Exit Lighting
- AS/NZS 1680.2.1 Interior and Workplace Lighting
- AS/NZS 1680.2.2 Interior and Workplace Lighting
- AS/NZS 1680.2.5 Hospital and Medical Tasks
- AS/NZS 1158 External Lighting – Roads and Public Spaces
- AS/NZS 4485 Security for Health Care Facilities
- The National Construction Code - Section J6 for energy efficiency

Communications

- AS/NZS 3080 Information technology – Generic cabling for customer premises,
- AS/CA S009 Installation requirements for customer cabling (Wiring Rules)
- NSW Health ICT Cabling Standard (current version)
- AS/CA S008 Requirements for customer cabling products
- NSW Health Wi-Fi Blueprint Standard
- NSW Health Wireless LAN Infrastructure Design Guide
- NSW Health Communications Room User Acceptance Testing
- NSW Health Policy Directive Electronic Information Security Policy PD2013_033
- NSW Health Policy Directive Electronic Information Security Policy PD2013_033
- ISO 11064 1 - 7: Ergonomic design of control centres

Uninterruptable Power Supply

- AS 6A2040.1.1 Uninterruptible Power Systems (UPS) - - General and safety requirements for UPS used in operator access areas.
- AS 6A2040.1.2 Uninterruptible power systems (UPS) - - General and safety requirements for UPS used in restricted access locations.
- AS 6A2040.2 Uninterruptible power systems (UPS) - Electromagnetic compatibility (EMC) requirements.

Security

- AS 2201 Intruder Alarm systems
- AS1428 Design for Access and Mobility
- AS/NZS 4485.2 Security for Health care facilities
- AS 4806 Closed circuit television (CCTV)
- NSW Health Policy and Standards for Security Risk Management in NSW Health Agencies - Protecting Property and People

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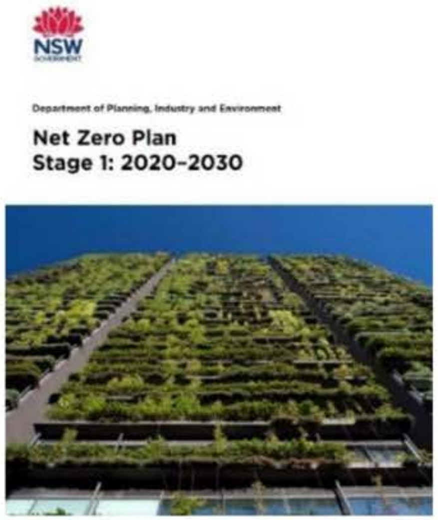
2.3 Environmentally Sustainable Design (ESD) - Electrical

The electrical design approach will take on a best practice approach which does not see ESD aspects related to Electrical Services as an add on but rather an integral part of the way and how the work is done.

The work will be fully coordinated with the ESD consultant's work and fully comply with the HI "DGN 058" document and the NSW Govt. Architect's integrated design policy for the built environment- "Better Placed" and NSW Govt. Dept. of Planning, Industry and Environment's "Net Zero Stage 1: 2020-2030 as part of the Climate Change Policy Framework 2016".



The work will be completed in a collaborative manner with the wider team to identity good design and ESD drivers that both support the ESD objectives and the Clinical Health Plan and vision, such as:

- Responsibly sourced materials
- Sustainable supply chains
- Peak Electricity Demand Reduction
- Degassing of the site with electrification, for hot water and HVAC hot water
- Solar Photovoltaics
- PVC minimisation
- Smart Building metering and interfaces

The important aspects of the decisions during the next design phase will include solutions that consider tipping points in sizing of infrastructure and their capital costs and importantly the running costs, life cycles and maintenance serviceability.

2.4 Site Infrastructure

The detail presented on the existing site infrastructure is based on Dial Before You Dig (DBYD), Utility information and on-site investigations.

Existing assets will be used and/or modified to suit the planned new works. The exact size and configuration of the site services is pending further input on loads and final health care requirements.

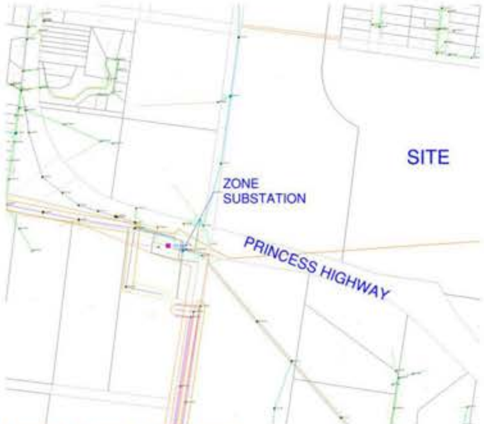
The engineered solutions within the following sections of the report address the wider site master plan which considers not only the Hospital requirements but possible future developments, by providing solutions that enable scalability and flexibility with clear lines of delineation and scope.

2.5 Essential Energy

It is noted that there is an existing Zone Substation near the proposed site.

No diversions are believed to be required by the new health facility however this is pending detail design of the road works.

The existing assets will be used and/or modified to support the new facility's electrical power requirements.



Essential Energy DBYD Extract

2.6 NBN

No existing National Broadband Network (NBN) assets are near or on the site. The NBN have confirmed that the site address is outside new development scope. As such NBN are not the Provider of Responsibility in the area. The Infrastructure Provider of Last Resort' (IPOLR) to the premises is Telstra.

No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works.

Future highway works may or may not involve some separate NBN work, but this is yet to be verified.

If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
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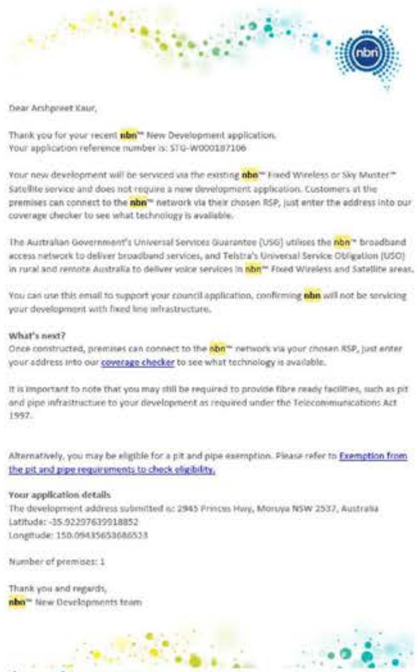
The site is not in a fixed wire area but is within wireless area, with capacity built into the tower system to allow for new connections to be added for internet services. No fixed wired links are proposed at this stage. The speed and performance of the wireless network is pending further investigation and negotiation.

The new development will be services via the existing NBN Fixed Wireless OR Sky Muster Satellite service and does not require a new development application. Customers at the premises can connect to the NBN network via their chosen RSP.



Dear Arshpreet Kaur,

Thank you for your recent nbn™ New Development application.
Your application reference number is: STG-W000187106

Your new development will be serviced via the existing nbn™ Fixed Wireless or Sky Muster™ Satellite service and does not require a new development application. Customers at the premises can connect to the nbn™ network via their chosen RSP, just enter the address into our coverage checker to see what technology is available.

The Australian Government's Universal Services Guarantee (USG) utilises the nbn™ broadband access network to deliver broadband services, and Telstra's Universal Service Obligation (USO) in rural and remote Australia to deliver voice services in nbn™ Fixed Wireless and Satellite areas.

You can use this email to support your council application, confirming nbn will not be servicing your development with fixed line infrastructure.

What's next?
Once constructed, premises can connect to the nbn™ network via your chosen RSP, just enter your address into our coverage checker to see what technology is available.

It is important to note that you may still be required to provide fibre ready facilities, such as pit and pipe infrastructure to your development as required under the Telecommunications Act 1997.

Alternatively, you may be eligible for a pit and pipe exemption. Please refer to Exemption from the pit and pipe requirements to check eligibility.

Your application details
The development address submitted is: 2945 Princes Hwy, Moruya NSW 2537, Australia
Latitude: -35.92297639918852
Longitude: 150.09435653686533

Number of premises: 1

Thank you and regards,
nbn™ New Developments team

Correspondence from NBN.

2.7 Telstra

DBYD and site investigation confirms that there are existing Telstra network cables on Princess Highway and in the north servicing residential properties.

No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the roadway works, such as the connection near the new roundabout where the cables may need to be lowered.

Telstra is the Infrastructure Provider of Last Resort' (IPOLR) of phone services for new the facility. It is anticipated that the adjacent underground network will be used to support the new facility.

The site shall be supported by two telecommunication Lead-in connections.

Telstra DBYD Extract

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From: Probst, Susann <Susann.Probst@team.telstra.com>
Sent: Friday, 30 April 2021 12:55 PM
To: Schneider, Mark P <Mark.P.Schneider@team.telstra.com>; Arshpreet Kaur <arshpreet.kaur@steensenvarming.com>
Subject: RE: 207183 - Eurobodalla Hospital NBN/Telstra

Hi Mark,

New fibre lead ins are order driven, and a fibre connection order to be raised by end user (Hospital), which will then trigger Wideband engagement.

Hi Arsh,

If you could reach out to the Hospital and or respective government entity i.e. NSW Health, to liaise with their Telstra Accounts team to create a Wideband request, that would be appreciated.

Otherwise, if you could provide government entity to myself, I can reach out to Telstra internals to liaise with their customer.

Kind regards

Susann Probst
Regional Program Specialist
Network Integrity
Design & Construction | InfraCo Operations

InfraCo

P 02 8576 9821
E susann.probst@team.telstra.com
W [illegible]
Telstra acknowledges the Traditional Custodians of country throughout Australia and recognises their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging.

Please Refer to above correspondence from Telstra. NSW Health to liaise with Telstra Accounts team to create a Wideband request. .

2.8 Optus

Based on DBYD, it is noted that Optus Fibre Optic Telecommunications cables exist in the vicinity of the site.

No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works.

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3.0 Power Systems

3.1 Power Supply Maximum Demand

General
The Maximum Demand is the largest electrical current that will exist in the electrical infrastructure at any one time under expected operating conditions.

The maximum demand calculations reflect as close as reasonably possible the actual loads that would be realised plus realistic allowance for future expansion as required. Realistic diversity figures have been used when sizing, substations, switchboards, generators and the like.

The following have been considered:
- Gross area of the new buildings;
- Diversified VA/m² figures for appropriate areas (eg figure of 100VA/m² for high demand areas, 85VA/m² for other areas and 50VA/m² for low demand areas);
- The type of HVAC solutions being applied;
- Special medical equipment;
- Number of lifts and their individual supply demand, and;
- Embedded renewable energy however these cannot officially be taken into account due to their possible load profiles.

Electrification of Hot Water Services
Anticipated loads provided by mechanical and hydraulic engineers for the option of degassing the hot water energy sources have also been assessed.
Estimated loads have also been provided for the larger expansion and the additional electrical load for hot water it will require.

Spare Capacity
An appropriate allowance for the space / capacity for future expansion should be allowed for. Spare capacity should be balanced with the appropriate allocation of available budget and should be agreed to by the design team and Health Infrastructure on a project-by-project basis.

Standards
The calculations shall be completed in accordance with the following:
- AS/NZS 3000 Wiring Rules
- Health Infrastructure – Engineering Guidelines
- Steensen Varming Database

Details and Summary
Various options based on the estimated maximum demand for Base Load and Future expansion including the HVAC Heating and Electrical Hot water systems are summarised in the table.
With the options for various electrification of the hot water systems, the one with the highest electrical load was used in the table.

The final sizing is pending further design and consideration of diversity being to the hot water system and HVAC hot water loads.

Summary

	Load Description	Assessment	Anticipated KVA	Overall KVA	Proposed Substation Size	Comments	Costs	Running Costs	Reliability
Day One	Base load 15,322sqm	50 VA/m2 – 100 VA/m2 Range	1162	1162	1500 KVA	1 x TX with space for another.	Standard Cost	Standard energy cost	Lower only 1 Substation
20yr	Future Expansion 4,806sqm (Total 20,128sqm)	85 /VAm2	409	1571	2 X 1500 KVA	2 x TX	Extra Cost $150K	Standard energy cost	Higher - 2 Substations
pending	CSSD	allowance only - TBC	200	1771	2 X 1500 KVA	2 x TX			
pending	Electrical Hot Water - No Gas	no diversity applied	390	2161	2 X 1500 KVA	30% added - assumed extra hot water load - pending final input	Submains and connections - less gas connection and smaller power	Additional elect energy cost / less gas energy cost	Higher - 2 Substations
pending	Electrical HVAC Hot Water - No Gas	no diversity applied	434	2595	2 X 1500 KVA	HVAC hot water load	Submains and connections - less gas connection and smaller power	Additional elect energy cost / less gas energy cost	Higher - 2 Substations

Extra Possible Future Loads

	Load Description	Assessment	Anticipated KVA	Overall KVA	Proposed Substation Size	Comments
pending	**Separate Buildings**			526	Possible Separate Substation / feeder - pending Future Design	Separate Power Supply from Essential Energy - Supported from the Site HV is possible. Pending Essential Energy Design Brief.
pending	Possible Future Separate Entities 1 2470sqm	85 VA/m2	210			
pending	Possible Future Separate Entities 2 1360sqm	85 VA/m2	116			
pending	Other	allowance only	200			

Maximum Demand Summary

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Eurobodalla Health Service			
SOA based on CSP V3.0	V2.7 Preferred Option	VA/ sqm	Total kVa
Service / Unit			
Main Entry / Café	296	85	25
Emergency Dept	835	85	71
Intensive Care	646	85	55
Operating Theatres	1169	100	117
Sterilising Unit - see below			
IPU 1 - Medical	1118	70	78
IPU 2 - Medical/Surgical	1044	70	73
Women's & Paediatric Unit	542	85	46
IPU 3 - see below			
IPU 4 - Rehabilitation / GEM	1155	85	98
Medical Imaging	523	100	52
Pathology	399	85	34
Pharmacy	221	85	19
Ambulatory Care / Chemo / Renal / Oral Health / Allied Health/Virtual	2164	85	184
Executive/ Administration / Education	393	85	33
Mortuary	100	85	9
Health Information Unit	140	85	12
Back of House (inc. Kitchen/Engineering/Linen/Environmental/Dock)	775	85	66
Staff Accommodation - see below			
OVERALL HOSPITAL	**11520**		**972**
T&E (28%)	3226	50	161
Planning Contingency 5%	576	50	29
OVERALL HOSPITAL WITH T&E	**15322**		**1162**
Possible de-gasing / Electrification - Domestic Hot Water (20,128sqm) worst case option			390
Possible de-gasing / Electrification - HVAC - Heating (20,128sqm) worst case option			434
Possible de-gasing / Electrification - CSSD equipment **			200
Electrical Hot Water Option			**1024**
Future Hospital Expansion - Accommodation	350	70	25
Future Hospital Expansion - Education	650	85	55
Future Hospital Expansion - Sterilising Unit	427	100	43
Future Hospital Expansion - IPU 3	1085	70	76
Future Hospital Expansion - Other - TBC	TBC		
OVERALL FUTURE EXPANSION	**4806**	**85**	**409**
OVERALL HOSPITAL WITH T&E + FUTURE	**20128**		**2595**
COMMENTS			
* Blue - Expansion to be confirmed. ** Red - estimate only pending detailed information.			

Schedule of Areas and Maximum Demand.

3.2 Substations and High Voltage Connection

General

Depending on the Supply Authority configuration of their equipment, the High Voltage Cabling and the substations offer a different range of features that help support reliability in different ways.

The intent is to provide an appropriate level of reliability to the site and to the substation configuration.

High Voltage Cabling

The reliability of supply to the site will be influenced by the means of supply either underground or overhead, and also with the topology of the High Voltage wiring.

The Supply Authority and Policy may govern the cables to be underground. This is more expensive but does avoid risks from bush fires, storms and vehicle accidents.

The topology of the cabling to site can also influence the level of reliability. Generally, the higher the reliability the higher the costs are.

High Voltage Supply Options - Levels of Reliability
STEENSEN VARMING

Level of Reliability	Options	Description	Comments
Very High	Dual Dedicated Supplies from two different Zone Substations in completely diverse paths.	Normally applied to critical loads with high demand. Each Feeder has typically 4-5MVA Capacity.	The Northern Zone Substation is 7km - 10km makes any connection to it very expensive.
High	One dedicated supply direct from the local zone substation. The other supply from the HV network.	Optional solution applied configuration for critical load connections.	The local Zone Substation is close by. Standard HV costs with additional cost for HV gear within Zone Substation. This option to be considered pending Essential Energy Design Brief and cost assessment.
Medium	Two supplies from the HV network	Normal configuration applied to standard critical and non-critical load connections.	This option to be considered pending Essential Energy Design Brief and cost assessment.
Low	Spur Connection	The lowest means of connection to the network. Usually applied to rural and remote locations.	Not applicable

Where possible a high level of reliability would be provided for a hospital. The ability to achieve this within reasonable investment depends on the Supply Authority network in the area.

The high and medium options are to be considered, pending detail design, Essential Energy Design Brief and cost assessment. Generally, cables will Loop In and Loop Out with RMU using separate ducts within the same route, separated at exit points with connecting ability to switch from one HV feeder to another HV feeder.

With the Zone Substation located close by it is understood that a high reliability connection can be achieved without extensive additional cost and appropriate use of a standard Ring Main Unit.

Final arrangement is pending Design Brief from the Essential Energy.

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Substations
Substation / Transformer configurations range is size and type from Pole Mount, Padmount and Chamber Types. The proposed type will be governed by the local supply Authority. The final configuration depends on the type of customer. I.e, High Voltage or Low Voltage customer connection, the size of load and customer preferences.

Generally, for a hospital a decision is made on the type of substation, either Padmount or Chamber. Some notes of each type are below.

Kiosks Pad Mount Type

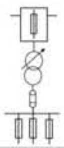
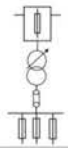
- Used generally for small to medium loads
- Limited in capacity to 1500kVA
- Approx. 4.2m x 7m of space per TX
- Possible limitations in the low voltage and high voltage switching arrangements due to limited space.
- Can't be generally built over therefore limiting the full use of real-estate
- Cost less than chamber type substation
- 6m clearances from ventilation openings is all directions
- Aesthetically less attractive and more exposed to vandalism.

Multi TX Chamber Type

- Used for medium to high demand loads
- 1500kVA subs
- Take up more space - 45.6sqm.
- Can be built over and thus ability to obtain better use of valuable land.
- More Secure and less prone to vandalism
- Easier to maintain especially in wet weather.
- Higher reliability and redundancy possible with the ability to link supplies in with a multi TX chamber if one fails.
- Greater flexibility in the high voltage switching and low voltage switch gear.
- Access and Ventilation aspects can be more complex.
- High Built Cost.

The following confirms the supply connection available for each transformer type.

The padmount and chamber configurations are shown below:

Substation Type	Transformers kVA	Approximate Rating AMPS Per Phase	Application
11kV Padmount / Chamber 	1 x 315 Various LV Fuse Options Up to 1 x 400A	400	Underground 11kV Radial or Closed Network Feeders
11kV Padmount / Chamber 	1 x 315 1 x 500 1 x 750 1 x 1000 **Single/LV Circuit Customer**: LV Bushing, isolator and circuit breaker connected. **Multiple/LV Circuits customer:** TX Isolator and various fuse/circuit breaker options, up to 1x1600A.	400 660 1000 1400	Underground 11kV Radial or Closed Network Feeders
11kV Padmount / Chamber 	1 x 1500 **Single/LV Circuit Customer:** LV Bushing, isolator and circuit breaker connected. **Multiple/LV Circuits Customer:** Tx Isolator and various fuse/circuit breaker options, up to 1 x 1900A.	1900	Underground HV Radial Feeders only

Proposed
Based on the information available, pad mount substation(s) have been allowed for this stage with the exact size and number pending further detail design. At this stage, allow for 2 substation easement locations.

3.3 Standby Generation

General
Standby generators provide a backup power supply to nominated loads when the mains power supply fails. The need for standby power can be either a statutory or business / clinical requirement.

Standby generators can be either diesel or gas type, the type to be selected depends on several criteria such as site infrastructure, type of loads to be supported and the allowable time to take load upon a mains failure.

Battery storage can also be used for relevant applications. At this point it is considered that Battery Power Storage for the size and type of the load is not appropriate.

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With regards to the sections of the Engineering Services Guidelines (ESG) on the extent of standby power supply, the decision on what does and doesn't gets finally connected to standby power is determined by the clinical staff and the LHD in regard to the functional operations of the facility, taking into account the safety of staff and the wellbeing of patients and visitors.

Standards
Standby Generation Power where provide shall be in accordance with the following standards and guidelines:

- AS/NZS 3009 Emergency power supplies in hospitals;
- NSW Department of Health – Engineering Services Guidelines (2016);
- AS/NZS 3000 Electrical Installation Wiring Rules;
- AS/NZS 2293.1 Emergency Lighting and Exit signs for buildings.
- Australian Health Facility Guidelines (AusHFG) Room Data Sheets & Guidelines.

Proposed
At this stage, it is proposed that on site external padmount 1000KVA diesel generator will be provided (considering 70% loading factor) with the provision of a 24-hour bulk storage fuel tank. The testing facility for the generator system is to be determined (either synchronised with grid or load bank). It is also proposed that the building will also be supported by an external temporary mobile generator connection facility.

In the next design phase further work will be completed on the final sizing with detailed costing on the impact an option for larger capacity generator system which would support additional air conditioning loads, facilitating appropriate environment conditions for occupants and for working staff in the event of a prolonged outage and future requirements.

3.4 Un-interruptible Power Supplies

General
Uninterruptable power supplies are power sources that incorporate an internal battery, inverter/rectifier that maintain power supply to selected items of equipment in the event of a mains power failure.

The NSW Health Engineering Services Guidelines identifies the following design principles associated with the provision of uninterruptible power supplies.

UPS systems will be required for specific critical loads. This includes ICT equipment, theatre equipment as basic requirements. Consideration should be given on a project-by-project basis, as to what loads require UPS support and whether local or centralised UPS's are best suited. As some equipment may be provided with inbuilt UPS; they should be accounted for in any design and capacity calculations.

Purpose and application of UPS
In selected areas, critical computer and communication systems and those systems supporting critical and major medical equipment will need to keep on operating without interruption in the event of a power outage. Some equipment and lighting cannot tolerate the delay between the power outage and the stand-by generator coming online and so an uninterruptible power supply (UPS) may be used to provide power to lighting and selected equipment until the stand-by generator is online and powering the critical load.

The on-battery runtime of most uninterruptible power sources is relatively short (up to 15 minutes is usually adequate) but it is sufficient to power the load until the stand-by generator is online, or until the protected equipment can properly shut down. In most cases a UPS will not be specified to supply high power equipment (e.g. x-ray generators) during the period with no power, but rather will be specified to keep the computers and control circuitry for major medical equipment operating, until the stand-by generator power is available.

3.5 Photovoltaics (PV) and Renewables

General
Renewable energy can be produced on site and or purchased from Energy Retailers. The use of Photovoltaics is the most appropriate source for on-site generation. Where used, they should be integrated such that they also provide another use such as shading or reduce heat load on the building.
The LHD also has the option to purchase green energy from the Energy Retailer under the 777 Contract.

Standards
The PV installation is to be provided in accordance with the following standards and guidelines:

- AS/NZS 1170.2: Structural Design Actions – Wind Actions;
- AS/NZS 1768 Lightning Protection
- AS 4509.1 Stand-alone power systems – Safety and installation
- AS 4509.2 Stand-alone power systems – Safety requirements
- AS 4777.1 Grid connection of energy systems via inverters – Installation requirements;
- AS 4777.2 Grid connection of energy systems via inverters – Inverter requirements;
- AS 4777.3 Grid connection of energy systems via inverters – Gird protection requirements;
- AS/NZS 5033 Installation and safety requirements for photovoltaic PV arrays;
- NSW Service and Installation Rules;
- Electricity Distributor Service and Installation Rules;
- Clean Energy Council – Grid Connected Solar PV Systems – Design guidelines for accredited installers;
- Clean Energy Council – Grid Connected Solar PV Systems – Install and supervise guidelines for accredited installers;
- Work Health and Safety Act.

Proposed
Several options have been provided. It is understood that the final size will be based on the final available spare roof space taking into account, clearances, access and funding.

Incorporate clearance for maintenance access ways, adjacent rows, lightning protection components, DC conduits and protection devices in accordance with CEC install and supervise guidelines and best practice guides.

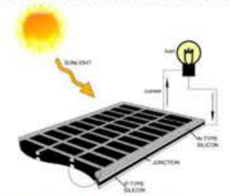

Diagram: PV Solution

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Standards
System will be provided in accordance with the following standards.

- Health Infrastructure – Engineering Guidelines
- AS 62040.1 Uninterruptible Power Supplies – General and Safety requirements.
- AS 62040.3 Uninterruptible Power Supplies – Method of specifying the performance and test requirements.
- AS/NZS 3003.

Proposed
It is proposed a 150kVA centralised UPS system shall be provided to support critical items of equipment as identified within the Engineering Services Guidelines and the approved Room Data Sheets (Australian Health Facility Guidelines) to maintain power supply to critical items of equipment.

The UPS system is to be configured with an N+1 redundancy arrangement, complete with an external maintenance bypass to allow removal of the UPS (for maintenance if required) without compromising the integrity of the power supply to the UPS supported loads and a minimum of 15-minute autonomy at end of life.

For large medical imaging equipment, it is envisaged that the backup power systems will be integral to the procurement of the medical equipment.

UPS outlets for patient care areas will be protected as defined in Wiring Systems for Patient Treatment section.

3.6 Switchboards

General
Switchboards included Main Switchboard, distribution boards and load centres, panels for lighting and power. While this section mainly addresses switchboards related to Electrical Services Trade, the requirements of protection selection and discrimination extend to all trades such as mechanical switchboards/ motor control centres (MCCs), hydraulic and vertical transportation boards.

Standards
Switchboards must be provided in accordance with the following:

- AS/NZS 3000 Wiring Rules;
- AS/NZS 61439 series of standards - Low Voltage Switchgear and Control Gear Assemblies;
- NSW Service and Installation Rules;
- Essential Energy requirements

Proposed

Main switchboard will have a minimum form of separation of at least AS/NZS 61439 Form 4. Main switchboards at all new heath care facilities will as a minimum aim to be designed to the following design principles:

- The main switchboard will be housed in a separate, accessible room, suitably ventilated and not subject to flooding;
- Divide the busbar system into separate 'essential', 'fire safety' and 'non-essential' circuits, each segregated from the other by fixed and continuous barriers. Clearly label each segregated section of the busbar system;
- The life safety section / business critical sections will be supported by a standby alternative power source, as well as facility for connection of a mobile generator
- 25% spare capacity on all busbar sections, but no need to install spare breakers;
- Provide complete grading and discrimination of all switchgear throughout the installation with the utility and standby generation system and;
- Power factor correction equipment to be installed.

The main switch room requires two egress routes, one with large double door access for equipment. The room is required to be 120/120/120 fire rated and is preferred to be near the chamber substation room. Direct access from external to the hospital is required for authority and NSW Fire and Rescue access. Clearances to the equipment and room are required as per AS/NZS 3000:2018.

There is minimal to no requirement to treat the room for acoustics. Depending on spatial planning and the proximity of staff offices or sensitive equipment located near the main switch room, electromagnetic radiation affects and shielding of the room is to be considered. It is recommended to provide air conditioning to the main switch room as there is a possibility for the room to get quite hot which impacts lifespan and performance of equipment.

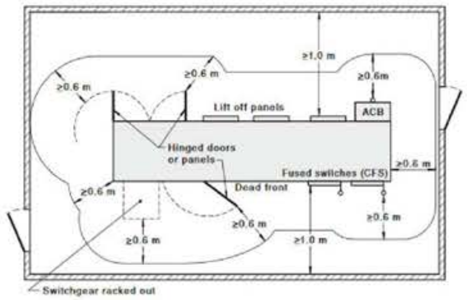

FIGURE 2.19 ACCESS TO SWITCHBOARDS—
FREESTANDING SWITCHBOARD WITH SWITCHGEAR RACKED OUT

<u>Distribution Boards</u>
It is proposed that the new distribution boards that comply with current code requirements. Each new distribution boards will incorporate split chassis for power and lighting circuits, sub -metering, transient surge protection and RCD protected circuits where required. Each distribution board will be housed within dedicated electrical cupboards located directly off corridor spaces.

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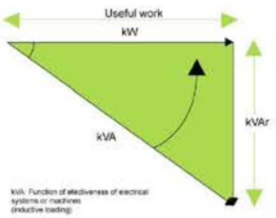
The electrical cupboards will be sized to allow works on the switchboards and consideration to alternative layout options which reduce impact of impeding pedestrian flow and functional operations of the corridor.

It is anticipated that each electrical cupboard will house a non-essential and essential distribution board in accordance with current Health Engineering Guidelines. Generally the boards will be Form 2. USP boards will be Form 4 such as Schneider Isobar / NHP Grizzbar or approved equal.

3.7 Power Factor Correction

General
Power factor correction is used within buildings to reduce the apparent power in kVA as seen by the supply authority metering, by installing capacitor banks to more closely align the apparent power kVA to the real power in kWatts.



Power Factor Graph

Standards
Power Factor Correction will be provided in accordance with the following standards.
- NSW Service and Installation Rules

Proposed
It is proposed that new power factor correction will be modern filter system shall be provided to the main switchboards in accordance with the NSW Service & Installation Rules.

The system will be complete with all associated control equipment, current transformer, and power factor regulator, capacitor banks with multiple phases to accommodate the fluctuating building load, contactors, fuses and anti-harmonic reactors. The power factor correction system will be designed so that it is automatically disconnected form the electrical installation when the standby diesel generator is connected to the system.

3.8 Metering

General
Subsidiary electrical metering of various areas of the installation can assist in the auditing of energy use and in the troubleshooting for system abnormalities. Digital multi-function meters will be incorporated at various strategic locations of the electrical network. As a minimum, multi-function meters will be provided to monitor all sub-mains servicing distribution boards, mechanical services switchboards and all other major control cabinets.

Standards
Energy metering will be in accordance with the latest NCC requirements as a minimum. This is to be interfaced to the mechanical services building monitoring and system (BMS).

<u>National Construction Code Requirements</u>
Private sub-metering will be provided to each main switchboard main switch / circuit breaker and to each outgoing submain such as mechanical plant and lift services.
Switchboards will be provided with separate metering for lighting and power switchboards in accordance with NCC Section J requirements.

<u>Private Meter Type</u>
As a minimum requirement the meters will provide Voltage, Current, PF, kWh, kVA, THD and kVAr and provide for central connection / interfacing and monitoring via the software analysis and reporting system.

Proposed
Supply Authority metering will be provided in accordance with Essential Energy requirements to monitor the energy usage of the building.
The electrical system within the new development will incorporate private sub -metering to each distribution board power and lighting chassis as well as each large submain over 100A/ph. The private meters will be connected to the BMS or energy monitoring system to allow comparison against the newly implemented Energy Performance Contract.

3.9 Earthing

General
Main electrical supply points of the building are provided with a MEN earthing.

Standards
MEN earthing system shall be provided in accordance with AS/NZS 3000 and the local supply authority regulations. Throughout the building, the earthing system will be in accordance with AS/NZS 3000 and incorporate 30mA RCD circuit breakers to all lighting and general power socket outlets sub-circuits, unless areas are body / cardiac protected with 10mA RCD circuit breakers.

Proposed
A MEN will be provided. Throughout the building all power outlet sub-circuits and lighting sub-circuits will be provided with RCD protection generally located within the distribution boards and positioned locally in some clinical care spaces where required.

Within clinical areas, earthing will be provided to suit the requirements of Cardiac and Body protected spaces in accordance with AS/NZS 3003,

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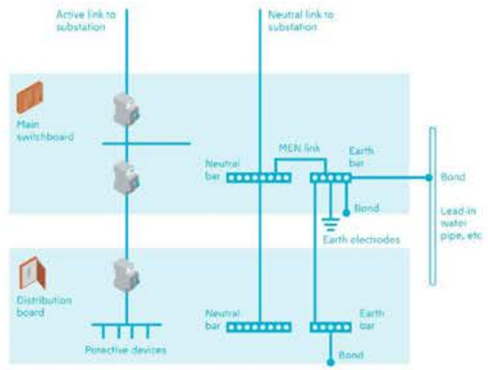


Typical MEN Earthing Arrangement

3.10 Submains and Services Reticulation

General
The types of submains for distribution of electricity supply from the main switchboard to light and power distribution boards and building services switchboards in various parts of a hospital building can broadly be categorised into the following groups:

Group A - Emergency Services (SAA defined)
Group B - Critical Care Services (Health Department defined)
Group C - General Services (Remainder)

Group A Emergency / Safety Services
The AS/NZS 3000 Electrical Installations define emergency services, some or all of which will be required in the hospital design. Submains for the emergency services require special provisions to ensure integrity of supply in fire and other building emergency situations.

Submains for the above SAA defined emergency equipment shall have fire and mechanical protection ratings as specified in the respective Australian Standard having jurisdiction over the system or installation.

Group B Critical Care Services
Standby lighting and power systems to AS/NZS 3009 shall be provided in critical care areas.

Submains for lighting and general-purpose power outlets in critical care areas require special consideration to ensure continuous availability of power supply.

Light and general-purpose power outlets in critical care areas shall have dedicated submains originating from the main switchboard, feeding dedicated distribution boards. The switchboard(s) and submains shall be configured to ensure continuous availability of electrical supply.

Two dedicated submains circuits shall be provided for each critical care area. At least one of the circuits shall be connected to the standby generator supply where installed. Via manual or automatic switching, it shall be possible to re-establish the supply to all distribution boards in particular areas if one submain supply fails. Critical care submains cables are not required to be fire rated. Protection against mechanical damage shall be provided.

Standby power shall be connected to all critical patient equipment involved in invasive subcutaneous procedures. This will allow clinical personnel time to complete or finalise an invasive procedure without risk to the patient.

Standby power shall also be provided to all subsidiary mechanical, hydraulic and medical gas systems (which are dependent on an electrical power source to operate) and are essential in delivering the services to the Critical Care areas.

Group C General Services
The remaining sub-mains for non-critical services and equipment will be wired in accordance with AS3000 and will comprise the following:
- General light and power throughout the buildings;
- Mechanical services systems;
- Medical imaging system;
- Computer (IT servers) system; and,
- Hydraulic services system

Standards
Submains shall be in accordance with the following standards and guidelines:

- AS/NZS 3009:1998 Emergency power supplies in hospitals;
- NSW Department of Health – Engineering Services Guidelines (2016);

Proposed

It is proposed that Submains will be provided in accordance with the NSW Health Engineering Guidelines. All new power cabling be sized to accommodate the load and incorporate spare capacity for future expansion in accordance with the Engineering Services Guidelines, AS/NZS3000 and AS/NZS3008. Submain cabling will be fire rated where it serves life safety equipment.

Cabling will be reticulated throughout the building on dedicated cable trays with IL4 seismic fixings (separate for power and communications services) sized to accommodate the required cabling and have 30% spare capacity for future cable installation. It is proposed that fire rated cable tray be provided with IL4 seismic fixings to support all submains, including 'life safety' fire rated submains, in accordance with AS/NZS 3013:2005 fire test requires that all the items that comprise a cabling system operating in the fire rated zone must be tested and pass as a system.

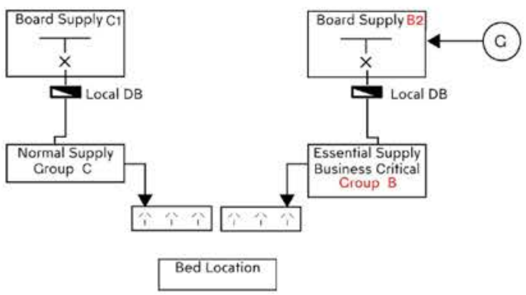
It is proposed that cable trays for power and communication services be separated either side of corridors, to assist in minimising the effects of EMI on the communication cabling.

In review of a number projects, there has been various methods of achieving the requirement of providing two dedicated submains to critical care areas. In some cases, some solutions have provided the primary submains and the backup submains from the same section of the Main Switchboard. While this method meets the written requirements of the guidelines, it is our opinion that it does not meet the intent. Having both submains from the same section of the main switchboard presents an installation that has a single critical point of supply failure. Thus, if maintenance work or an outage occurred on that section of the main switchboard, all supply would be lost.

The various types of submains proposed are in accordance with the guidelines. Quantities shall be provided to accommodate the various loads required in satisfying the functional brief.

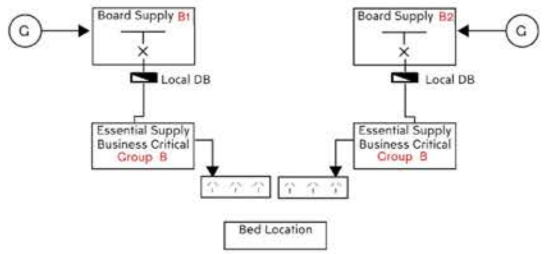
Power Arrangement for Health Buildings
Typically, there are three (3) Types of supplying power to typical Patient Care Areas which the following high-level diagrams indicate. The load in the images indicate Bed Location the same logic will be applied to critical loads such as ICT Comms racks.

Type 1 Main Power Supply Arrangement



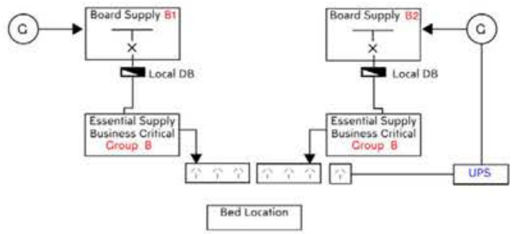
In **Type 1 arrangement** there is a mixture of power outlets from two different power supplies *Normal Supply Group C & Essential Business Critical Supply Group B*.
Each supply would originate at different Main Switchboards (MSB) where possible. One of the Sections, the Essential Section is Generator backed up.

Type 2 Main Power Supply Arrangement



In **Type 2 Arrangement** there is a mixture of power outlets from two different power supplies; both are *Essential Business Critical Group B*. Each supply would originate at different Main Switchboards (MSB) where possible. Both Sections are backed up by Standby Power Generator.

Type 3 Main Power Supply Arrangement



In **Type 3 Arrangement** there is a mixture of power outlets from two different power supplies; both are *Essential Business Critical Group B*. Each supply would originate at different Main Switchboards (MSB) where possible. Both Sections are backed up by Standby Power Generator.

In addition, there is Uninterruptible power systems (UPS) which supplies a limited number of power outlets.

These arrangements shall also be considered for services and functional areas that support patient care areas such as Nurse Call and staff stations. Thus, where field equipment is provided for a service the power supply to these items of kit should be arranged such at each alternate item is supplied from different power supply.

At this stage dual power supplies from separate supply sources will be provided to following.

- Nurse Call Main Panels; this covered at ICT racks but also need to consider remote main gear in the field.
- IT Cabinets and Racks; - this is covered in our standard rack layouts BMS main terminal & Data Gather Panels.

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- Dual Supply for journey boards.

3.11 Servicing Strategy and Redundancy

Redundancy is a central strategic question to any business that relies on certain systems for its operation. In order to determine the required level of redundancy and reliability when planning a facility or extending an existing one it is of utmost importance to first analyse which services require which degree of availability.

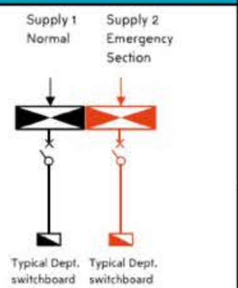
Although it may be desirable for reasons of operational ease to provide high availability to all services, the cost of this level of availability must be compared to the potential cost of failures of these services.

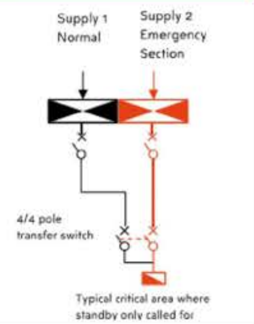
Providing a higher level of redundancy and reliability than a service requires may increase the inefficiency of the infrastructure and the operational recurrent costs would be higher.

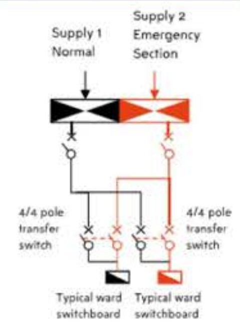
It is noted that the ability to service equipment and maintain operations is desirable. Thus, solutions that enable this including n+1 arrangements and alternative supply solutions must be provided. It is noted that the true understanding of the systems involved is necessary for example there is less benefit in providing redundancy by way of an alternative power supply to a chiller if the pumps are off another non -functional supply.

To provide resiliency, each level of power supply can have an alternative redundant back up supply with alternative servicing routes. This can be applied from power feeders, substations, generators, UPS, main switchboards, distribution boards and down to each outlet such that there is no single point failure in the system.

There are generally three options for supplying power to distribution boards. The third option provides the most redundancy but requires the most space and comes at a higher cost.

Option 1 Separate Supplies & Switchboards Each Dept. has two individual switchboards	Pros	Cons
	- Each department has a mixture of normal and emergency power outlets and lighting. - In Planned or Unplanned power outage at local switchboard the department can still function with limited power and lighting.	- More space and costs for extra switchboard and additional final sub-circuiting .
	- If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting.	
	-	-

Option 2 Single Board with Redundancy Submain Supply Transfer Switch	Pros	Cons
	- Less space and costs for extra switchboard and additional final sub-circuiting .	- All Lighting and power is on the one switchboard thus in Planned or Unplanned outage of local board department can not function.
	- If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting.	- All services in department are on same local Switchboard - single point critical
		-

OPTION 3 Separate Supplies & Switchboards Full Redundancy	Pros	Cons
	- Each department has a mixture of normal and emergency power outlets and lighting. - In Planned or Unplanned power outage at local switchboard the department can still function with limited power and lighting.	- More space and costs for extra switchboard and additional final sub-circuiting .
	- If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting. -	- Additional cost & space for transfer switches -
Note: High Critical loads also have UPS units and server equipment have dual supplies inputs.	-	-

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3.12 Wiring Systems for Patient Treatment

General
Cardiac Protected Areas and Body Protected Areas are defined as per AS/NZS 3003.

<u>Body Protected Areas</u>
All patient occupied areas are to be provided with a minimum body protected wiring system. Patient areas include areas where the patient may be located for treatment, diagnosis or accommodation, including wards, patient bathrooms and patient holding areas.

<u>Cardiac Protected Areas</u>
A patient is considered as undergoing a cardiac type procedure when an electrical conductor is placed within the heart or is likely to come into contact with the heart and such conductor is accessible outside the patient's body. In this context, an electrical conductor includes electrical wires such as cardiac pacing electrodes, intra-cardiac ECG electrodes, intra-cardiac catheters or insulated tubes filed with conducting fluids. Equipotential Junctions and Terminals will be provided in all Cardiac Protected Areas to comply with AS/NZS 3003.

Generally, RCD's shall be flush mounted on the Medical Service Panels (MSP's) and shall include 'power available' indicators and trip alarms. Where the RCD serves more than one room or is otherwise remotely mounted, additional indicators shall be provided in accordance with the standard.

RCD's shall be provided in accordance with AS/NZS 3003 and shall be Type 1, 10mA rated and be connected to no more than 12 General Purpose Outlets (GPO's).

Equipotential earth bonding shall be provided to AS/NZS 3003. Testing shall be to AS/NZS 3003 and carried out by a medical system commissioning specialist. The appropriate symbol / label to indicate 'Body Protected Area' or 'Cardiac Protected Area' shall be supplied and fitted in a prominent location in accordance with AS/NZS 3003.

Some patient care areas warrant UPS power outlets. Where UPS power is provided to patient care areas detailed assessment must be completed to ascertain the appropriate protection is provided with options ranging from RCDs with Alarms to Isolation Transformers with LIOMs.

Standards
AS/NZS 3003 Electrical installations – Patient Areas

Proposed
Within the nominated Body Protected and Cardiac Protected areas of the building, additional Residual Current Device (RCD) earthing requirements will be provided in accordance with AS/NZS 3003. It is proposed that line isolation transformers and associated monitors are provided for selected UPS outlets within the cardiac protected areas, such as Operating theatre medical service pendants. The final protection will be verified in the future stages of design.

3.13 Lightning & Transient Protection

General
Lightning protection and transient protection are important systems incorporated within buildings to assist in minimising damage to the building structure and to the electrical / electronic systems within buildings.

Standards
A lightning protection system will be provided in accordance with the following standards.

- Health Infrastructure – Engineering Guidelines
- AS/NZS 1768 Lightning Protection for Buildings

Proposed
It is proposed that Lightning Protection system shall be provided in accordance with AS/NZS1768. Surge protection must be installed on the Mains Power Supply.

Exposed metal roof and roof mounted elements must be bonded to the new structural reinforcement or via individual down conductors then bonded to earth via test points. It is also proposed that Surge Protection on the Main Switchboards, distribution boards and communications services will be provided.

3.14 Electromagnetic Interference

General
Electrical equipment and cables produce electromagnetic fields that could be, under certain circumstances, dangerous to health and may cause interference to other electronic equipment located close to such fields.

Standards and references
It is noted that there is no specific client requirement however, the electrical installation must be provided in accordance with the following:

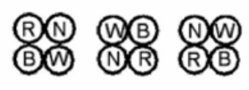
- Guidelines for the Management of 50Hz Magnetic Fields in Office Buildings Owned and Managed by the Queensland Department of Public Works Queensland Government, Department of Public Works - as there is currently no NSW Guide;
- ENA Guidance on Electrical Installation Practices to Reduce EMF from Low Voltage Wiring;
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).
- AS/NZS 3003.

Proposed
To minimise the impact of electromagnetic interference (EMI) the main sources of interference such as substation, main switch boards and diesel generator and their cabling are to be located away from sensitive areas and communications equipment within the building.

Also, the reticulation of submain routes throughout the building must be through dedicated services risers and along corridors to avoid areas with sensitive equipment or where people may be present for long periods of time.

It is noted that this may not always be possible therefore mitigation of interference must be implemented.

To reduce the likelihood of stray fields from submain installations, cables must be laid in **trefoil** configuration or in **quad** configuration as follows.



Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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4.0 Communications & ICT

4.1 Lead In Service

Telstra is the IPOLR of phone services for new the facility. It is anticipated that the adjacent underground network will be used to support the new facility.
It is proposed that dual lead-in communications cables shall be provided to provide redundancy as required by NSW Health Standards.
The new development will be services via the existing NBN Fixed Wireless OR Sky Muster Satellite service and does not require a new development application. Customers at the premises can connect to the NBN network via their chosen RSP. NSW Health to liaise with Telstra Accounts team to create a Wideband request.

4.2 Smart Building and eHealth

New and enhanced models of patient care are advancing, and with it demands a higher level of power reliability and ICT conductivity. Using our experience in ICT Strategy Planning and Digital Hospital Briefing works completed for the Central Coast LHD and at Northern Beaches Hospital we shall demonstrate how technology and system design topology will support VC, eHealth, Telehealth/ Healthnet, eMedical Records and the like in a safe and reliable manner.

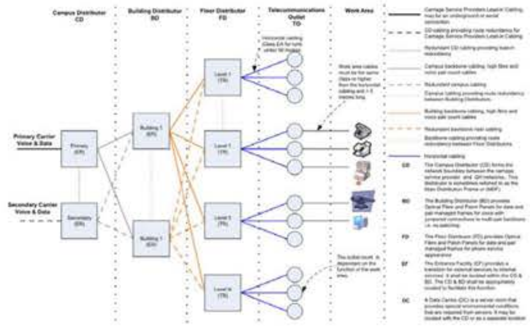
The application of '***Smart Building***' will be applied to ensure that the functional requirements of the modern health service is facilitated with a robust reliable inclusive of all relevant interfaces, this will involve close coordination with the BMS scope and coordination & collaboration with the LHD ICT strategy including:
- ICT Infrastructure (Integrated Structured Cabling, etc)
- ICT Functional Systems (security, BMS etc)
- ICT Business Systems (Software & servers, databases).

A clear understanding of the procurement 'grouping' will be defined to ensure cost & interfaces are included.

4.3 Structured Cabling System -Voice & Data

General
The NSW Health Engineering Guidelines identifies the following design principles associated with the provision of communications services.

The project has considered the master-plan for the hospital campus. The site-wide infrastructure needs must be assessed and balanced with the needs of the project, including future land acquisition and divestment opportunities.



NSW Health ICT Cabling Standard – Cabling Architecture

Above Cabling architecture shows typical configuration of cabling between Campus Distributors, Building Distributors, Floor Distributors and outlets.

Key considerations include:
- Proposed cabling routes to connect new facilities;
- Site location in context to the major data centre(s);
- Site location in context to the legacy PABX Room and;
- Cost and service impacts.

Cabling routes should be chosen to minimise the need for future relocation. In-ground cabling infrastructure will be carefully planned to not reduce flexibility of the site.

Where the needs require a local data centre to be established, it will be viewed as a permanent fixture on campus and positioned in the best location for the overall future of the site. NSW Health, eHealth, Health Share, Local Health Districts and NSW Health Infrastructure all have standards that will influence the ICT related works for a health facility.

- There are other areas ICT will be influenced by the following criteria;
- Recommendations of Australian Standards;
- New technologies that offer significant benefits to a health facility;
- Specific Project Briefing process and;
- Best practice from similar projects.

Proposed
It is proposed that campus distributors, carrier room, building distributors and Floor Distributors be generally provided as per relevant NSW Health ICT Standards. Due to the size of the facility each Campus Distributor and Building Distributor shall be combined to room 1 and room 2, while still maintaining separation and redundancy.

It is proposed that voice and data services be provided as per relevant standards. It is proposed that Communications facility cabling will be Category 6A F/UTP in accordance with Health Communication Guidelines. Communication facility cabling will terminate at Cat. 6 A RJ45 shuttered outlets.

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Communications cabling for other building services communications systems will be colour coded independently to each other and the LHD voice / data cabling.

4.4 Wireless Communications

It is proposed the new facility be provided with wireless access points (WAPs) to allow ubiquitous coverage internally and coverage to nominated external locations.

The coverage provided to meet the performance criteria which enables high quality Voice over Wi-Fi and Real Time Location Services (RTLS). The access points will be provided in accordance with the NSW Health Wireless LAN Infrastructure Design Guide to achieve Clinical Grade coverage in accordance with NSW Health Wireless LAN Infrastructure Design Guidelines.

4.5 Paging System

Further discussion is required with the LHD to determine the requirements of the paging system. It is assumed this will form part of the FFE ICT scope.

4.6 System Integration

It is proposed that the building engineering systems will be interconnected with each other to provide the required interfaces to enable the building to operate effectively and have the required building services information monitored / measured to assist in tuning the building to operate as efficiently and possible.

The various building services systems to be integrated will utilise the facilities communication structured cabling network to facilitate two-way communications with the hospital messaging platform.

This will allow the following, but not limited to, building services systems to be interfaced:

- Clinical systems alarms and monitoring;
- Fire System;
- Access Control System;
- CCTV System;
- Duress Alarm System, including Mobile Duress;
- WiFi Mobile Phone system;
- BMS, including building services systems monitoring;
- Electrical meters;
- Exit & Emergency Lighting System;
- Nurse Call system;
- MATV

As part of the project there is a requirement to set up and maintain messaging flows.

A new Message Integration Engine will be considered as part of the IT FFE budget.

4.7 Distributed Antenna System / Mobile Phones

General
Distributed Antenna Systems (DAS) transmits and receives or relays RF signals within buildings, structures, tunnels, or other areas where wireless services cannot be provided because of lack of signal penetration from outdoor networks or where no suitable outdoor network exists.

A DAS facilitates the In-Building Coverage (IBC) for mobile wireless devices where access to wireless communications is increasingly important in health facilities.

Mobile wireless devices in a health facility can include:

- Mobile and smart phones;
- Laptop computers and tablets;
- GRN devices;
- Health Interior Radio Paging Network;
- Any other devices using commercial carrier provided access, including security and biometric devices using Subscriber Identity Modules (SIM cards).

A dedicated In-Building Coverage system usually consists of:

- Mobile Telecommunications Operator base station equipment, often located in a facilities room, communications room or other service area;
- Cables which run from the base station through the building risers connecting the base station equipment to antennas;
- Small antennas located on ceilings or walls in strategic locations.

Proposed
It is proposed that the new facility incorporates an active Distributed Antenna System pending a detailed survey plus consideration of future commercial and technology situations.

4.8 Audio Visual Systems

Overview
The Audio-Visual systems, include Public Address, Hearing Augmentation, Meeting Room systems with Sound Reinforcement to special Operating Theatre systems for educational purposes where warranted. The works will be coordinated with the acoustic and lighting designs, addresses the DDA, and include best practice in terms layout and line of sight to monitors and access to controls and ensure that systems are set up in an intuitive manner which are easy to use.

There are associated works which form part of the electrical trade. These include provision of dedicated 240v power supplies, communications outlets VGA /HDMI and auxiliary audio jack outlets together with associated cabling & conduits to the locations as indicated on the drawings

Public Address (PA) Systems
Further discussion is required with the LHD to determine the requirements of the PA system. At this stage it is assumed to be required for emergency and medical imaging.

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Hearing Augmentation
A hearing augmentation system will be provided to assist with amplified speech within rooms nominated by the BCA consultant. Further discussion is required with the LHD to determine the need for hearing augmentation.

4.9 MATV System

General
Master Antenna Television systems provide free to air TV and radio services to patient care areas and other nominated locations within the Unit. MATV systems can also provide distributed movie, educational services if required.

Standards
The MATV system will be provided in accordance with the following standards.
- AS 1367 Multiple outlet distribution systems – Sound and Vision
- Health Infrastructure – Engineering Guidelines

Proposed
It is proposed that a digital TV system be provided to suit the requirements of the proposed development. It is proposed to install a new digital MATV system to provide free to air TV and radio services to the TV outlets nominated in the room data sheets.

4.10 Nurse Call

General
A new IP based nurse call system is proposed for the facility. The nurse call system shall be capable to be expanded to accommodate future Stages of developments. The nurse call system shall incorporate all outlets, indicator lights, cabling, terminations, control units, power supplies and system interfaces to complete the installation.

Standards
A new Nurse Call system will be provided in accordance with the following standards.
- Health Infrastructure – Engineering Guidelines
- AS/NZS 3811 Hard wired patient alarm systems for hospitals
- NSW Health and LHD Guidelines.

Proposed
The nurse call system shall incorporate nurse calls with Emergency Calls, Staff Assist, and patient call points and emergency call. The system shall provide two-way speech facility which may be specified in certain areas as required.

The proposed nurse call system will incorporate LED monitor type annunciators to display all system alarms and information board functions.

If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
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5.0 Security

5.1 Electronic Security & CCTV

General
Electronic security systems are an integral part of health services buildings as they assist in securing, monitoring and protecting building assets and staff during a security event. Systems include access control, intruder alarms, duress, both fixed and mobile and closed-circuit television systems.

Standards
Electronic Security will be provided in accordance with the following standards.
- Health Infrastructure – Engineering Guidelines
- Health Infrastructure Protecting People and Property
- AS 4485.2 Security for Health Care Facilities
- AusHFG room layouts
- NSW Health and LHD Guidelines.

Proposed
It is proposed that the new development be provided with an IP security system comprising access control, intruder alarms, duress alarms, CCTV system, PA systems, paging systems, hearing augmentation and intercom systems.

The electronic security system will incorporate the following systems. All security systems will be supplied through the central UPS to ensure they remain powered during a power outage of the main electrical supply. Provision for external monitoring of the security system can be made in the system if required by the client.

Access Control
An IP access control system shall be provided throughout the building. Locations of access-controlled doors will be as per the AusHFG room layouts and discussions from meetings with the users and engineers.

Fail Safe electrical strikes / electromagnetic lock will be provided and interfaced with the fire services system to release in the event of a fire alarm. However, the exact details on this are pending further discussion to address the clinical security requirements and as such may warrant special approval by the BCA consultant and PCA to enable delayed controlled egress.

Fixed Duress
Fixed duress will be provided in accordance with the AusHFG room layout sheets and shall form part of the access control system. Fixed duress buttons will generally be located under desks in rooms where they are required. Where there is no desk, buttons shall be wall mounted directly adjacent to the person providing the treatment.

Mobile Duress
The mobile duress provision is expected to be facilitated via the Wi-Fi system.

Coverage is to be proposed to be provided throughout the building with the resolutions noted below:
- Carpark and other external areas directly outside the building – 10m
- All indoor spaces – 5m
- Special rooms (rooms to be advised) – 3m

CCTV
Final locations of CCTV cameras will be identified during the security user group process. A monitoring location has not been determined but it is typically located in the emergency department staff station. The areas to be covered by CCTV cameras are as follows:
- Main entrance into the building
- Waiting rooms
- Car park and loading dock
- Ambulance/drop off bay
- Department entry points
- Cash handling areas
- Gun safe locations
- External entry to the safe assessment room (if relevant)

The CCTV system shall be capable of:
- Storing video feeds from all CCTV cameras for a period up to 30 days, while recording for all cameras;
- Be capable of Remote off-site monitoring;
- Accommodating analytics software;
- Expansion of the system;
- Integration with other CCTV systems (IP and Analogue);
- Be open protocol and compatible with CCTV cameras and equipment of various manufactures;
- ONVIF compliant;
- Capable to send images to the Government Data Centre should the requirement for excess of 30 days recording be required;
- Being interfaced with Security Access Control system, Duress Alarm system and Intruder Detection system. This shall allow the CCTV system to cater for features like recording on motion detection and producing an alarm signal which shall initiate the intruder detection and/or access control systems. Contractor must ensure compatibility between the above-mentioned systems.

High level interface from the security system to the CCTV system matrix to provide:
- Alarm and event outputs and status signals from the Access Control Security System to the Surveillance CCTV System to initiate pre-programmed actions controlled by the CCTV System;
- On screen display of CCTV images associated with alarms at the Security System.

Intercoms
An IP audio and video intercom system shall be provided in locations as agreed during meetings with the user groups. All call stations shall be complete with video capabilities. Intercom headend equipment shall be in the various floor distributors. Video master stations shall be in the staff stations as required. Video call stations to be located at the agreed entrance locations with remote door release capability to be provided to selected locations.

Intruder Detection System
The requirement for an intruder detection system shall be discussed and agreed with the LHD at the security user group meetings.

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6.0 Lighting

6.1 General

Light has a direct influence on the perception of the space and the visual performance and comfort of its users. Research has proven that lighting can have a significant impact on the visual comfort, health and productivity for people working within the built environment.

In Hospitals and health care facilities, complex and diverse task are continuously conducted. Optimizing natural daylight and electric lighting is necessary for both performance and comfort of the staff and patients. Lighting design within hospital buildings is especially important considering the higher illumination levels and complexity of the tasks being undertaken.

Lighting shall be designed to create a comfortable, varied and inviting atmosphere and support the design of the architecture. The lighting will be designed in accordance with AS/NZS 1680, the NSW Health Service Guidelines and the National Construction Code Part J6. Lighting controls for the JHHIP may incorporate BMS controls for major circulation corridors, localised switching and occupancy / daylight sensors to assist with achieving energy performance criteria.

Standards
- AS/NZS 1158 External Lighting – Roads and Public Spaces;
- AS/NZS 4282-2019 Control of Obtrusive Lighting Effects;
- AS/NZS 4485.1-2021Security for Health Care Facilities.
- AS/NZS 2293 Emergency escape lighting and exit signs for buildings.

Proposed
The lighting is to be approached and designed in accordance with the following principles:

- An approach that supports the comfort and well-being of the patients;
- The lighting needs of the medical staff for examination, treatment and observation of patients;
- An approach that enhances and reinforces the Architect's vision and identity of the building, particularly to the lobby, and that is fully integrated into the architectural design;
- Designing lighting atmosphere (in terms of colour temperature, colour rendering properties, illumination intensity etc) to suit the context and use of different spaces;
- Provision of operational and functional lighting to the various spaces to fulfil visual task requirements without glare or discomfort;
- Lighting used to draw people to particular areas of down certain routes (orientation and wayfinding);
- Minimisation of energy consumption and environmentally sustainable initiatives as part of the design;
- Use of LED light sources for energy efficiency and minimisation of maintenance due to extended lamp life in comparison to traditional light sources;
- All luminaires to consider efficacy, light output ratio and suitable light distribution;
- The provision of an intelligent lighting control system to key areas and consideration of the lighting control strategies to provide flexibility of operation and reduce energy consumption;
- Use of occupancy sensors and automated control to control lighting when appropriate;
- Maximise daylight access and views to the landscape, to maintain a connection to the outside/ day-night cycle for the patient;
- Designing night-time lighting so as to prevent light pollution or trespass onto adjacent properties.
-

6.2 Daylight

The use of daylight will have a positive influence on staff and patients. Daylight entering a space provides a connection to the outside and is important for giving context in time and space. This perceptual contact and the dynamic properties of natural light are key factors of comfort in terms of physiology and psychology. Several studies have linked quicker patient recovery times when patients recover with daylight/view access.

On the other hand, if the sun penetrates the space it may cause disabling or discomfort glare. The amount of daylight, especially direct sunlight entering the building shall be controlled by employing appropriate mechanisms to avoid glare (external louvers, light shelves, blinds, etc.). The details and level of control (manual, automatic) may vary depending on the space and its use. Artificial lighting shall be used to balance and supplement daylight throughout the day, or during patient clinical evaluation.

6.3 Cyanosis Lighting

For areas where cyanosis observation is required, as confirmed by the hospital, the light sources must meet the requirements of AS/NZS 1680.2.5:

- Correlated colour temperature (CCT) within CIE lamp colour appearance group 2, between 3300K and 5300K;
- Cyanosis Observation Index (COI) of not greater than 3.3, as determined in AS/NZS 1680.2.5.

Cyanosis compliant lighting is to be provided to patient transit areas and patient care areas and patient interaction areas including waiting areas, nurse stations, corridors, examination room, consultation rooms, operating theatres, wards.

The hospital should assemble a team of experienced staff members in different capacities (General Practitioner, Anaesthesiologist, Nurse, HI Representative, etc.) to assess and confirm the final spaces that will be designated for cyanosis observation and that require cyanosis compliant lighting.

6.4 External Lighting

To create a comfortable night environment, the site lighting will be organized in a hierarchical way that draws public/patients to key entrances. The lighting will be a play an important role in signalling visitors to that entrance. The main entrance and car drop-off areas will have higher light levels for increased visibility. Pedestrian pathways will be uniformly lit, creating a safe night-time environment, while mindful of light-spill onto adjacent properties and dark sky considerations. All external lighting shall be controlled via PE Cell and timers and connected to the central lighting control system.

6.5 Exit and Emergency Lighting

Emergency and Exit lighting will be provided throughout the building in accordance with the following guidelines and standards.

- Health Engineering Guidelines;
- AS/NZS 2293 Emergency escape lighting and exit signs for buildings;

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- National Construction Code.

Emergency lighting and emergency exit lighting are an essential part of the building lighting. The system will consist of luminaries and exit signs that identify an escape route as per the NCC/ BCA consultant's advice and escape path.

The fittings require regularly scheduled maintenance testing in accordance with the requirements of AS/NZS 2293. The maintenance testing of the emergency lighting system shall have the capacity for automatic testing, generate test reports, colour graphic display and be capable of remote monitoring (testing, report generation).

A monitored emergency lighting system is proposed for the development. The style and type of emergency fittings will be selected to suit the area in which it is located and to match the hospital standards and preferences. Generally, the emergency lighting equipment will be an integral part of the design and mainly concealed or unobtrusive. In line with this principle, where possible, emergency lighting will be integrated within general luminaries where possible or provided through dedicated recessed LED emergency fittings complete with self-contained battery and charger. Exit signs are to be slimline LED versions.

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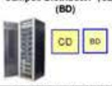
7.0 Appendix A – Electrical Services Spatial Spreadsheet

	Project	**Eurobodalla Hospital**				**Project No.** 207183		STEENSEN VARMING	
	Stage:	**Preliminary Spatial Advice**				**Date** 16/07/2021 **Revision** 4 **Name** MH/AK			
	Item	**Description**	**Preferred Location**	**Area & Foot print**	**Min Head Height and Discharge Height**	**Opening requirements & limitations to openings**	**Interdependancy**	**Acoustics & Ventilation**	**Comments**
E1	**SUBSTATION** 	**Pad Mount Substation**	Outside - 6m away from the building with access from the street and must be above flood level	30sqm 7m (W) x4.2m (D) x1.8m (H) each	N/A	Clear Truck Access	Main switch room shall be provided close to the substation and Chiller Plantroom - 10m away from gases		1 x 1500KVA - pending detail design - Allow for 2 TX at this stage.
E2	**Back Up Generator** 	**Pad Mount External . Back Up Generator**	Outside - 6m away from the building with access from the street and must be above flood level	9sqm 4.5m (W) x 2m(W) x 2.4m (H)	6m away from air intake.	External and weather proof complete with Acoustic Canopy	Close to Main Switchroom	Noise impact to be considered	1 x 1000kVa external weatherproof canopy type generator set. Final size pending detail design.
E3	**Main Switchroom** 	**Main Switchroom**	Ground Level with access from the street and must be above flood level	98sqm: 13m (W) x 7.5m (D) x 3.2m (H)	3.2m	Space for egress - 2 separate from diagonal points of the room. Clear access for Authority and Fire Fighters. Consider impact of EMI thus position electricity away from habitable spaces.Standard clearance requirements must be considered	Adjacent to Substation and Generator	Cooling required	Large door to allow access for equipment. Two forms of egress. 120/120/120 Fire rated located close to Substation and Mech Plant. Direct person access for metering reading is required from external. Must have access to the outside for authority access and NSW Fire & Rescue access.
E4	**UPS**	**UPS room**	Close to Communications Room	30sqm: 6m (W) x 5m (D) x 3m (H)	3m		Near Communications Room and Security Room.		Fire rated 120/120/120 - Located close to main Communications Room. N + 1 Configuration
E5	**Solar Power** 	**Solar Photovoltaic - Invertor Room**	Close to main switch room	30sqm: 7.5m (W) x 3m (D) x 3m (H)			Close to Main Switchroom		Locate close to Main Switchroom
E6	**EDB** 	**Electrical Distribution Boards (EDB) Light & Power**	Corridor	2.75m wide x 0.6m deep (each) located on each level and positioned coverage of ~30m radius. Vertically aligned on each floor. Located off corridor or accessible areas. Coverage not to cross fire compartments. (2.4m high doors). Refer to Electrical details sheet-E1008 for details and other options.		Locate away from egress paths - allow for door openings into corridors			2 hr Fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. Distribution boards shall be provided for each fire compartment to minimise the number of small penetrations through fire walls. Boards shall be minimum Form of Separation of Form 2. C/W Separate Light and Power Chassis with individual meters on each section. Critical Loads arranged in accordance with AS3009. Critical & Safety Services shall be Fire Rated in AS/NZS3013.
E7	**EDB Riser**	**EDB Cupboard**	Corridor	Allow a space of 700mm (width) and 0.250mDeep Cupboard space			Consider impact of EMI thus position electricity away from habitable spaces. Located with EDB		
E8	**Carrier Room**	**Carrier Room**		48 sqm for 3 Carriers 8m (W) x 6m (D) x 3.5m (H)			Locate away from water sources. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.	Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. Locate so that external Telcos can gain access without going through sensitive areas. 2 Incoming supplies for each telco provider for redundancy
C1/B1	**Main Comms Room Campus Distributor (CD) & (BD)** 	**Combined Campus Distributor and Building Distributor**	1off - Each Located at Different ends of the campus. Located not more than one above or below ground.	8m x 4m x 3.5m H 24 sqm	3.5m		Locate away from water sources. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.	Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. 2 Incoming supplies for each telco provider for redundancy
C2/B2	**Main Comms Room (2) Building Distributor (BD) & (CD)** 	**Combined Campus Distributor and Building Distributor & Server Room**		6m x 4m x 3.5m H 24 sqm	3.5m		Locate away from water sources. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.	Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.
C3	**Carrier Room** 	**Carrier Room**		48 sqm for 3 Carriers 8m (W) x 6m (D) x 3.5m (H)	3.5m		Locate away from water sources. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.	Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. Locate so that external Telcos can gain access without going through sensitive areas. 2 Incoming supplies for each telco provider for redundancy
C4	**Floor Distributor (FD)** 	**Floor Distributor**		4.1m x 3.4m x 3.5m H 14 sqm	3.5m		Locate away from water sources. Communications Rooms & fire compartments - Rooms shall be located to minimise the number of small penetrations through fire walls.	Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7. Locate so that external Telcos can gain access without going through sensitive areas. 2 Incoming supplies for each telco provider for redundancy
C5	**Communcation Riser**	**Telecommunication Riser cupboard**	Corridor	400mm x 250mm (each) located on each level and Vertically aligned. Preferably located off corridor or access areas. (2.4m high doors)				Cooling required	Recommended 60/60/60 fire rating. Smoke seals etc. to be in accordance with BCA clause D2.7.
C7	**Building Services Control Room**	**Building Services Control Room**	Anywhere	15 sqm	2.7m			Separate dedicated cooling and ventilation and compliance to AS2201.2	
C8	**Plant space**	**Roof level plant space for Satellite and Comms equipment**	BOH Areas	80 sqm	2.7m			Separate dedicated cooling and ventilation and compliance to AS2201.2	

If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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8.0 Appendix B – Drawings

EUROBODALLA HEALTH SERVICES

ELECTRICAL SERVICES AND LIGHTING
CONCEPT DESIGN

DRAWING LIST

E1000	COVER SHEET
E1002	ELECTRICAL SITE PLAN
E1003	LIGHTING SITE PLAN
E1004	ELECTRICAL SINGLE LINE DIAGRAM
E1005	COMMUNICATIONS SINGLE LINE DIAGRAM
E1006	ELECTRICAL DETAILS
E1007	ELECTRICAL TRENCHING DETAILS
E1008	COMMUNICATIONS DETAILS
E1009	PV DRAWING
E2000	POWER AND COMMUNICATIONS LAYOUT - LOWER GROUND LEVEL
E2001	POWER AND COMMUNICATIONS LAYOUT - GROUND LEVEL
E2002	POWER AND COMMUNICATIONS LAYOUT - FIRST LEVEL

CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

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PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
COVER SHEET

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	NTS

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
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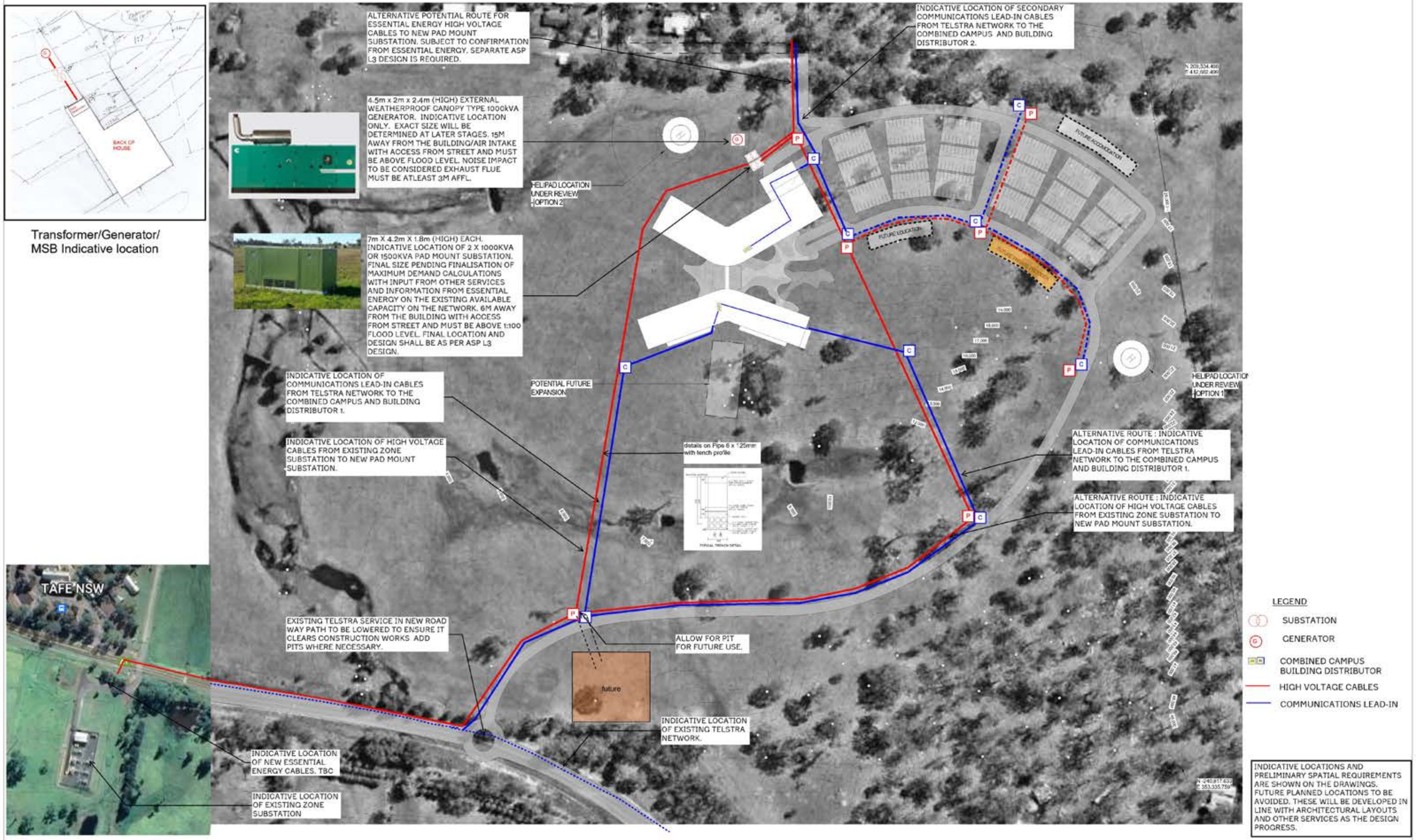

DESIGNED UNDER QUALITY SYSTEM CERTIFIED AS COMPLYING WITH ISO 9001 BY AN ACCREDITED CERTIFICATION BODY

CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

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PROJECT
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DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL SITE PLAN

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:1175

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
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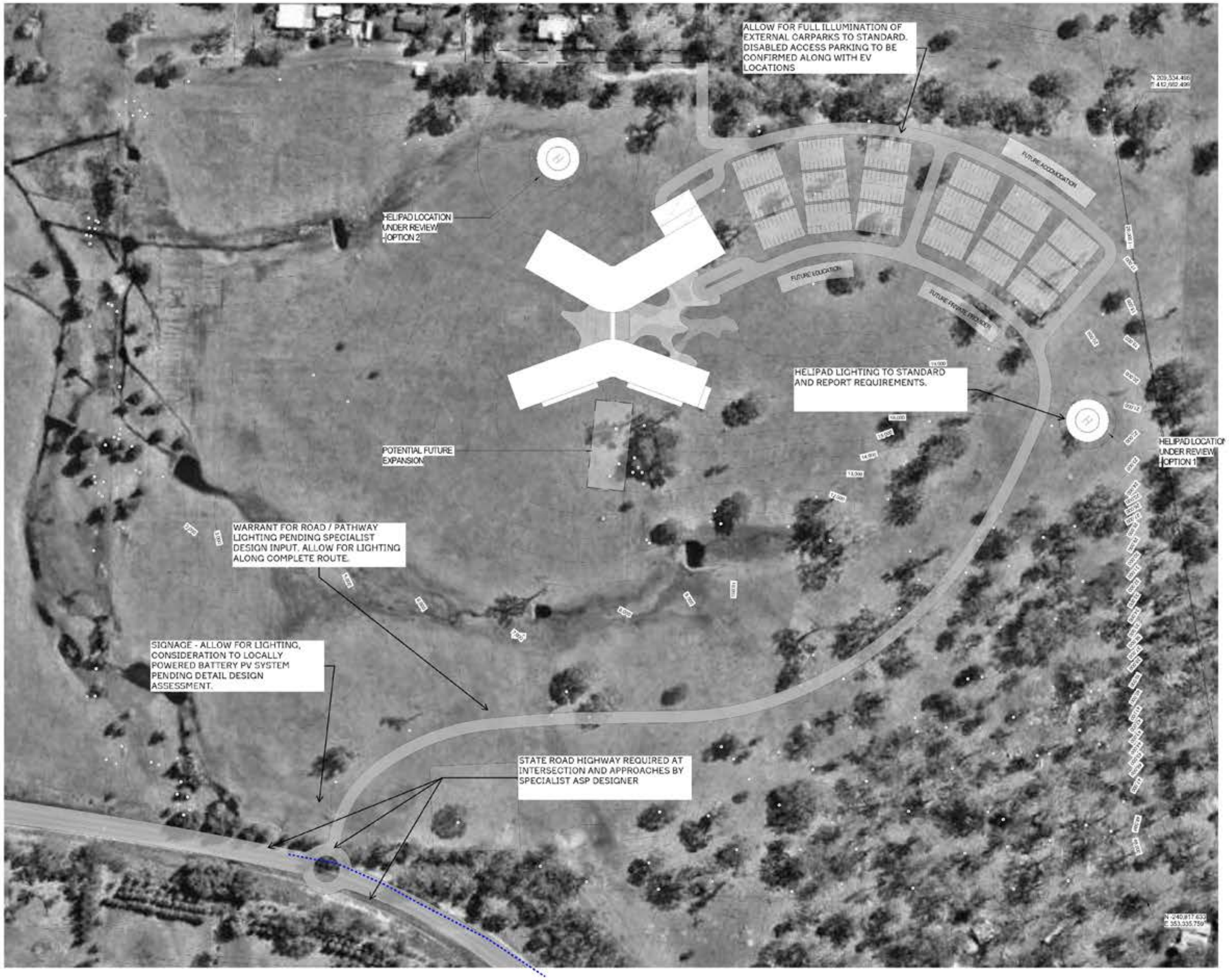

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AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

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DRAWING TITLE
ELECTRICAL SERVICES
LIGHTING SITE PLAN

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:1175

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
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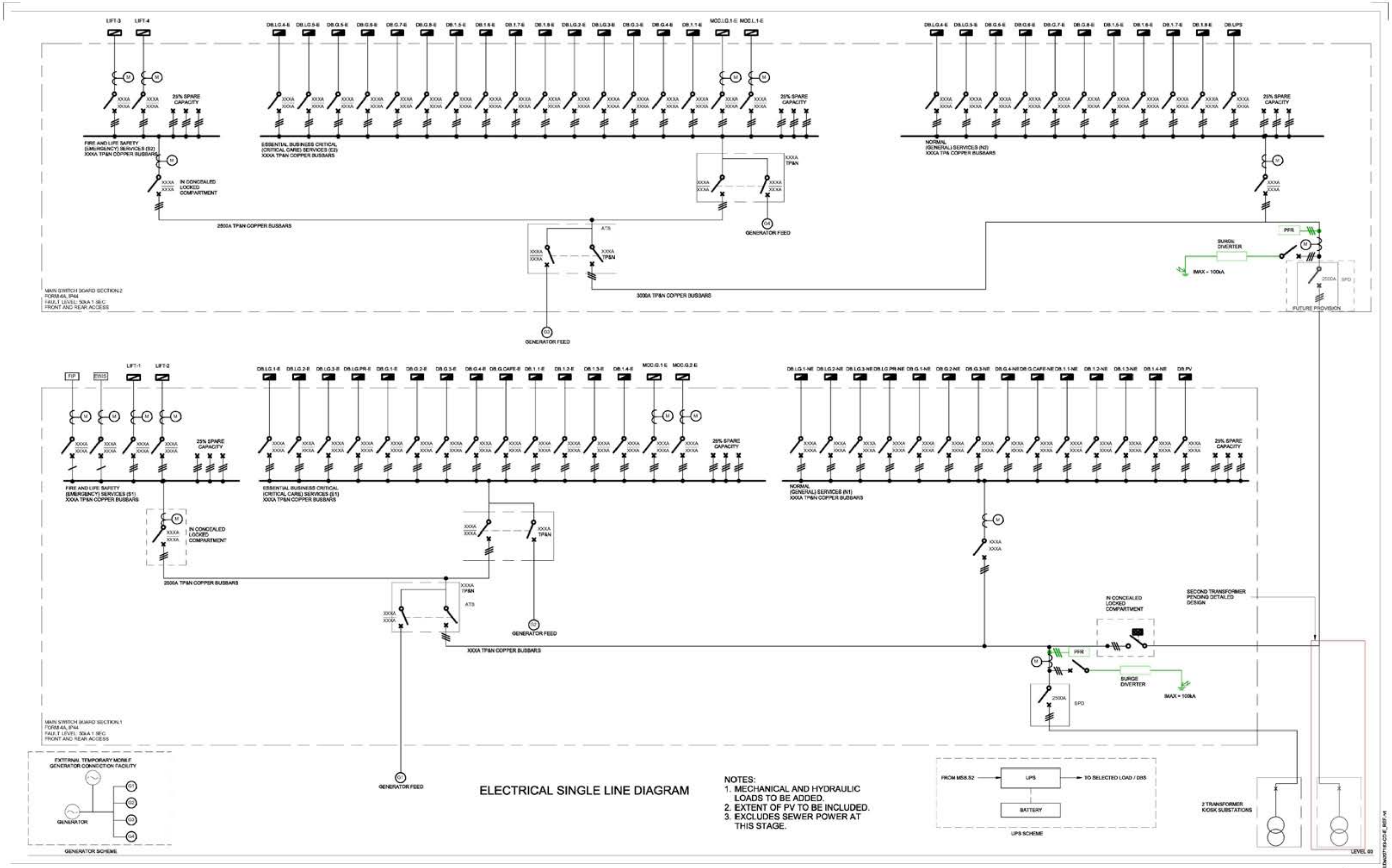

ELECTRICAL SINGLE LINE DIAGRAM

NOTES:
1. MECHANICAL AND HYDRAULIC LOADS TO BE ADDED.
2. EXTENT OF PV TO BE INCLUDED.
3. EXCLUDES SEWER POWER AT THIS STAGE.

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CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
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PROJECT
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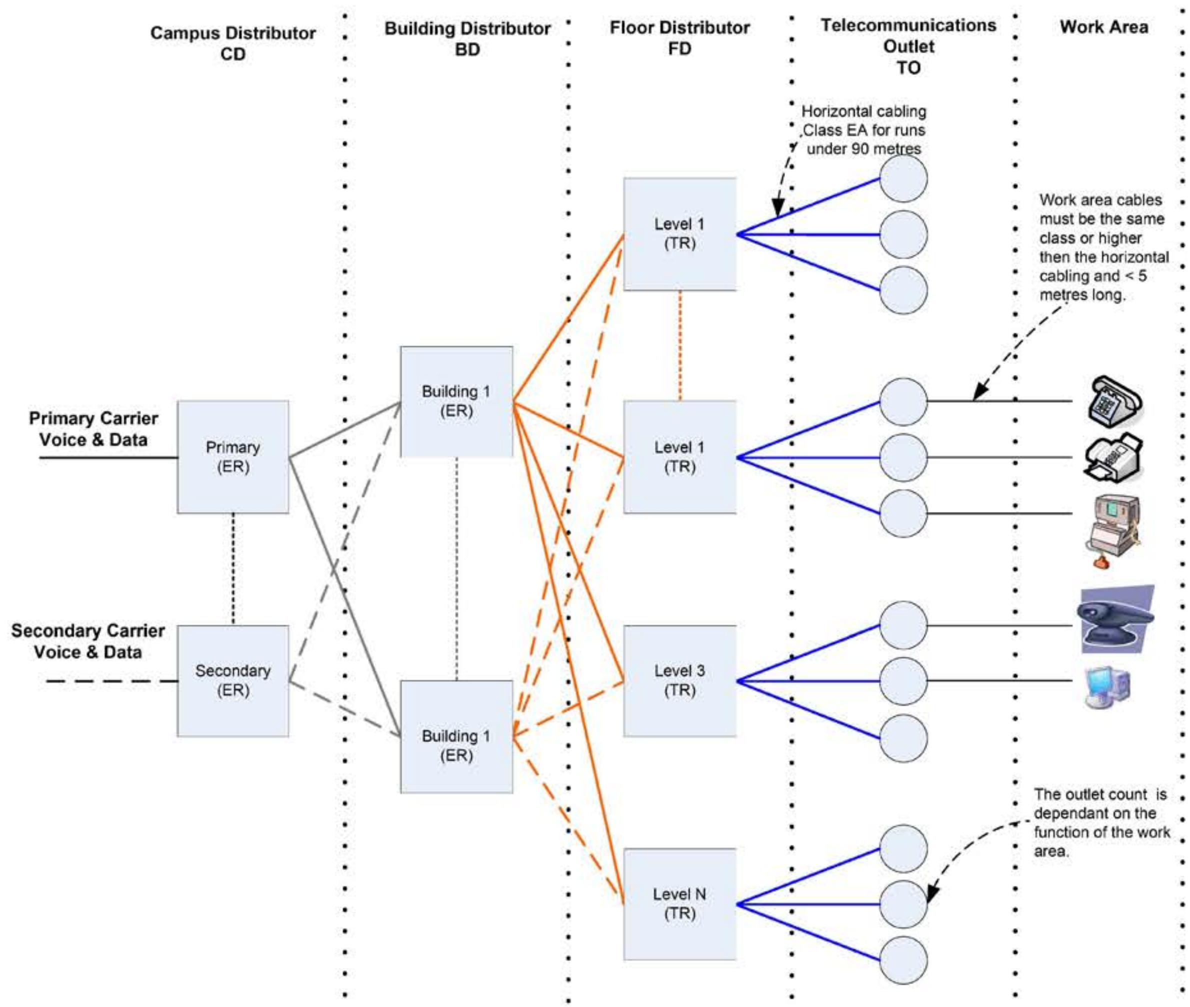
DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL SINGLE LINE DIAGRAM

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1 : 1

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E1004	2



Carriage Service Providers Lead-in Cabling, may be an underground or aerial connection

CD cabling providing route redundancy for Carriage Service Providers Lead-in Cabling

Redundant CD cabling providing lead-in redundancy

Campus backbone cabling, high fibre and voice pair count cables

Redundant campus cabling

Campus cabling providing route redundancy between Building Distributors.

Building backbone cabling, high fibre and voice pair count cables

Redundant backbone riser cabling

Backbone cabling providing route redundancy between Floor Distributors.

Horizontal cabling

CD The Campus Distributor (CD) forms the network boundary between the carriage service provider and QH networks.. This distributor is sometimes referred to as the Main Distribution Frame or (MDF)

BD The Building Distributor (BD) provides Optical Fibre and Patch Panels for data and pair managed frames for voice with jumpered connections to multi pair backbone i.e. no patching

FD The Floor Distributor (FD) provides Optical Fibre and Patch Panels for data and pair managed frames for phone service appearance

EF The Entrance Facility (EF) provides a transition for external services to internal services. It shall be located within the CD & BD. The CD & BD shall be appropriately located to facilitate this function

DC A Data Centre (DC) is a server room that provides special environmental conditions that are required from servers. It may be located with the CD or as a separate location

TYPICAL CABLING ARCHITECTURE FOR ICT IS SHOWN HERE FOR INFORMATION ONLY. A PROJECT SPECIFIC ONE WILL BE PROVIDE AT AT LATER STAGE.

DESIGNED UNDER QUALITY SYSTEM CERTIFIED AS COMPLYING WITH ISO 9001 BY AN ACCREDITED CERTIFICATION BODY

CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

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PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
COMMUNICATIONS SINGLE LINE DIAGRAM

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	NTS

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
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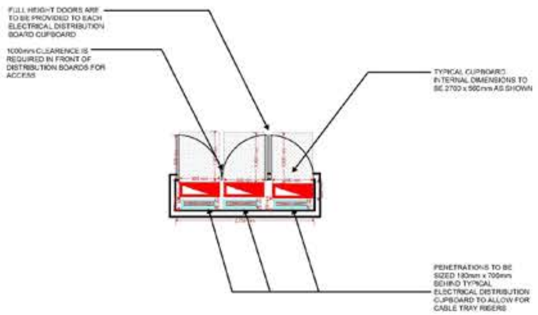
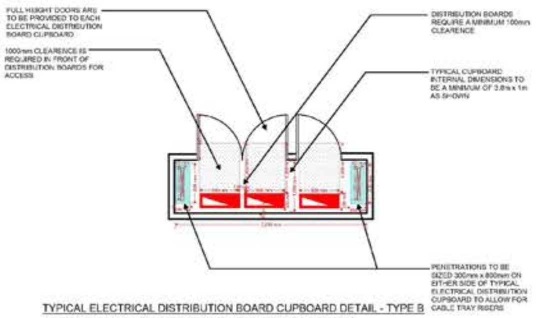


TYPICAL ELECTRICAL DISTRIBUTION BOARD CUPBOARD DETAIL - TYPE A

LOW DENSITY AREA HIGH INTERRUPTIONS TO THE CORRIDOR.
SWITCHBOARDS CAN HAVE DOORS WHICH WILL REQUIRE FURTHER SPACE IN THE CORRIDOR.

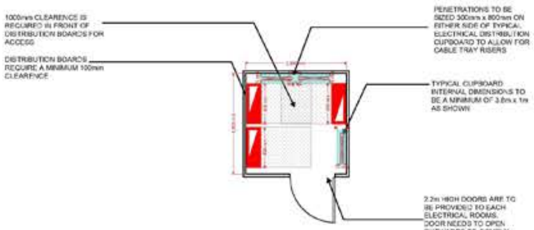
AREA: 1.65 sqm.



TYPICAL ELECTRICAL DISTRIBUTION BOARD CUPBOARD DETAIL - TYPE B

HIGH DENSITY AREA WITH ACCESS TO RISERS. HIGH INTERRUPTIONS TO THE CORRIDOR.
SWITCHBOARDS CAN HAVE DOORS WHICH WILL REQUIRE FURTHER SPACE IN THE CORRIDOR.

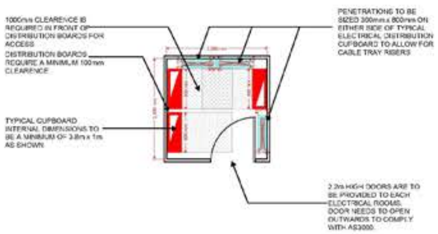
AREA: 3.8 sqm.



TYPICAL ELECTRICAL ROOM - TYPE C

ACCESS TO RISERS MINIMAL DISRUPTION TO CORRIDOR.
SWITCHBOARDS ARE CONSIDERED NOT TO HAVE DOORS.

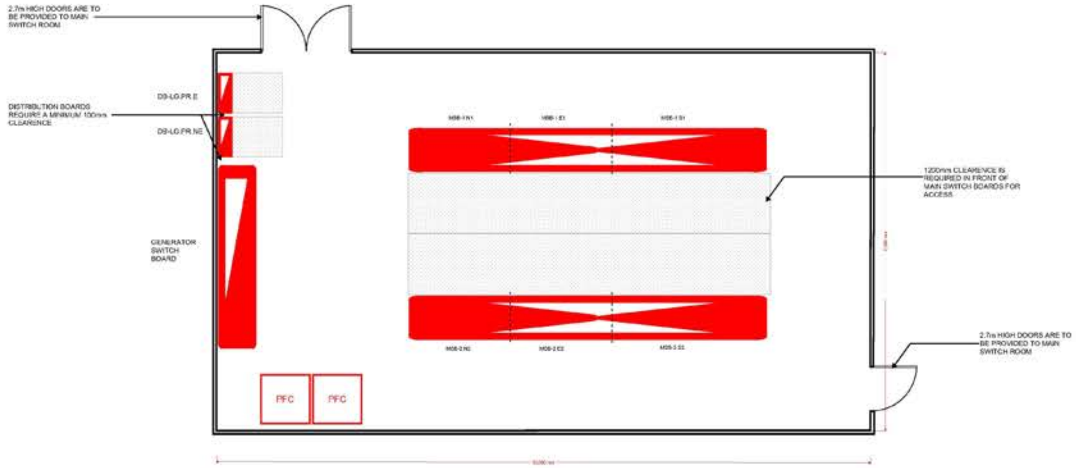
AREA: 4 sqm.



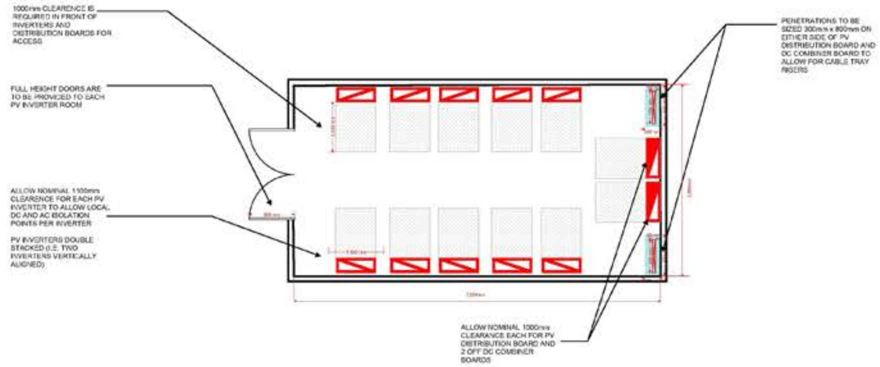
TYPICAL ELECTRICAL ROOM - TYPE D

ACCESS TO RISERS WITH NO DISRUPTION TO CORRIDOR.
SWITCHBOARDS ARE CONSIDERED NOT TO HAVE DOORS.

AREA: 4 sqm.



TYPICAL ELECTRICAL ROOM - TYPE C



TYPICAL PV INVERTER ROOM DETAIL

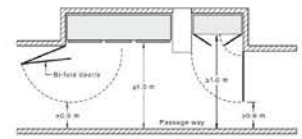


FIGURE 2.22 ACCESS TO SWITCHBOARDS—SWITCHBOARD DOORS THAT OPEN INTO ACCESS WAYS OR NARROW PASSAGE WAYS

SNIPPET OF AS3000

HIGHLIGHTS THE ADDITIONAL SPACE REQUIRED IF THE DB HAVE DOORS

NOTE: THIS DRAWING PROVIDES SPATIAL PLANNING REQUIREMENTS FOR POWER SERVICES.

ALSO OPTIONAL ALTERNATIVE WALK-IN EDBs, ARE INDICATED WHICH PROVIDE SOME BENEFIT ESPECIALLY IN HIGH DENSITY AREAS.

FINAL SOLUTIONS PENDING DETAIL DESIGN.

DESIGNED UNDER QUALITY SYSTEM CERTIFIED AS COMPLYING WITH ISO 9001 BY AN ACCREDITED CERTIFICATION BODY

CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

NOTES

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STEENSEN VARMING

PROJECT
EUROBODALLA HEALTH SERVICES

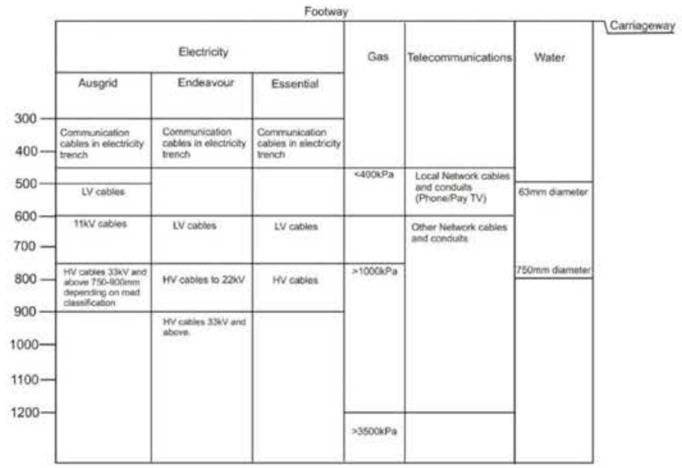
DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL DETAILS

A1

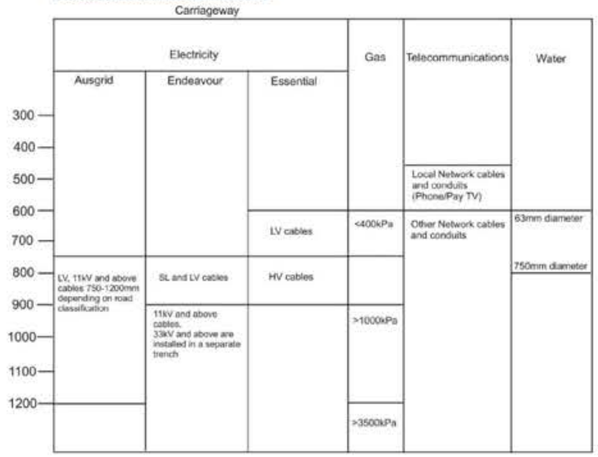
CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	NTS

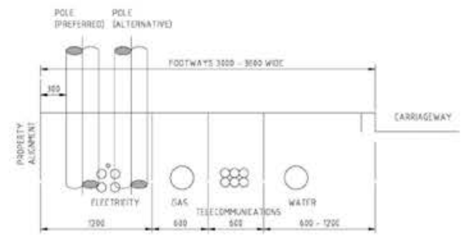
NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E1006	2

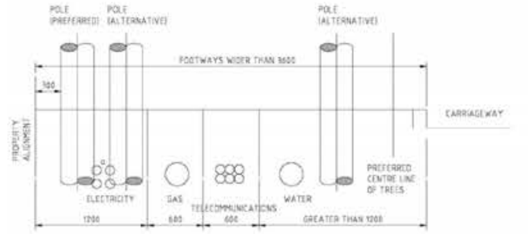
IN PATHWAYS NEW CONSTRUCTION



IN CARRIAGEWAYS NEW CONSTRUCTION







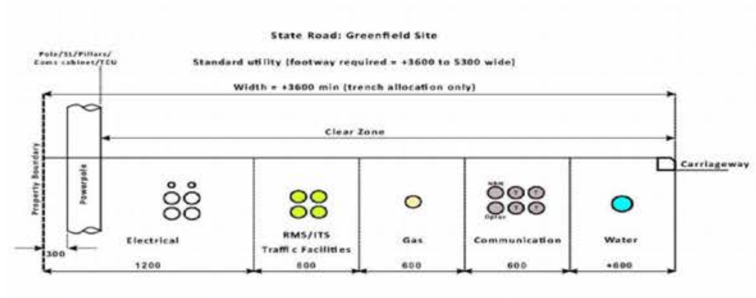
Desirable Minimum Separations Between Utility Services

Desirable Minimum Seperations **Horizontal mm**

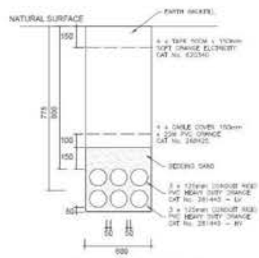
	Gas mains up to 75mm diameter	Gas Mains greater than 75mm diameter and up to 200mm diameter	Gas Mains greater then 200mm diameter	Telecommunication cables and/or conduits	Protected (2) low voltage electricity cables	Protected (2) high voltage electricity cables	Extra high voltage electricity cables	Water Mains	Sewer Mains	Drainage
Gas mains up to 75mm diameter	150	300	500	150	150	300	500	150	300	300
Gas Mains greater than 75mm diameter and up to 200mm diameter	300	300	500	300	300	300	4000	150	300	300
Gas Mains greater then 200mm diameter	500	500	500	500	500	500	4000	150	300	300
Telecommunication cables and/or conduits	150	300	500	100	100	300	1000	150	300	300
Protected (2) low voltage electricity cables	150	300	500	100	TBN	TBN	1000	1000	500	300
Protected (2) high voltage electricity cables	300	300	500	300	TBN	TBN	TBN	1000	500	300
Extra High voltage electricity cables	500	4000	4000	1000	1000	TBN	TBN	2000	1000	1000
Water Mains	150	150	150	150	1000	1000	2000	300	500	500
Sewer Mains	300	300	300	300	500	500	1000	500	300	300
Drainage	300	300	300	300	300	300	1000	500	300	300

Desirable Minimum Seperations **Vertical mm**

	Gas mains up to 75mm diameter	Gas Mains greater than 75mm diameter and up to 200mm diameter	Gas Mains greater then 200mm diameter	Telecommunication cables and/or conduits	Protected (2) low voltage electricity cables	Protected (2) high voltage electricity cables	Extra High voltage electricity cables	Water Mains	Sewer Mains	Drainage
Gas mains up to 75mm diameter	150	300	500	150	150	300	500	150	300	300
Gas Mains greater than 75mm diameter and up to 200mm diameter	300	300	500	300	300	500	1000	150	300	300
Gas Mains greater then 200mm diameter	500	500	500	500	500	1000	1500	150	300	300
Telecommunication cables and/or conduits	150	300	500	100	100	300	600	150	300	300
Protected (2) low voltage electricity cables	150	300	600	100	TBN	TBN	TBN	300	300	300
Protected (2) high voltage electricity cables	300	500	1000	300	TBN	TBN	TBN	600	300	300
Extra High voltage electricity cables	500	1000	1500	600	TBN	TBN	TBN	1000	600	600
Water Mains	150	150	150	150	300	600	1000	300	500	500
Sewer Mains	300	300	300	300	300	300	600	500	300	300
Drainage	300	300	300	300	300	300	600	500	300	300

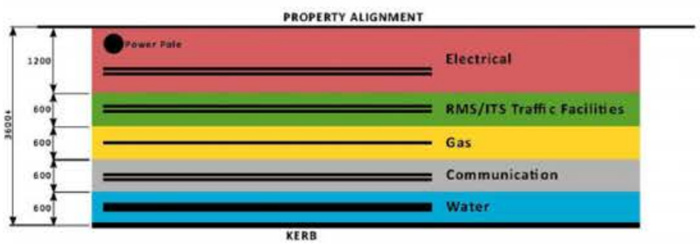


Standard Utility Service (trench allocation only)



TYPICAL TRENCH DETAIL

ELECTRICAL UTILITY



The details on this drawing are for information only, the actual arrangement will be as per utility requirements, the intent is to limit the easements and have shared easement / access.

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CONCEPT DESIGN

AMENDMENTS

REV	DESCRIPTION	DATE
1	CONCEPT DESIGN - 90% DRAFT	23/06/21
2	CONCEPT DESIGN	16/07/21

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PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL TRENCHING DETAILS

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	NTS

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E1007	2

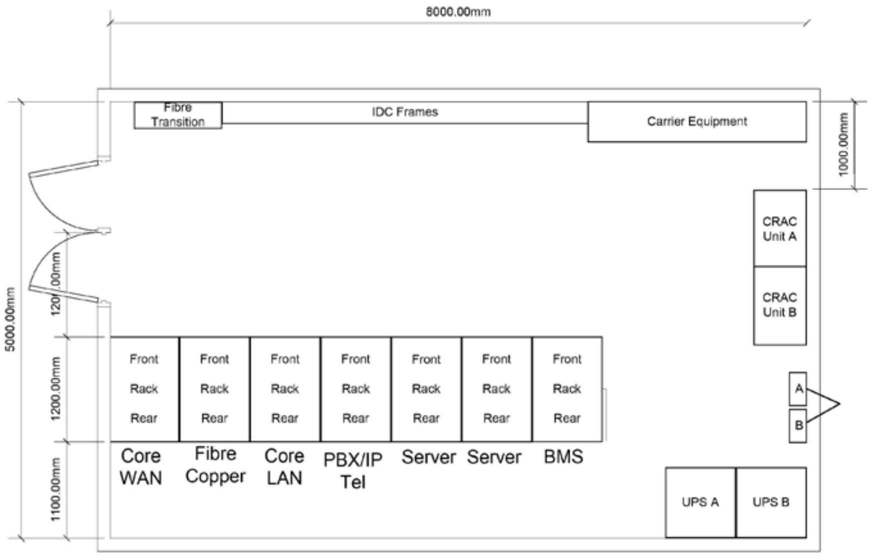


Figure 5. TR servicing up to 3000sqm of usable floor space

Notes:

1. Typical load would be a 9-12Kva for power and 9-12Kva for HVAC for NSW Health data side of room only.

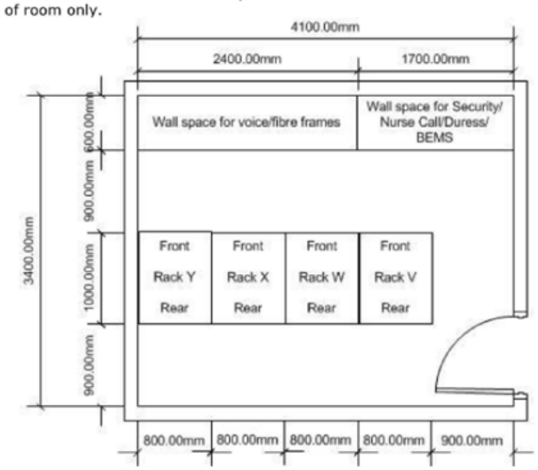
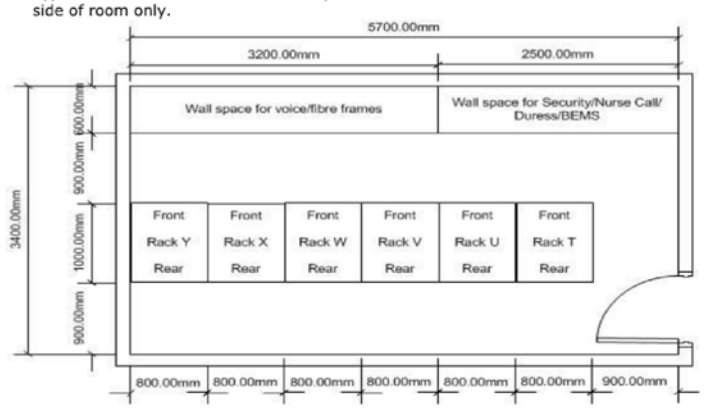


Figure 6. TR servicing up to 4000sqm of usable floor space

Notes:

1. Typical load would be a 12-18Kva for power and 12-18Kva for HVAC for NSW Health data side of room only.



CONCEPT DESIGN

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STEENSEN VARMING

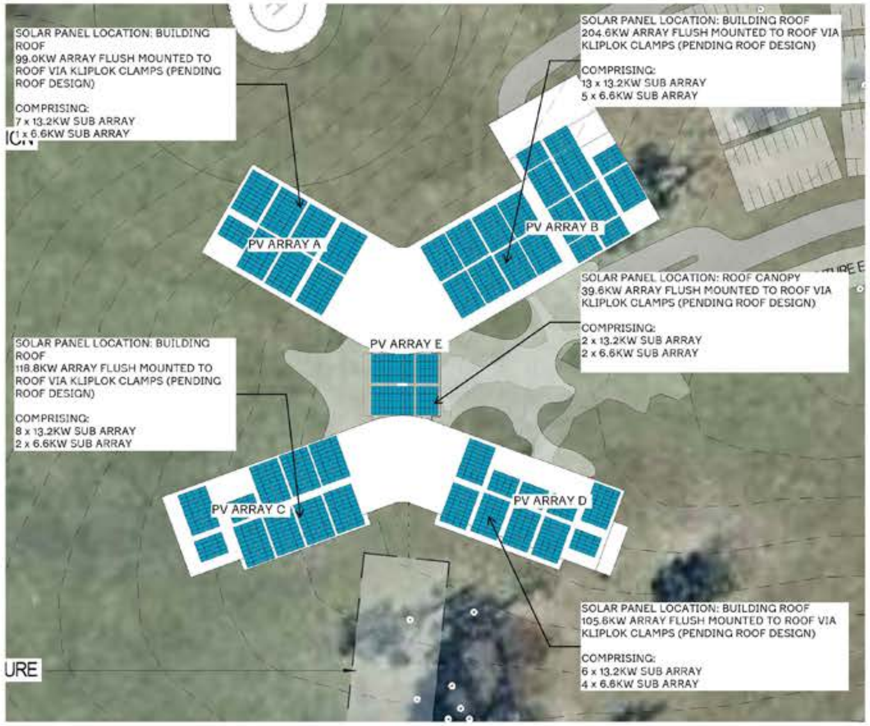
PROJECT
EURROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
COMMUNICATIONS DETAILS

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	NTS

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E1008	2



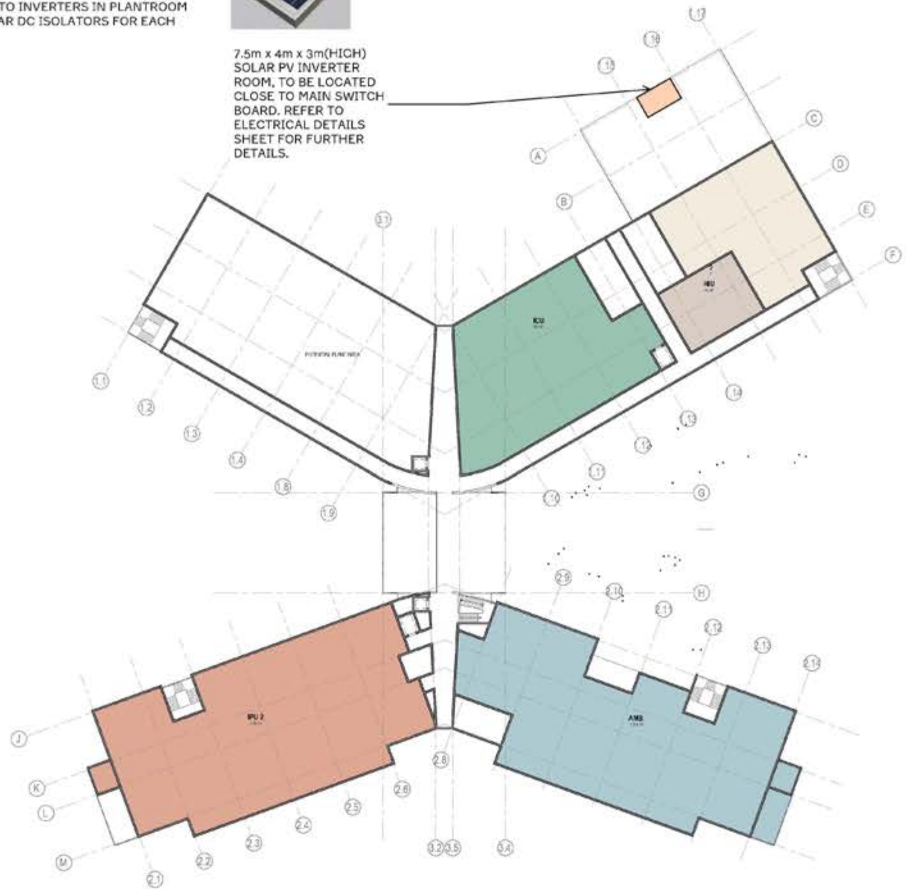
NOTE: THE DRAWING INDICATES SEVERAL PV OPTIONS. THE EXTENT OF PV IS PENDING, BUILDING LAYOUT, ESD STRATEGY AND FUNDING.

FOR EACH ROOF PROVIDE:
- SOLAR PV ARRAY TO MAXIMUM AVAILABLE ROOF SPACE (ASSUME 80% AVAILABLE ROOF SPACE),
- NOMINAL 600MM CLEARANCE FOR MAINTENANCE ACCESS BETWEEN ADJACENT ROWS
- NOMINAL 1M CLEARANCE AROUND PERIMETER OF ARRAY
- DC CABLE PENETRATION BENEATH PANELS, RETICULATION TO INVERTERS IN PLANTROOM
- ROOFTOP SOLAR DC ISOLATORS FOR EACH STRING

7.5m x 4m x 3m(HIGH) SOLAR PV INVERTER ROOM, TO BE LOCATED CLOSE TO MAIN SWITCH BOARD. REFER TO ELECTRICAL DETAILS SHEET FOR FURTHER DETAILS.

INDICATIVE LOCATIONS AND PRELIMINARY SPATIAL REQUIREMENTS FOR THE BUILDING ARE SHOWN ON THE DRAWINGS. THESE WILL BE DEVELOPED IN LINE WITH ARCHITECTURAL LAYOUTS AND OTHER SERVICES AS THE DESIGN PROGRESS. REFER TO OTHERS DOCUMENTATION FOR INFORMATION ON MECHANICAL BOARDS, FIRE/HYDRAULIC PANELS (INCLUDING SPECIAL COUNCIL REQUIREMENTS) AND LIFTS.

BUILDING SERVICES CONTROL ROOM AND SECURITY ROOM TO BE LOCATED BASED ON CLIENT'S REQUIREMENTS.



CONSIDERATION FOR REMOTELY LOCATED LIGHTING FIXTURES TO BE SOLAR POWERED TO AVOID CABLING PENDING FURTHER DISCUSSIONS

CONCEPT DESIGN

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STEENSEN VARMING

PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL LAYOUT - LEVEL 01

A1

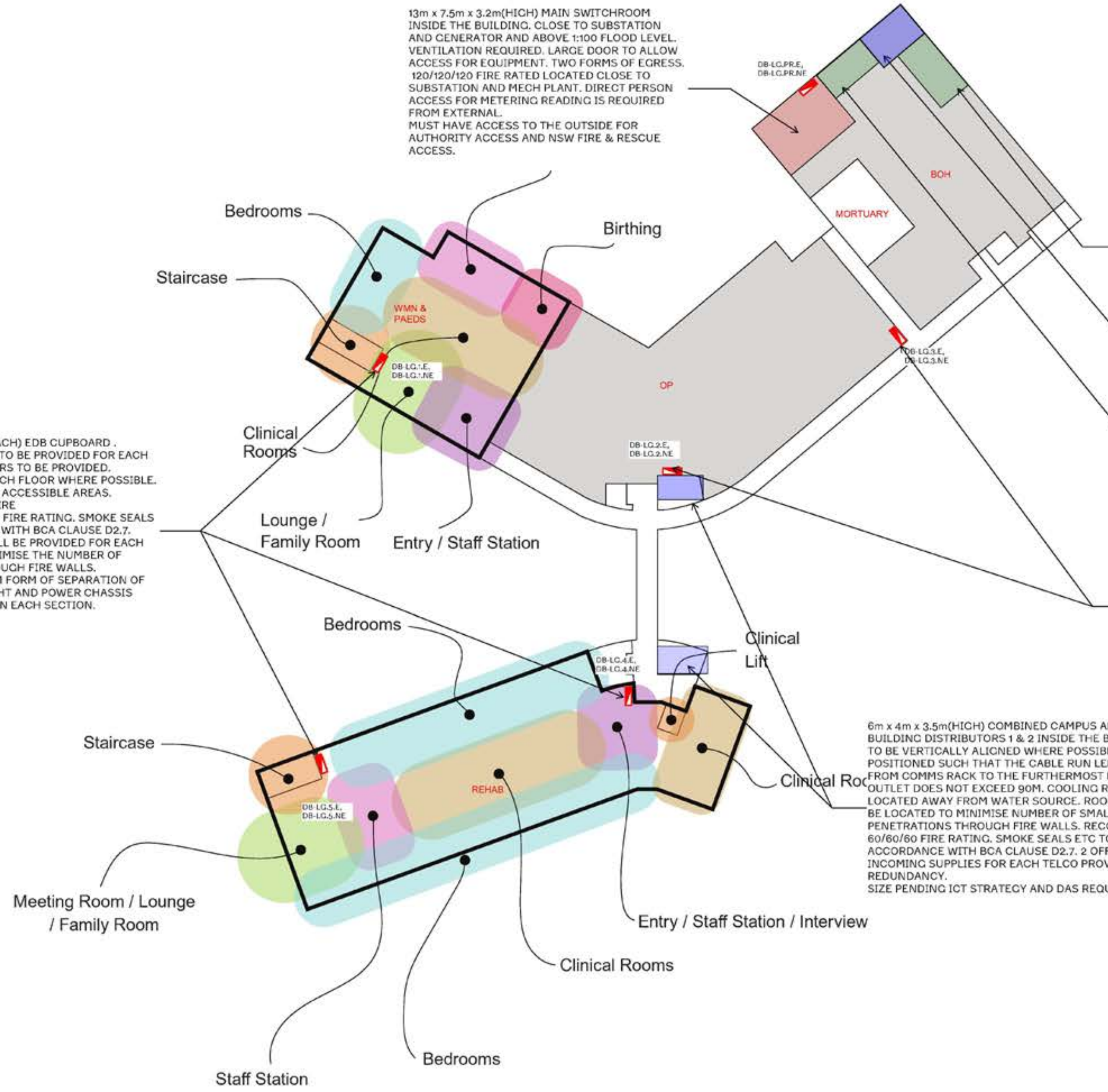
CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:300

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E1009	2

13m x 7.5m x 3.2m(HIGH) MAIN SWITCHROOM INSIDE THE BUILDING. CLOSE TO SUBSTATION AND GENERATOR AND ABOVE 1:100 FLOOD LEVEL. VENTILATION REQUIRED. LARGE DOOR TO ALLOW ACCESS FOR EQUIPMENT. TWO FORMS OF EGRESS. 120/120/120 FIRE RATED LOCATED CLOSE TO SUBSTATION AND MECH PLANT. DIRECT PERSON ACCESS FOR METERING READING IS REQUIRED FROM EXTERNAL.
MUST HAVE ACCESS TO THE OUTSIDE FOR AUTHORITY ACCESS AND NSW FIRE & RESCUE ACCESS.

INDICATIVE LOCATIONS AND PRELIMINARY SPATIAL REQUIREMENTS FOR THE BUILDING ARE SHOWN ON THE DRAWINGS. THESE WILL BE DEVELOPED IN LINE WITH ARCHITECTURAL LAYOUTS AND OTHER SERVICES AS THE DESIGN PROGRESS. REFER TO OTHERS DOCUMENTATION FOR INFORMATION ON MECHANICAL BOARDS, FIRE/HYDRAULIC PANELS (INCLUDING SPECIAL COUNCIL REQUIREMENTS) AND LIFTS.

BUILDING SERVICES CONTROL ROOM AND SECURITY ROOM TO BE LOCATED ANYWHERE BASED ON CLIENT'S REQUIREMENTS.



8m x 5m x 3.5m(HIGH) CARRIER ROOM. COOLING REQUIRED. LOCATED AWAY FROM WATER SOURCE. ROOM SHALL BE LOCATED TO MINIMISE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS. RECOMMEND 60/60/60 FIRE RATING. SMOKE SEALS ETC TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7.
2 OFF INCOMING SUPPLIES FOR EACH TELCO PROVIDER FOR REDUNDANCY.
SIZE PENDING ICT STRATEGY AND DAS REQUIREMENTS

6m x 5m x 3m(HIGH) UPS ROOM. FIRE RATED 120/120/120 - LOCATED CLOSE TO MAIN COMMUNICATIONS ROOM.
N + 1 CONFIGURATION

7.5m x 4m x 3m(HIGH) SOLAR PV INVERTER ROOM, TO BE LOCATED CLOSE TO MAIN SWITCH BOARD.
REFER TO ELECTRICAL DETAILS SHEET FOR FURTHER DETAILS.

2.75 M WIDE X 0.6M DEEP (EACH) EDB CUPBOARD. DEDICATED EDB CUPBOARD TO BE PROVIDED FOR EACH DEPARTMENT. 2.4 HIGH DOORS TO BE PROVIDED. VERTICALLY ALIGNED ON EACH FLOOR WHERE POSSIBLE. LOCATED OFF CORRIDOR OR ACCESSIBLE AREAS. COVERAGE NOT TO CROSS FIRE COMPARTMENTS.120/120/120 FIRE RATING. SMOKE SEALS ETC. TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. DISTRIBUTION BOARDS SHALL BE PROVIDED FOR EACH FIRE COMPARTMENT TO MINIMISE THE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS.
BOARDS SHALL BE MINIMUM FORM OF SEPARATION OF FORM 2. C/W SEPARATE LIGHT AND POWER CHASSIS WITH INDIVIDUAL METERS ON EACH SECTION.

3.8 M WIDE X 1M DEEP (EACH) EDB CUPBOARD. DEDICATED EDB CUPBOARD TO BE PROVIDED FOR EACH DEPARTMENT. 2.4 HIGH DOORS TO BE PROVIDED. VERTICALLY ALIGNED ON EACH FLOOR WHERE POSSIBLE. LOCATED OFF CORRIDOR OR ACCESSIBLE AREAS. COVERAGE NOT TO CROSS FIRE COMPARTMENTS.120/120/120 FIRE RATING. SMOKE SEALS ETC. TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. DISTRIBUTION BOARDS SHALL BE PROVIDED FOR EACH FIRE COMPARTMENT TO MINIMISE THE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS.
BOARDS SHALL BE MINIMUM FORM OF SEPARATION OF FORM 2. C/W SEPARATE LIGHT AND POWER CHASSIS WITH INDIVIDUAL METERS ON EACH SECTION.
SPACE FOR ISOLATION TRANSFORMER IS INCLUDED IN THE EDB CUPBOARD/ROOM

6m x 4m x 3.5m(HIGH) COMBINED CAMPUS AND BUILDING DISTRIBUTORS 1 & 2 INSIDE THE BUILDING. TO BE VERTICALLY ALIGNED WHERE POSSIBLE. TO BE POSITIONED SUCH THAT THE CABLE RUN LENGTH FROM COMMS RACK TO THE FURTHERMOST DATA OUTLET DOES NOT EXCEED 90M. COOLING REQUIRED. LOCATED AWAY FROM WATER SOURCE. ROOM SHALL BE LOCATED TO MINIMISE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS. RECOMMEND 60/60/60 FIRE RATING. SMOKE SEALS ETC TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. 2 OFF INCOMING SUPPLIES FOR EACH TELCO PROVIDER FOR REDUNDANCY.
SIZE PENDING ICT STRATEGY AND DAS REQUIREMENTS

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PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL LAYOUT - LOWER GROUND LEVEL

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:300

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E2000	2

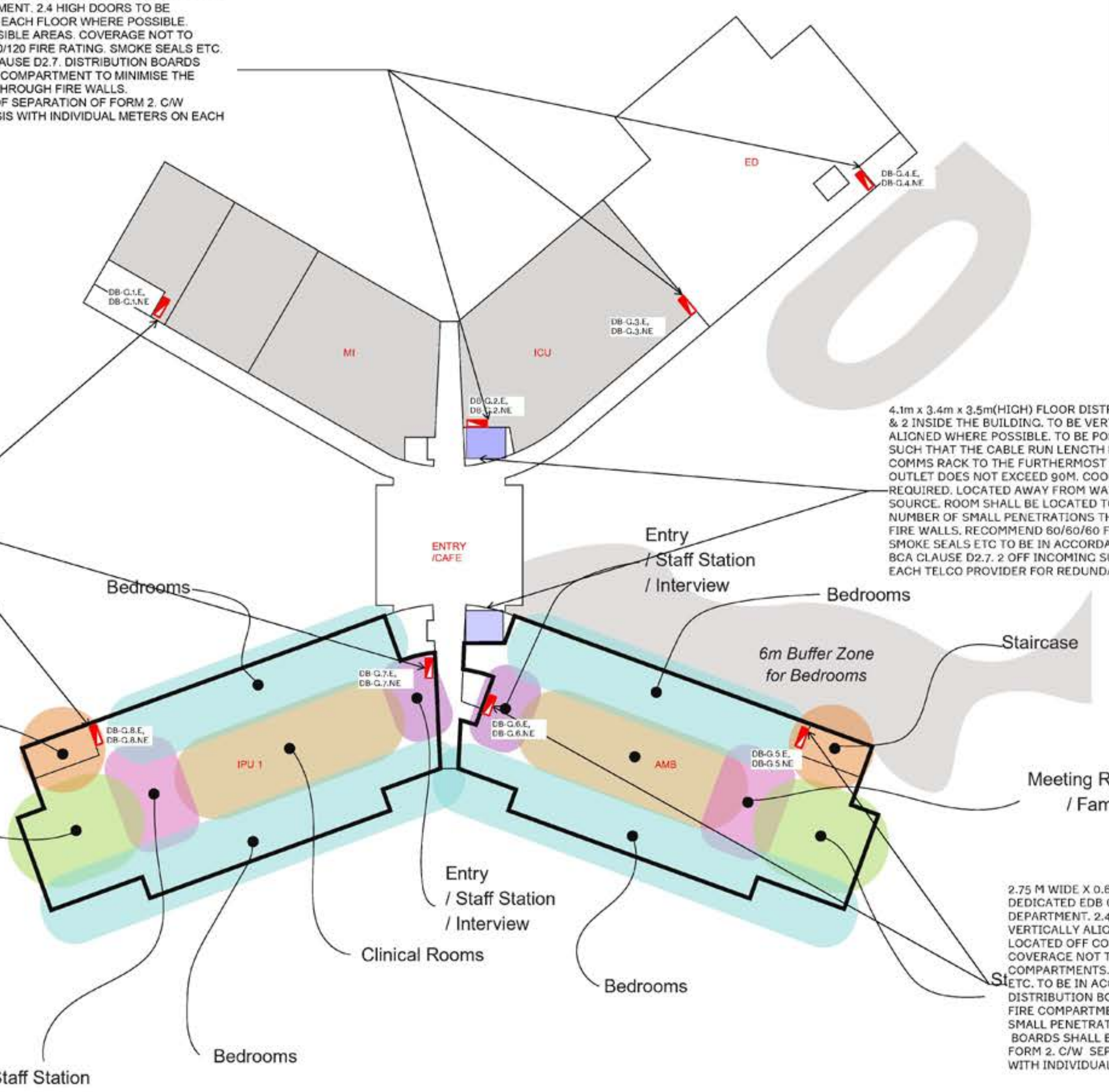
3.8 M WIDE X 1M DEEP (EACH) EDB CUPBOARD . DEDICATED EDB CUPBOARD TO BE PROVIDED FOR EACH DEPARTMENT. 2.4 HIGH DOORS TO BE PROVIDED. VERTICALLY ALIGNED ON EACH FLOOR WHERE POSSIBLE. LOCATED OFF CORRIDOR OR ACCESSIBLE AREAS. COVERAGE NOT TO CROSS FIRE COMPARTMENTS.120/120/120 FIRE RATING. SMOKE SEALS ETC. TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. DISTRIBUTION BOARDS SHALL BE PROVIDED FOR EACH FIRE COMPARTMENT TO MINIMISE THE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS.
BOARDS SHALL BE MINIMUM FORM OF SEPARATION OF FORM 2. C/W SEPARATE LIGHT AND POWER CHASSIS WITH INDIVIDUAL METERS ON EACH SECTION.

INDICATIVE LOCATIONS AND PRELIMINARY SPATIAL REQUIREMENTS FOR THE BUILDING ARE SHOWN ON THE DRAWINGS. THESE WILL BE DEVELOPED IN LINE WITH ARCHITECTURAL LAYOUTS AND OTHER SERVICES AS THE DESIGN PROGRESS. REFER TO OTHERS DOCUMENTATION FOR INFORMATION ON MECHANICAL BOARDS, FIRE/HYDRAULIC PANELS (INCLUDING SPECIAL COUNCIL REQUIREMENTS) AND LIFTS.

BUILDING SERVICES CONTROL ROOM AND SECURITY ROOM TO BE LOCATED BASED ON CLIENT'S REQUIREMENTS.

2.75 M WIDE X 0.6M DEEP (EACH) EDB CUPBOARD . DEDICATED EDB CUPBOARD TO BE PROVIDED FOR EACH DEPARTMENT. 2.4 HIGH DOORS TO BE PROVIDED. VERTICALLY ALIGNED ON EACH FLOOR WHERE POSSIBLE. LOCATED OFF CORRIDOR OR ACCESSIBLE AREAS. COVERAGE NOT TO CROSS FIRE COMPARTMENTS.120/120/120 FIRE RATING. SMOKE SEALS ETC. TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. DISTRIBUTION BOARDS SHALL BE PROVIDED FOR EACH FIRE COMPARTMENT TO MINIMISE THE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS.
BOARDS SHALL BE MINIMUM FORM OF SEPARATION OF FORM 2. C/W SEPARATE LIGHT AND POWER CHASSIS WITH INDIVIDUAL METERS ON EACH SECTION.

4.1m x 3.4m x 3.5m(HIGH) FLOOR DISTRIBUTORS 1 & 2 INSIDE THE BUILDING. TO BE VERTICALLY ALIGNED WHERE POSSIBLE. TO BE POSITIONED SUCH THAT THE CABLE RUN LENGTH FROM COMMS RACK TO THE FURTHERMOST DATA OUTLET DOES NOT EXCEED 90M. COOLING REQUIRED. LOCATED AWAY FROM WATER SOURCE. ROOM SHALL BE LOCATED TO MINIMISE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS. RECOMMEND 60/60/60 FIRE RATING. SMOKE SEALS ETC TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. 2 OFF INCOMING SUPPLIES FOR EACH TELCO PROVIDER FOR REDUNDANCY.



2.75 M WIDE X 0.6M DEEP (EACH) EDB CUPBOARD . DEDICATED EDB CUPBOARD TO BE PROVIDED FOR EACH DEPARTMENT. 2.4 HIGH DOORS TO BE PROVIDED. VERTICALLY ALIGNED ON EACH FLOOR WHERE POSSIBLE. LOCATED OFF CORRIDOR OR ACCESSIBLE AREAS. COVERAGE NOT TO CROSS FIRE COMPARTMENTS.120/120/120 FIRE RATING. SMOKE SEALS ETC. TO BE IN ACCORDANCE WITH BCA CLAUSE D2.7. DISTRIBUTION BOARDS SHALL BE PROVIDED FOR EACH FIRE COMPARTMENT TO MINIMISE THE NUMBER OF SMALL PENETRATIONS THROUGH FIRE WALLS.
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PROJECT
EUROBODALLA HEALTH SERVICES

DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL LAYOUT - GROUND LEVEL

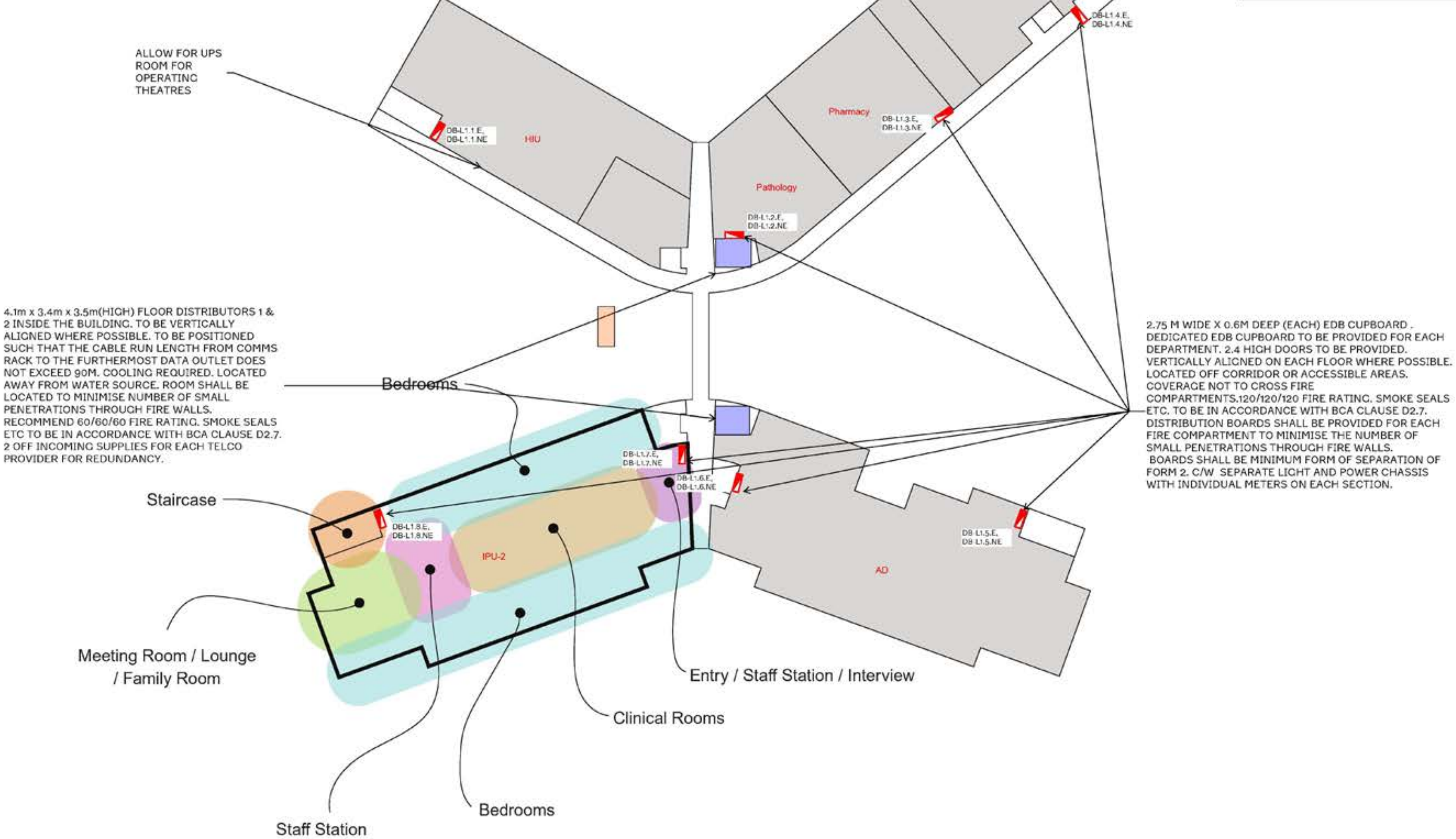
A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:300

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E2001	2

INDICATIVE LOCATIONS AND PRELIMINARY SPATIAL REQUIREMENTS FOR THE BUILDING ARE SHOWN ON THE DRAWINGS. THESE WILL BE DEVELOPED IN LINE WITH ARCHITECTURAL LAYOUTS AND OTHER SERVICES AS THE DESIGN PROGRESS. REFER TO OTHERS DOCUMENTATION FOR INFORMATION ON MECHANICAL BOARDS, FIRE/HYDRAULIC PANELS (INCLUDING SPECIAL COUNCIL REQUIREMENTS) AND LIFTS.

BUILDING SERVICES CONTROL ROOM AND SECURITY ROOM TO BE LOCATED BASED ON CLIENT'S REQUIREMENTS.



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DRAWING TITLE
ELECTRICAL SERVICES
ELECTRICAL LAYOUT - FIRST LEVEL

A1

CREATED	DRAWN	DESIGNED	CHECKED	APPROVED	SCALE
JUNE'21	BD	BD	AK	MH	1:300

NORTHPOINT	PROJECT No.	DRAWING No.	REVISION
	207183	E2002	2

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9.0 Appendix C – Survey

NOTES

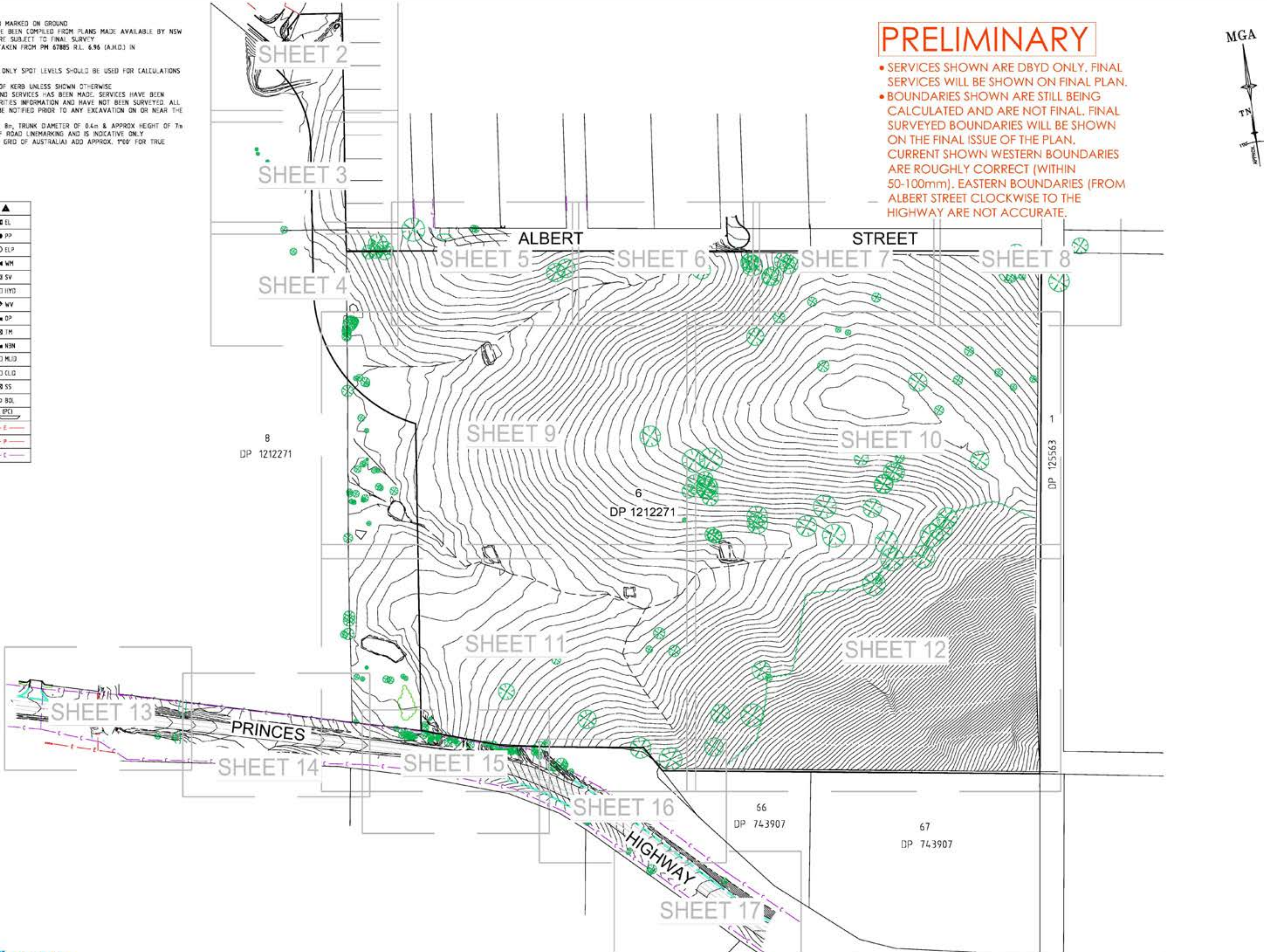
1. THE BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY NSW LAND REGISTRY SERVICES AND ARE SUBJECT TO FINAL SURVEY
3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM PM 67885 R.L. 6.96 (A.H.D.) IN ALBERT STREET
4. CONTOUR INTERVAL 0.5 m
5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
6. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
7. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
8. 8/.4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
9. SHOWS APPROXIMATE POSITION OF ROAD LINEMARKING AND IS INDICATIVE ONLY
10. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH

LEGEND

BENCH MARK	▲
ELECTRICITY BOX	EL
POWER POLE	● PP
ELECTRIC LIGHT POLE	ELP
WATER METER	WM
STOP VALVE	SV
HYDRANT	HYD
WATER VALVE	WV
OPTUS PIT	OP
TELSTRA MARKER	TM
NBN PIT	NBN
PIT WITH METAL LID	MLID
PIT WITH CONCRETE LID	CLID
STREET SIGN	SS
BOLLARD	BOL
PRAM CROSSING	(PC)
ELECTRICITY (U/GROUND) (DBYD)	E
ELECTRICITY (OVERHEAD)	P
COMMUNICATIONS (DBYD)	C

PRELIMINARY

- SERVICES SHOWN ARE DBYD ONLY. FINAL SERVICES WILL BE SHOWN ON FINAL PLAN.
- BOUNDARIES SHOWN ARE STILL BEING CALCULATED AND ARE NOT FINAL. FINAL SURVEYED BOUNDARIES WILL BE SHOWN ON THE FINAL ISSUE OF THE PLAN. CURRENT SHOWN WESTERN BOUNDARIES ARE ROUGHLY CORRECT (WITHIN 50-100mm). EASTERN BOUNDARIES (FROM ALBERT STREET CLOCKWISE TO THE HIGHWAY ARE NOT ACCURATE.



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GDA2020

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E	00/00/00	–	00	A	00/00/00	–	00

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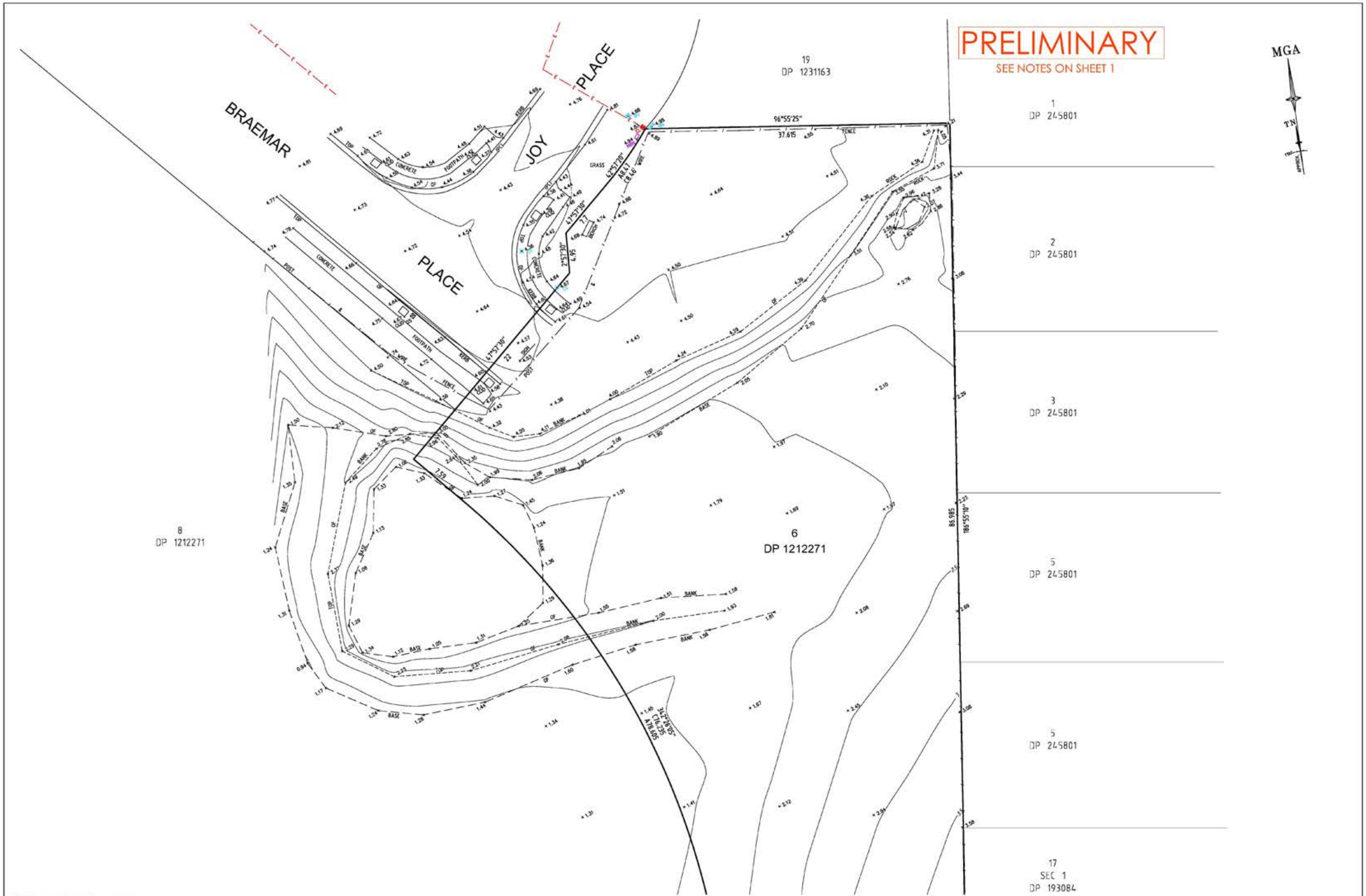
Registered Surveyor NSW

Client HEALTH INFRASTRUCTURE

Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 6 IN DP 1212271, KNOWN AS LOT 6 PRINCES HIGHWAY, MORUYA

datum AHD	reference number 51266 001DT
site Area 26.24ha (CALC)	scale 1:1500 @A1
date of survey 23/02/2021	
LGA EUROBODALLA	SHEET 1 OF 17



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SCALE 1:200 @ A1

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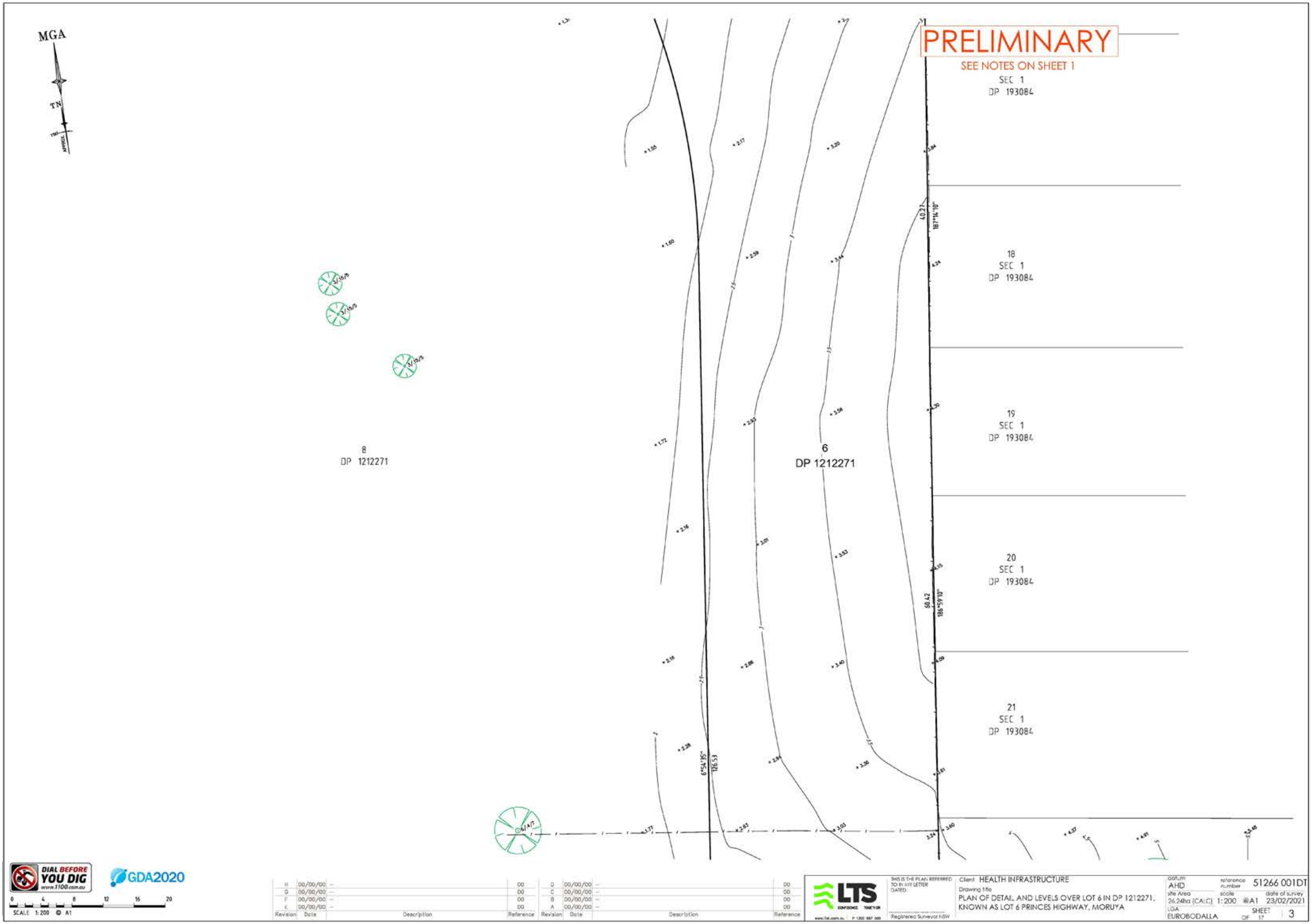
scale 1:200 @A1
date of survey 23/02/2021
LGA EUROBODALLA
SHEET 2 OF 17



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SHEET 3 OF 17

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SCALE 1:200 @ A1

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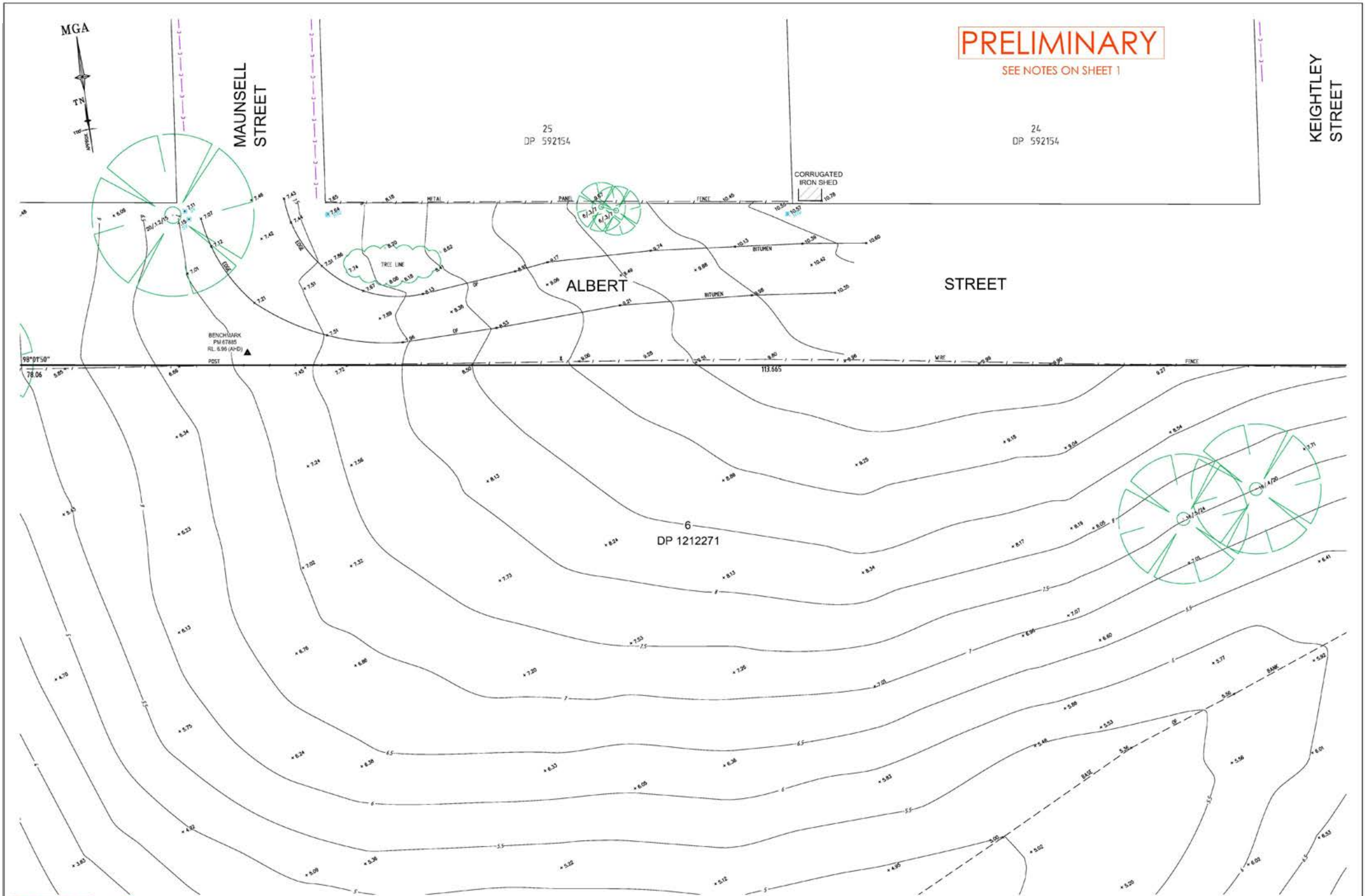
SHEET 4 OF 17



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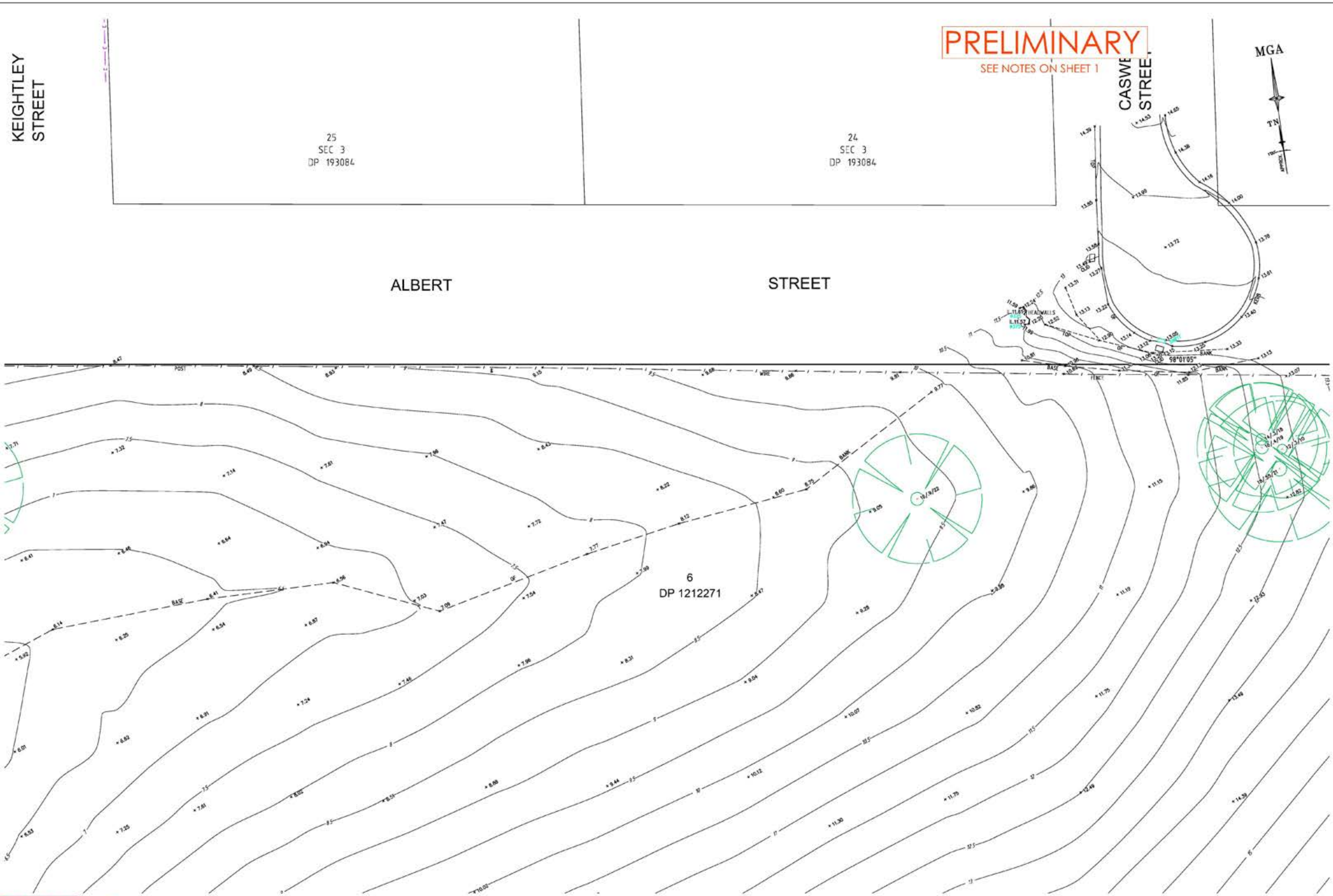
SHEET 5 OF 17



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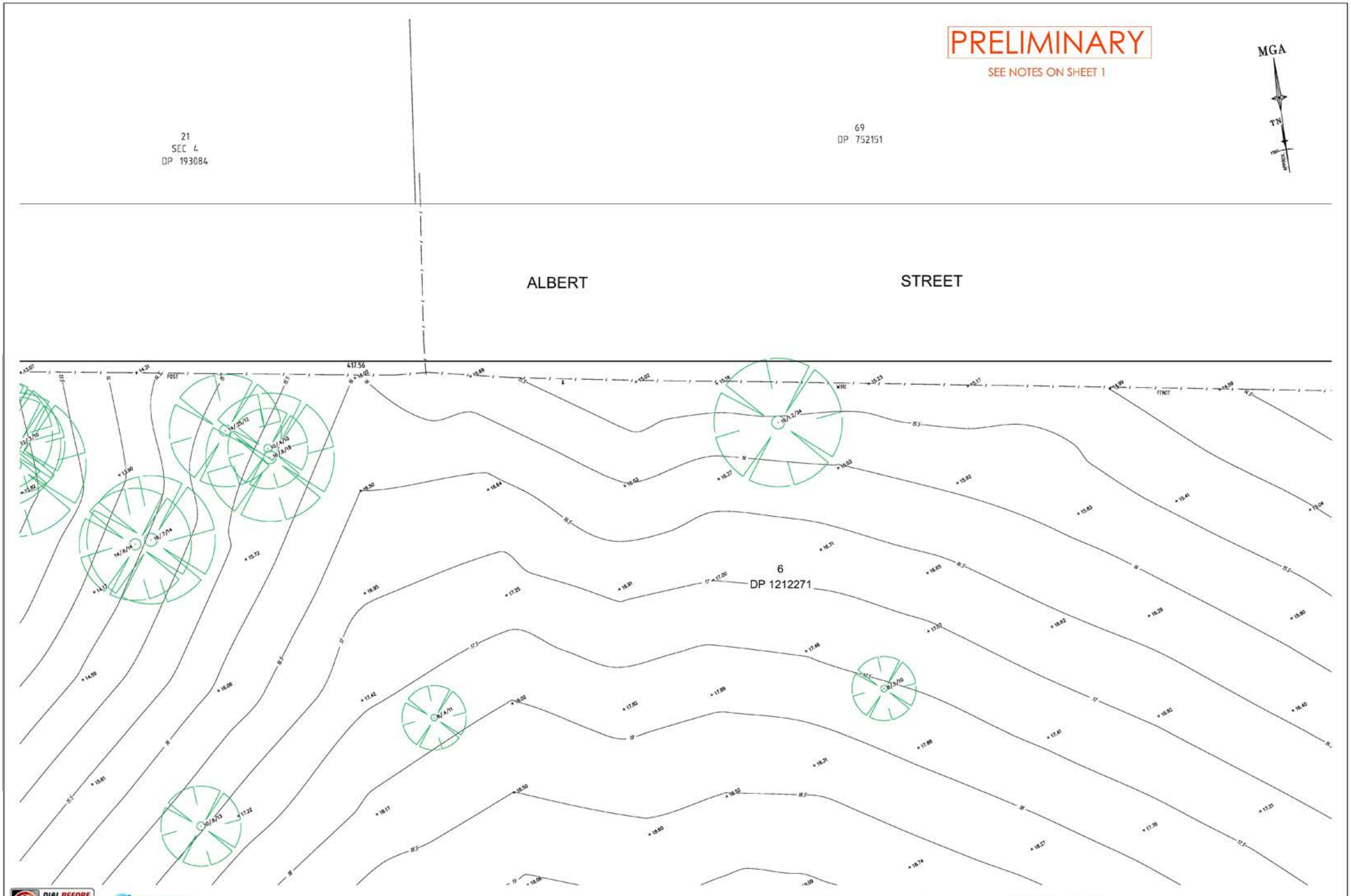
LGA EUROBODALLA
SHEET 6 OF 17



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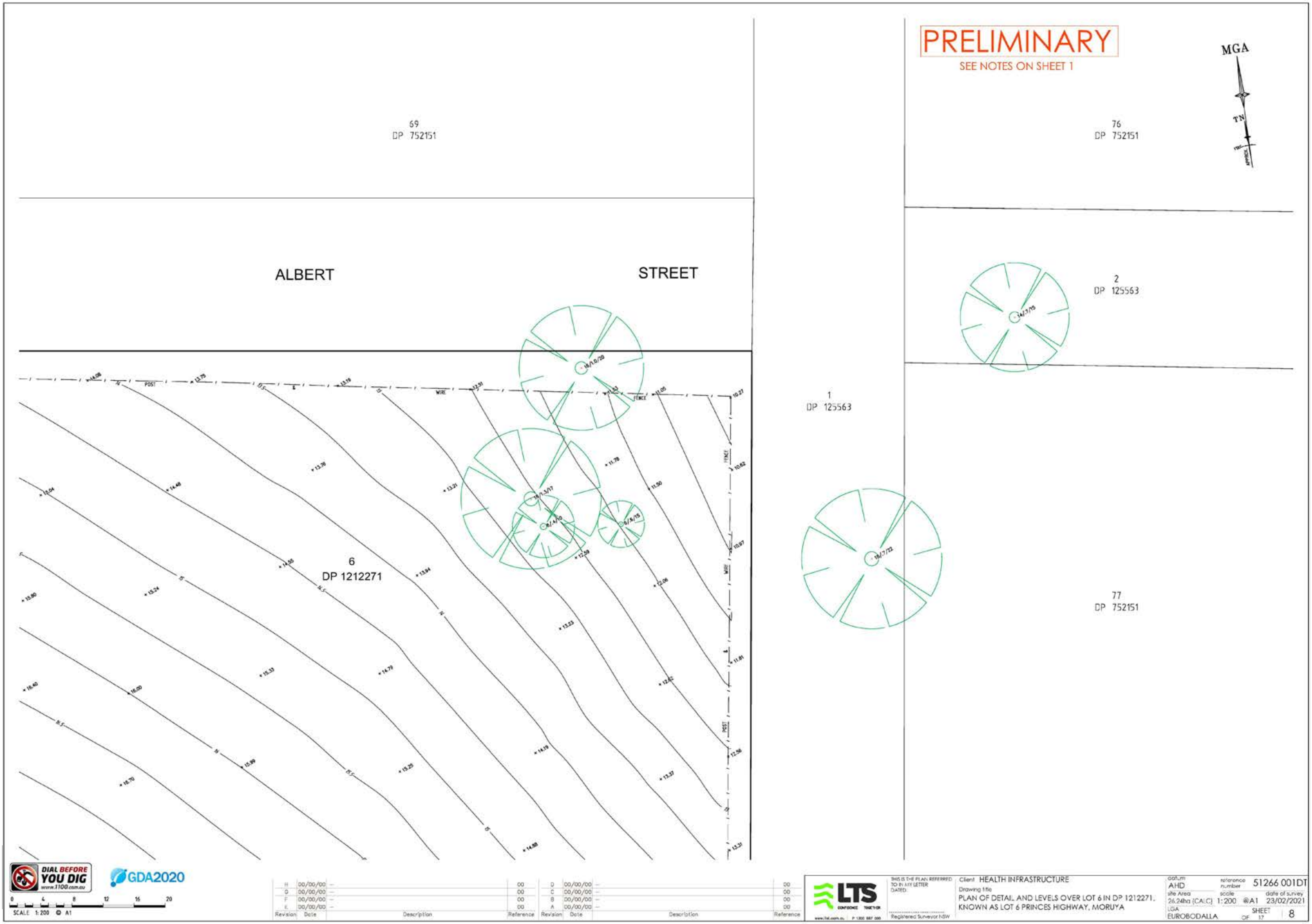
SHEET 7 OF 17



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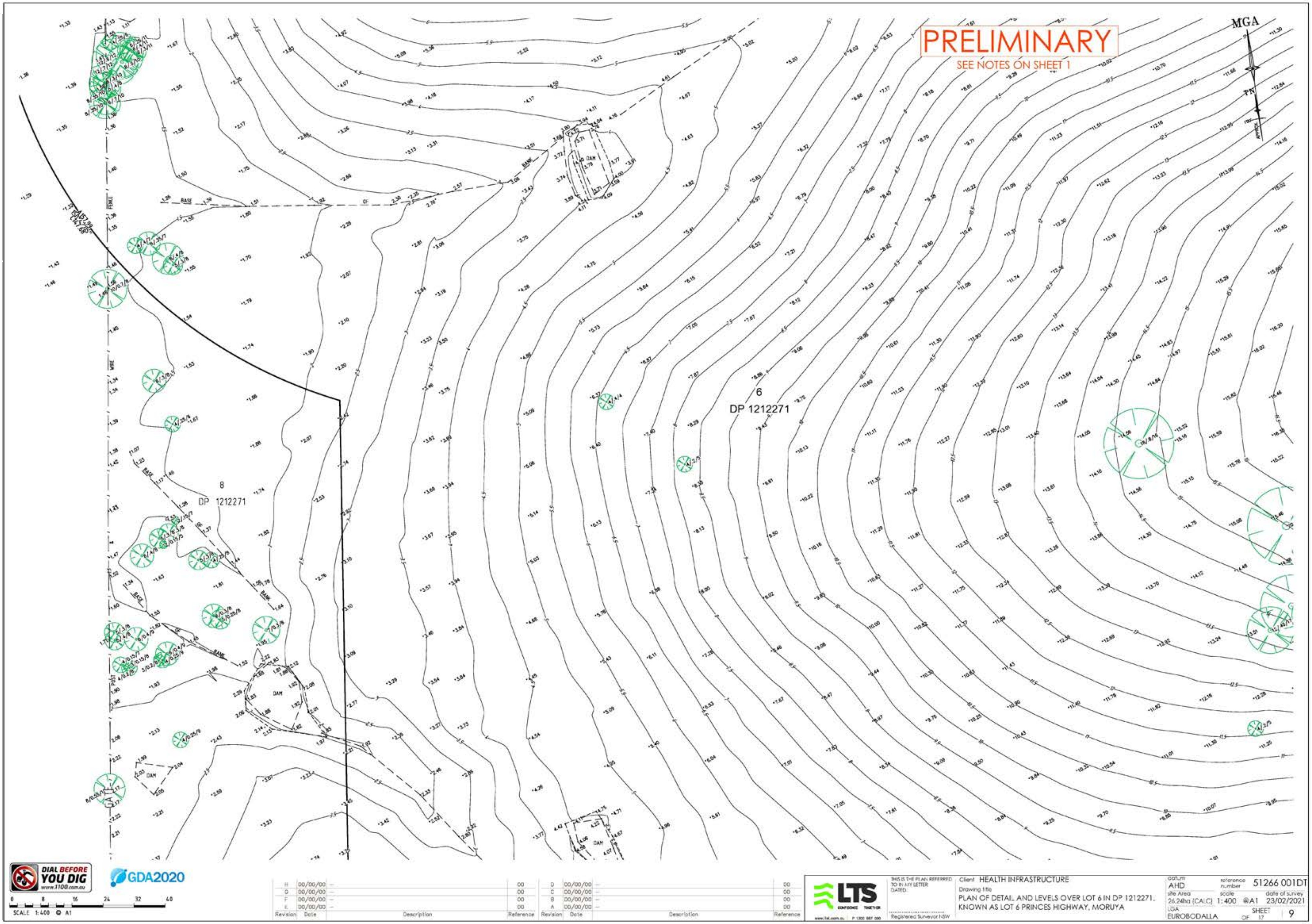

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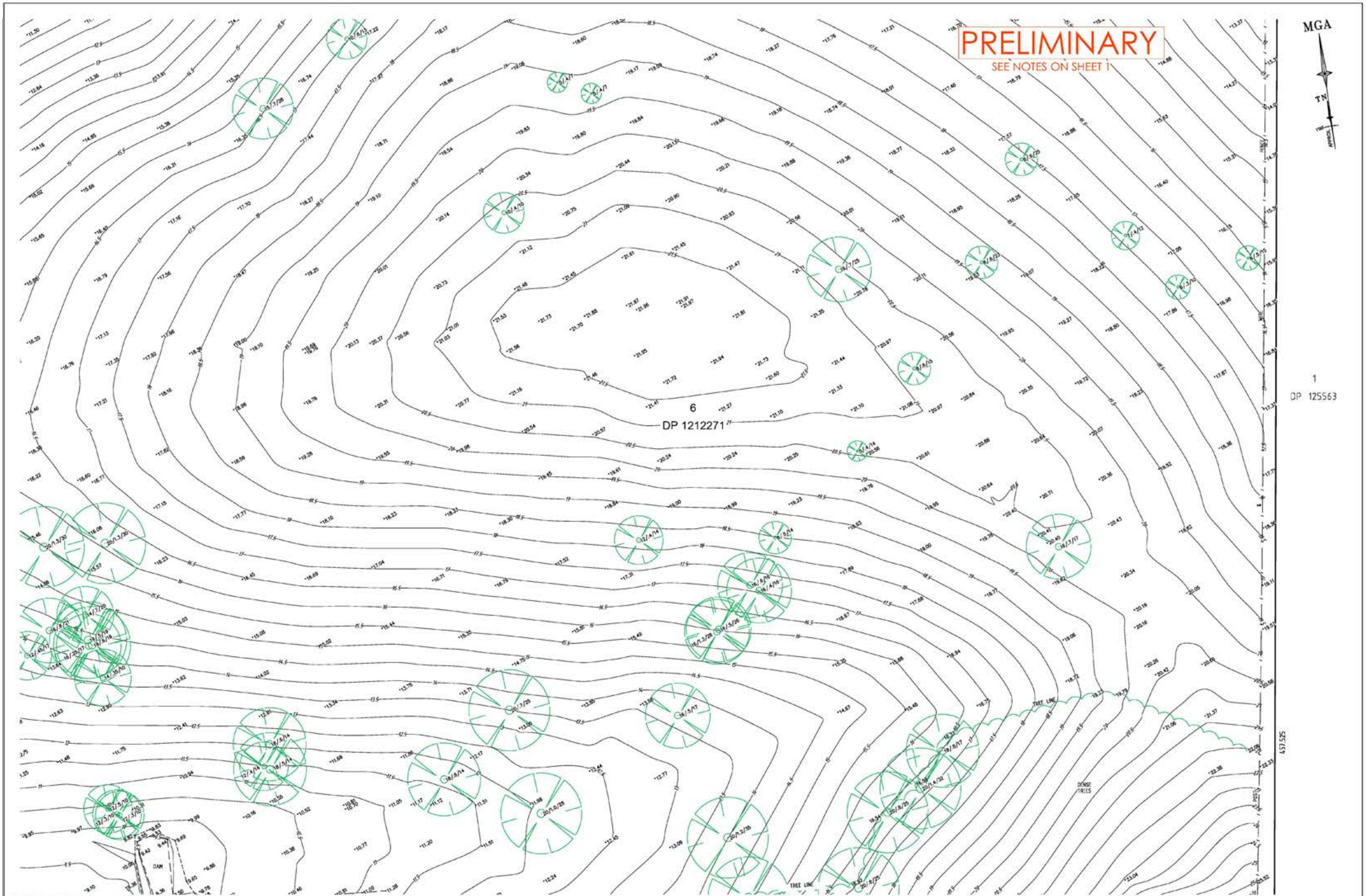
LGA EUROBODALLA
SHEET 9 OF 17



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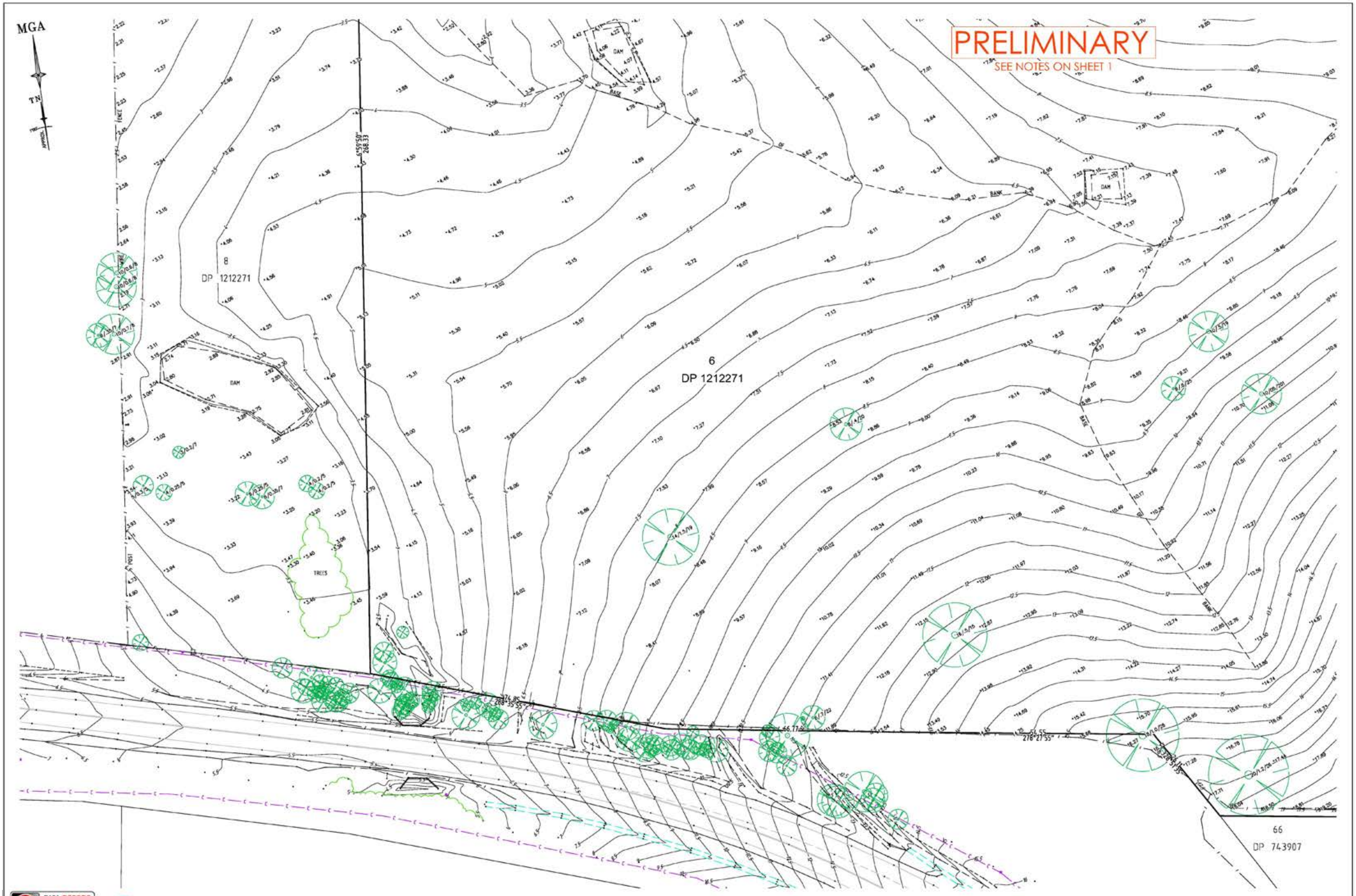
SHEET 10 OF 17



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datum: AHD
reference number: 51266 001DT
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date of survey: 23/02/2021
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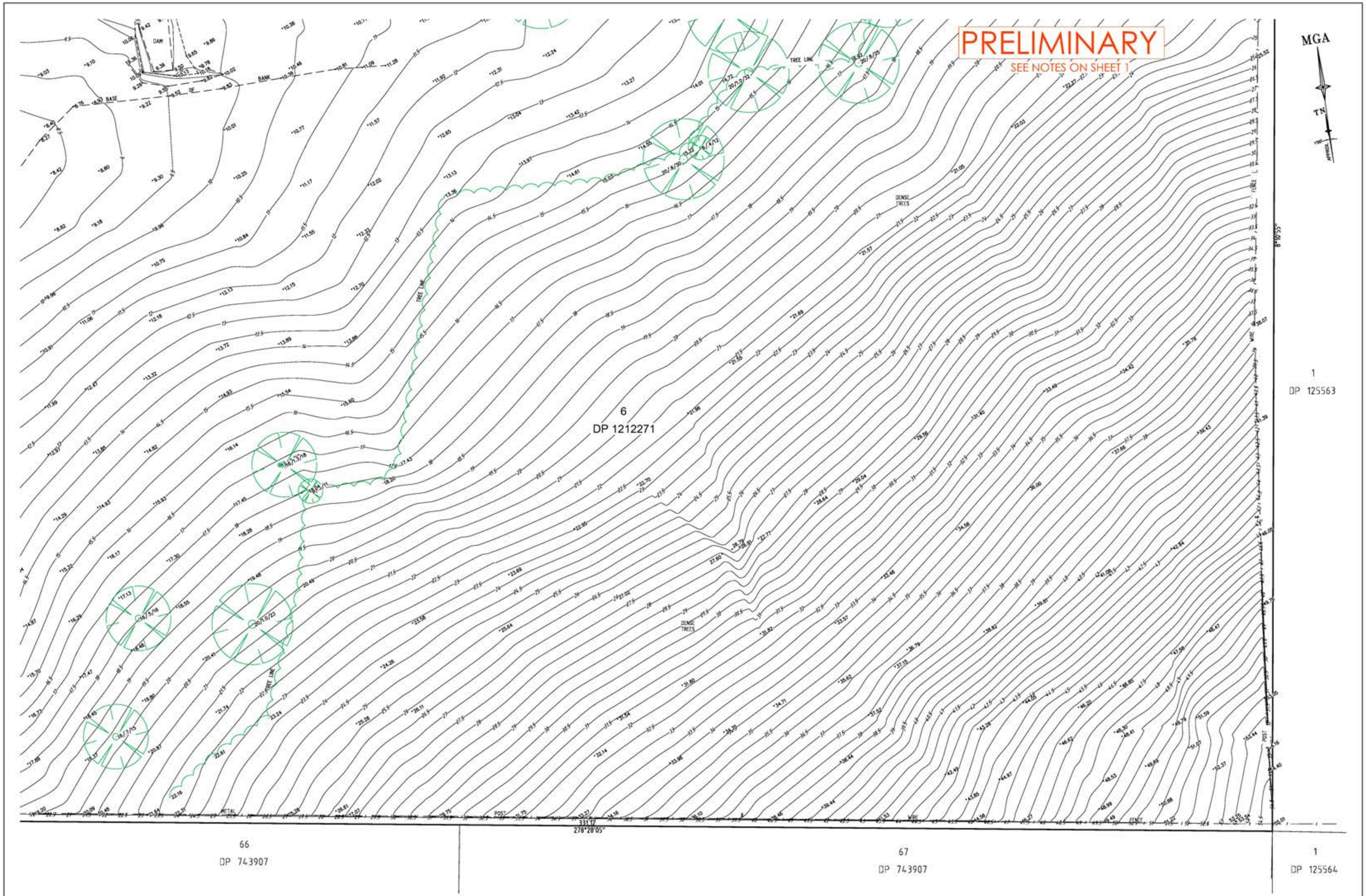
SHEET 11 OF 17



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reference number 51266 001DT
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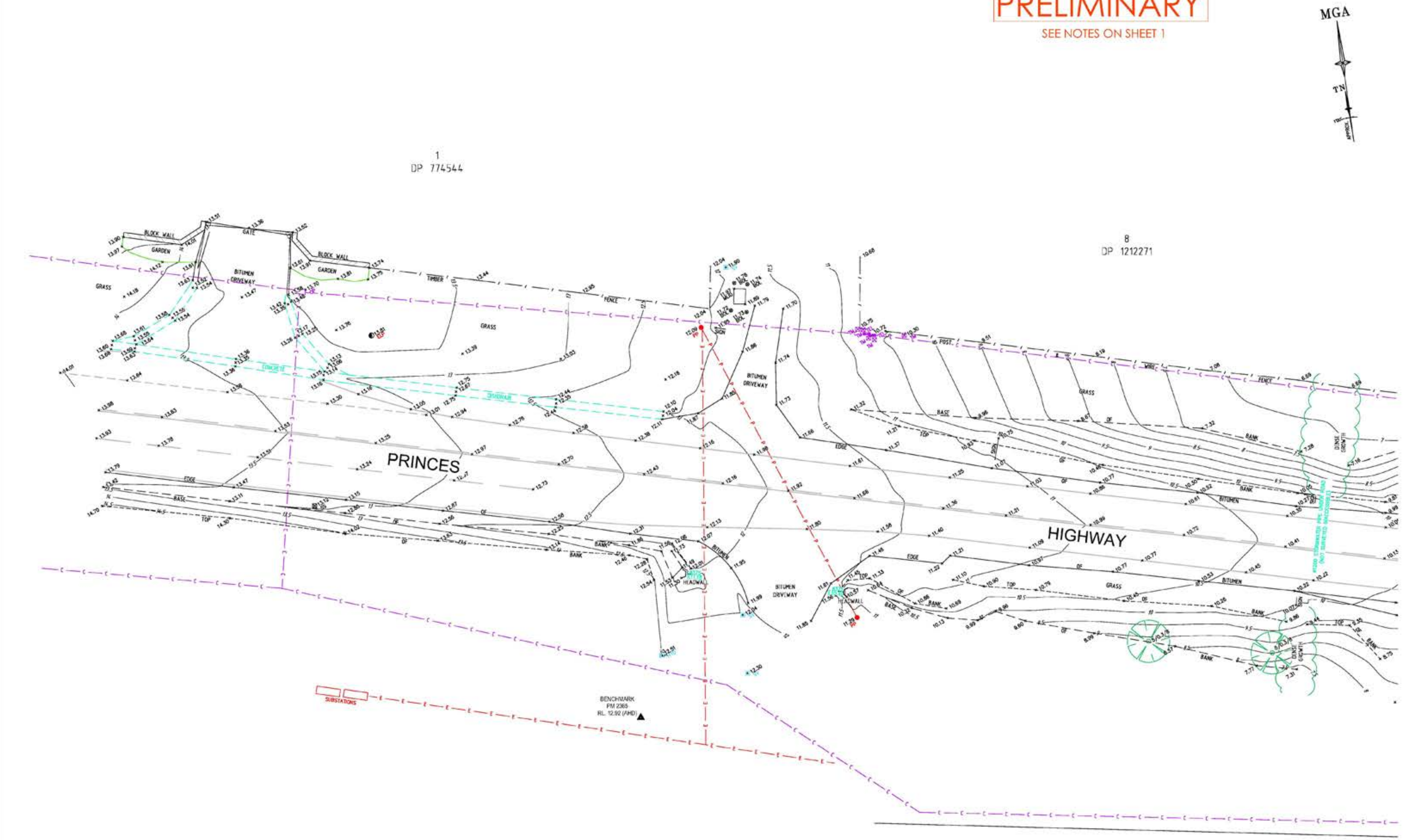
SHEET 12 OF 17

MOH.9999.1108.0325

PRELIMINARY

SEE NOTES ON SHEET 1



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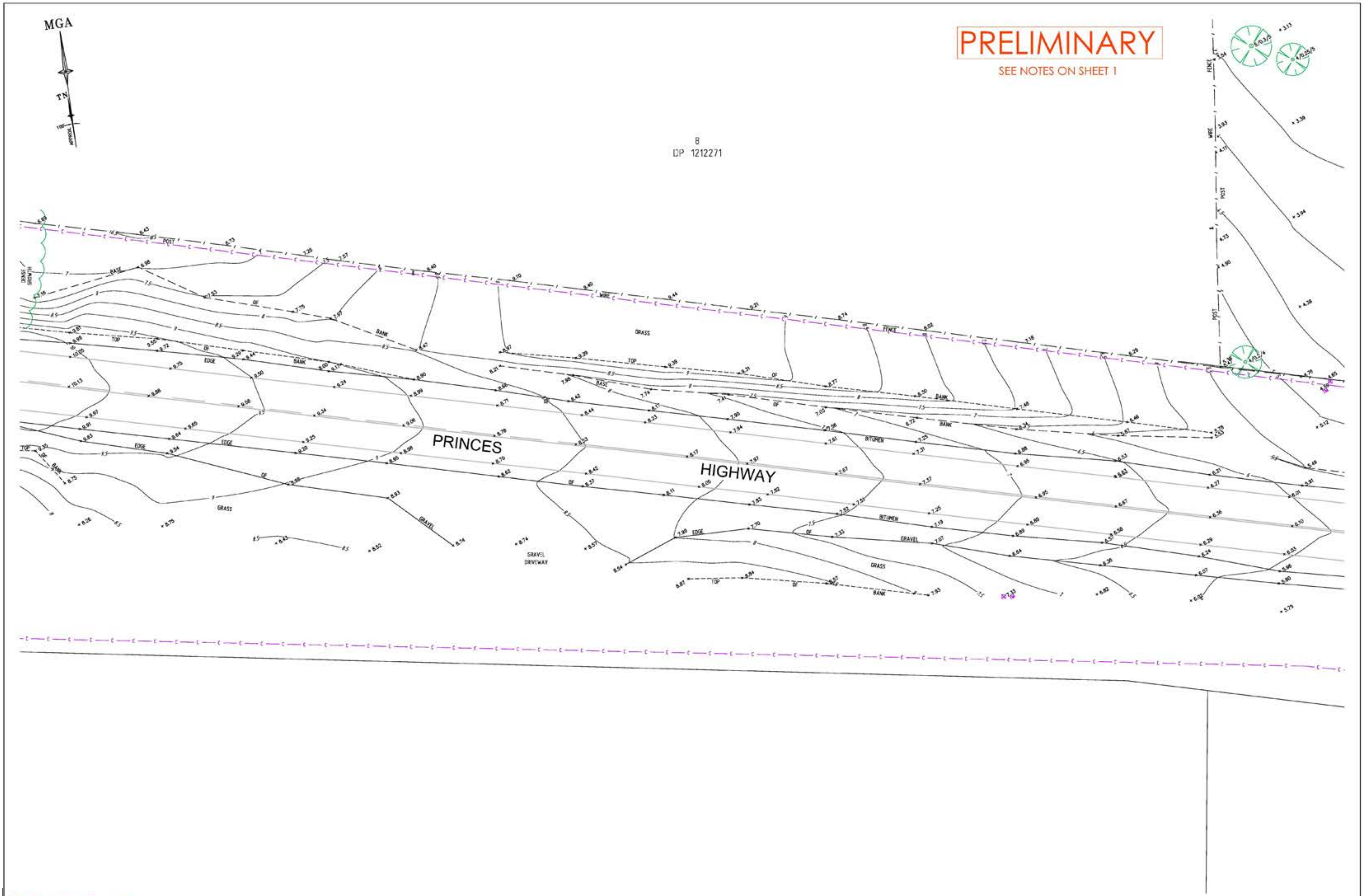
date of survey 23/02/2021

LGA EUROBODALLA

SHEET 13 OF 17



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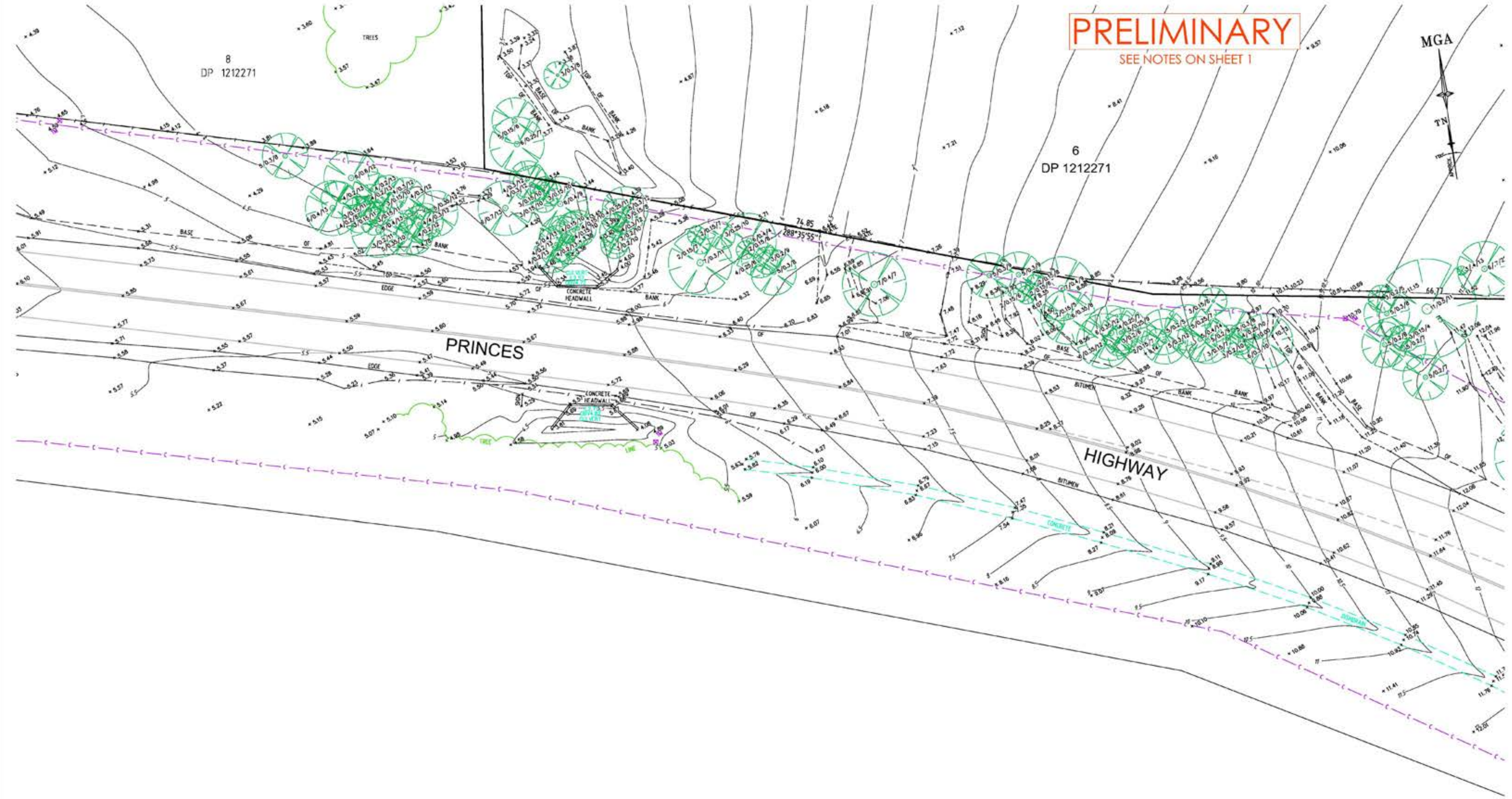
SHEET 14 OF 17



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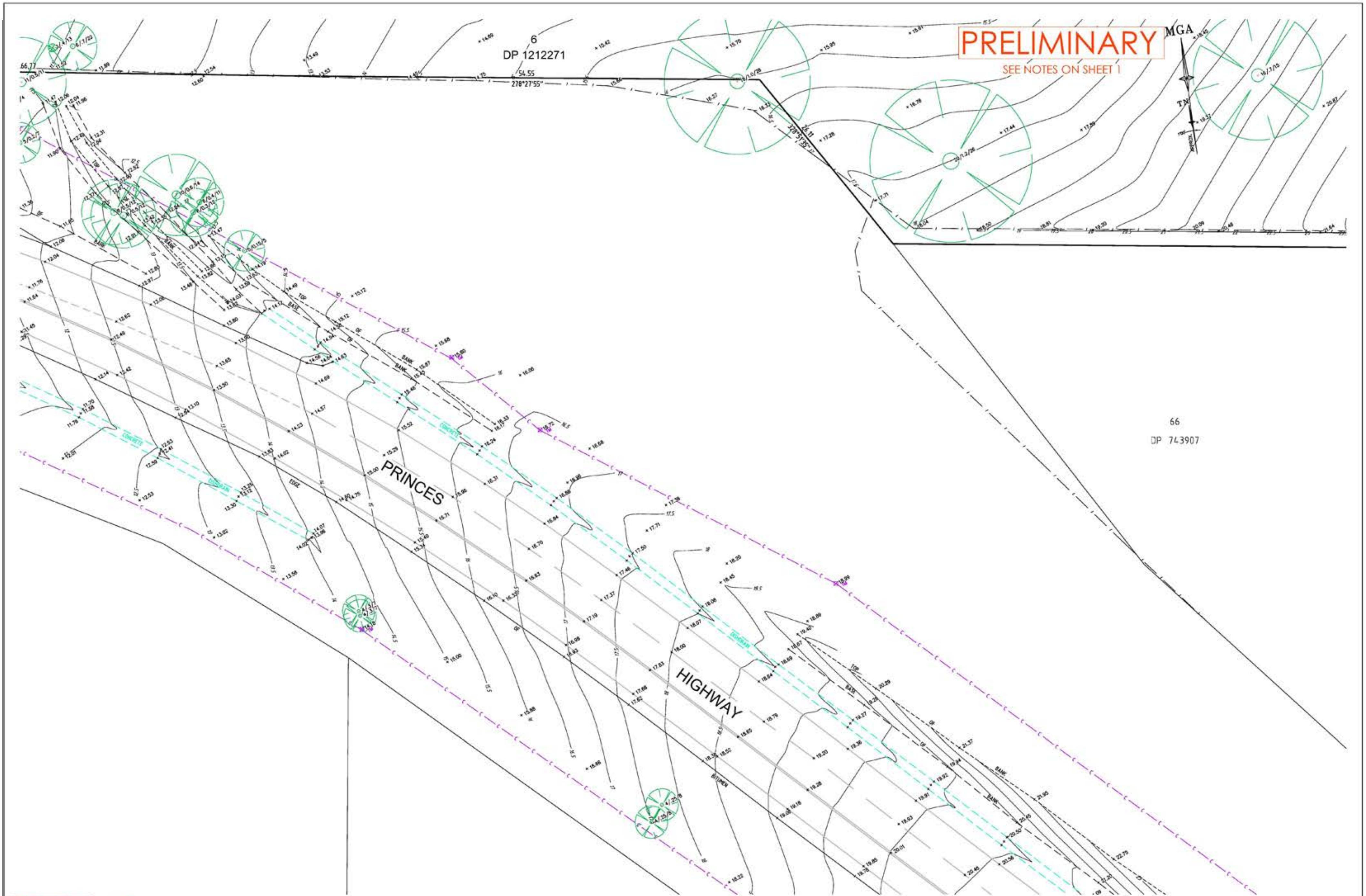

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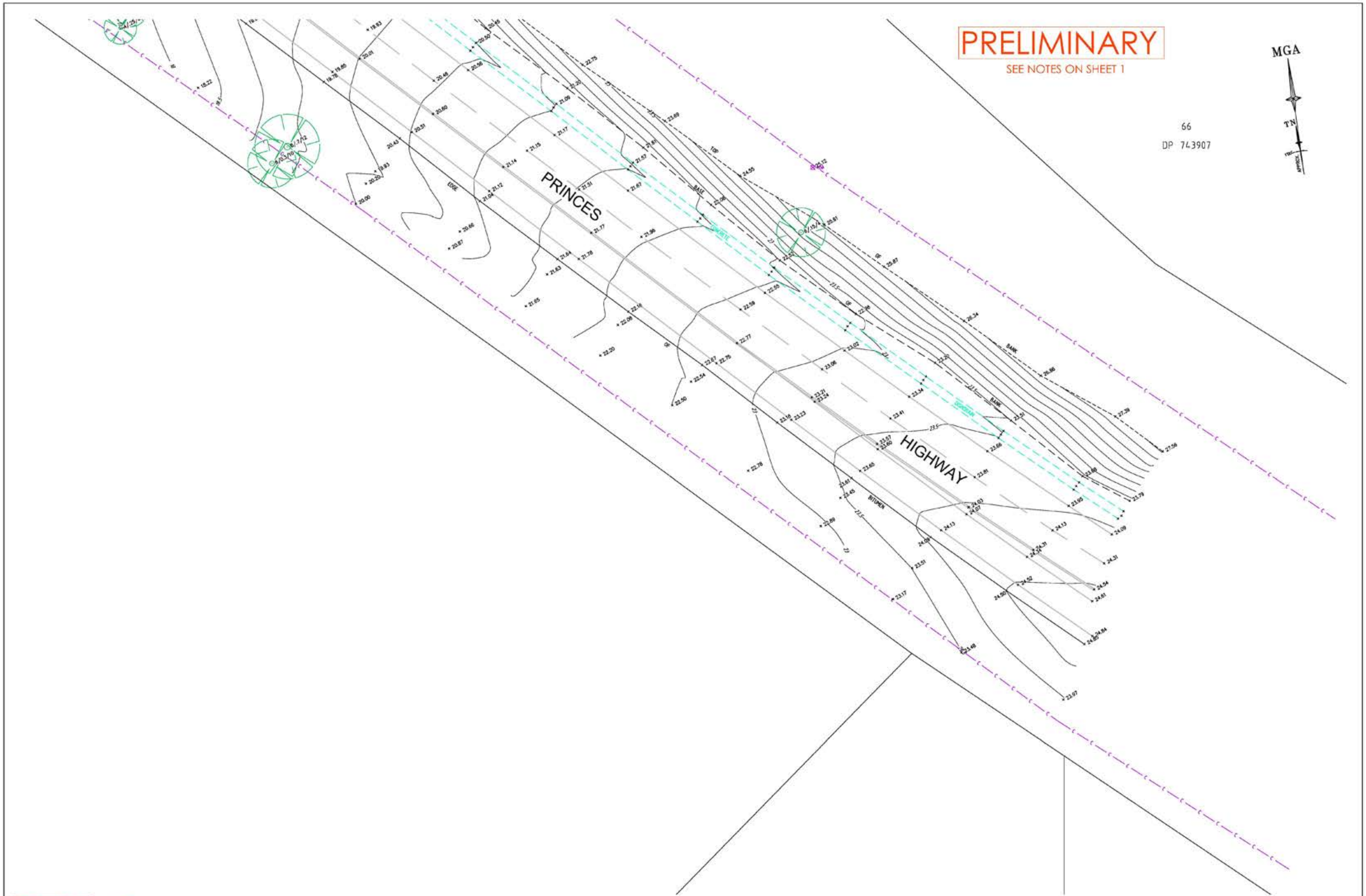

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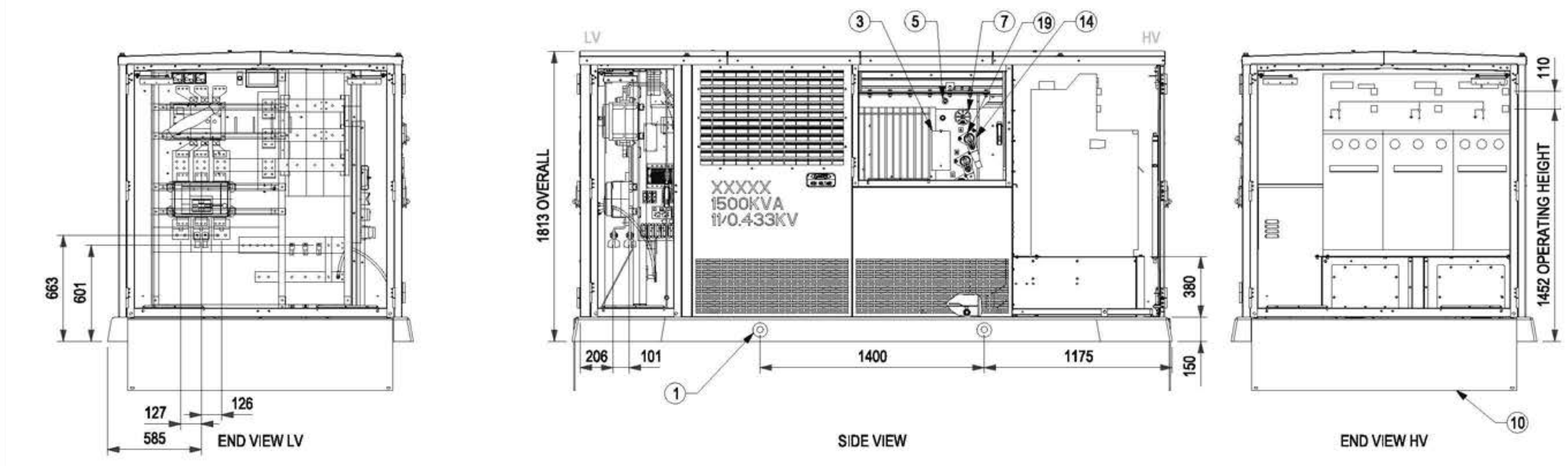
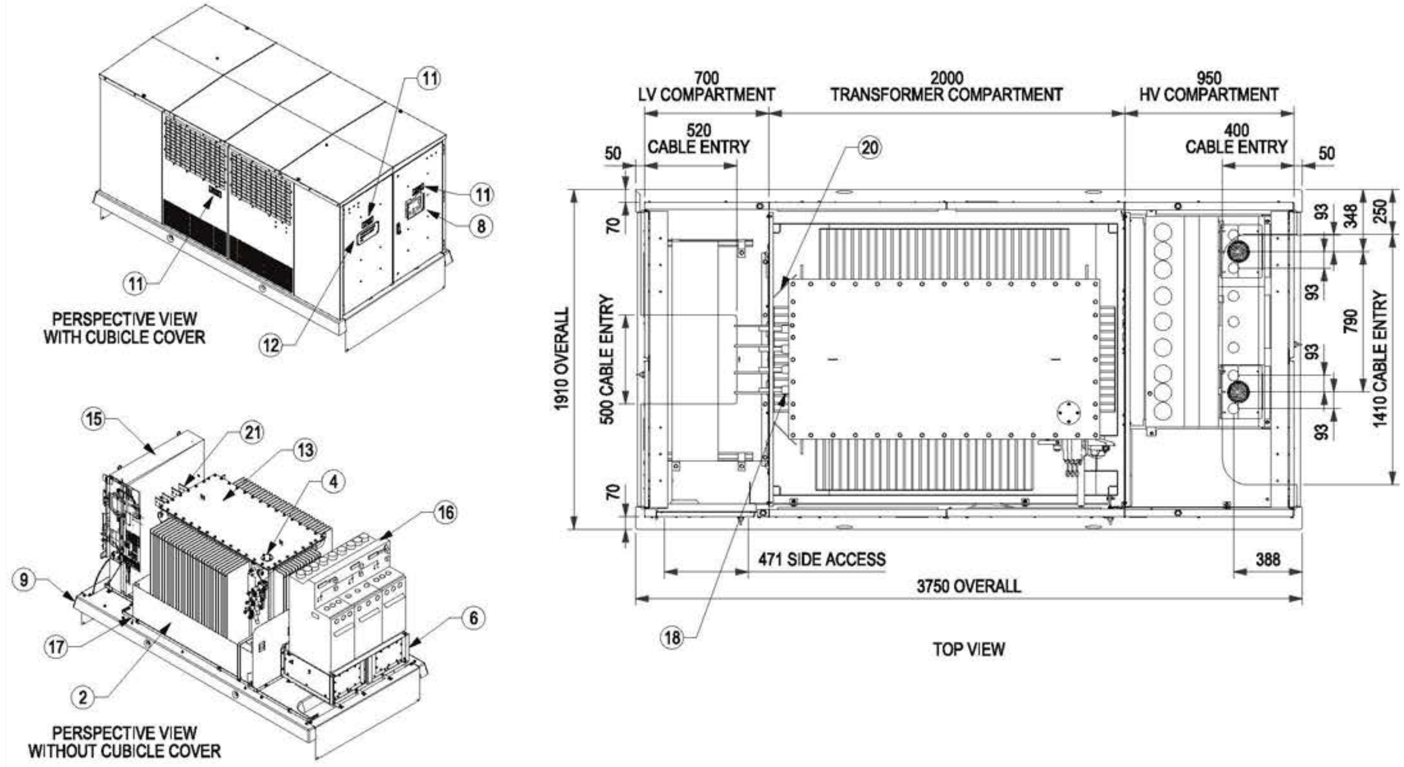
date of survey 23/02/2021
SHEET 17 OF 17

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

10.0 Appendix D – Substation Drawings





SUMMARY OF MASS:- TRANSFORMER	
UNTANKING	2498kg
OIL VOLUME	1364Ltr
TANK & FITTINGS	963kg
TRANSFORMER TOTAL	4648kg
ENCLOSURE	725kg
BASE	2280kg
L.V. SWITCHGEAR	200kg
H.V. SWITCHGEAR & IAC	380kg
Oil Bund	100kg
KIOSK TOTAL	8333kg

AMENDMENT DETAILS

3	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
REFER TO SHEET 2.		
2	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2016
REFER TO SHEET 2.		

SCALE	NTS
ISSUED	18/03/2015
DRAWN BY	SG
CHECKED BY	D.KELLY

AUTHORISED BY

Graeme Barnewall

PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

DATE	26/05/2018

CEOM7203.163

#	1 of 2	A4

PADMOUNT SUBSTATION 11kV, 1500kVA GENERAL ARRANGEMENT (SCHNEIDER) ELONGATED

essential energy

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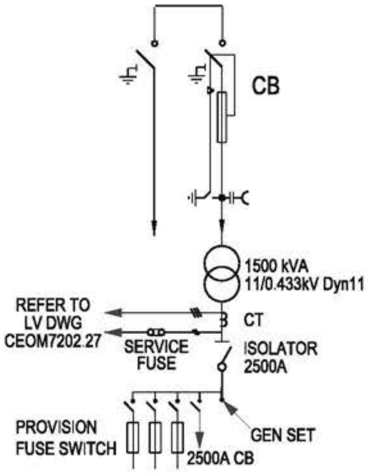
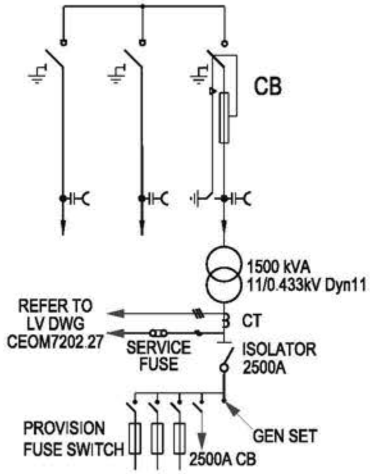


SINGLE LINE DIAGRAM

SUBPAD_11_1500_EL_CB 3_CBRM

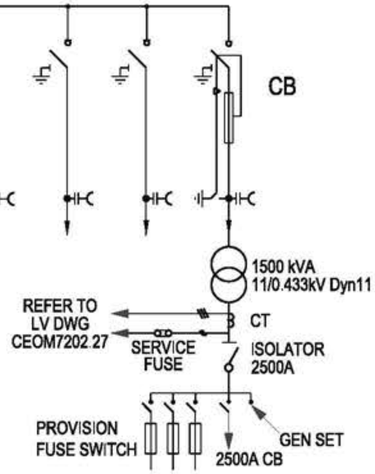
CAT No 251734



SINGLE LINE DIAGRAM

SUBPAD_11_1500_EL_CB 3_3WCBRM

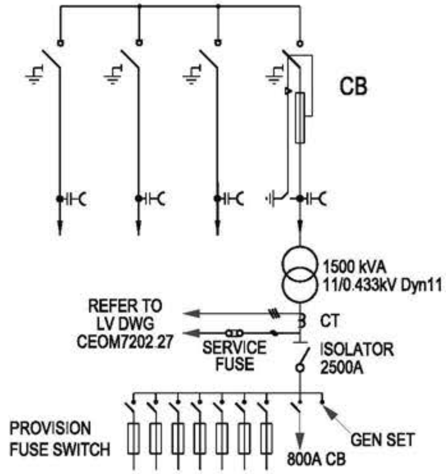
CAT No 251735



SINGLE LINE DIAGRAM

SUBPAD_11_1500_EL_CB 3_4WCBRM

CAT No 251736



SINGLE LINE DIAGRAM

SUBPAD_11_1500_EL_CB 7_4WCBRM

CAT No 251738

NOTES

1. The appropriate number of padlocks (Cat No. 112666) are required for the high voltage switchgear.
2. The appropriate number of padlocks (Cat No. 112666) are required for all doors.
3. This drawing to be read in conjunction with CEOM7203.48
4. All bolts, nuts and washers to be stainless steel.
5. Both transformer and plinth to be earthed back to the main earth bar.
6. Danger and identification signs to be fitted to all doors and transformer access door.
7. Item 24 to be centrally located on the doors of the HV switchgear. Where there are two doors the label is to be placed on the left hand door. Item to be fixed with item 25.
8. Low Voltage switch fuse modules and fuse cartridges/links will need to be ordered separately as per CEOM7202.12

ITEM No.	Qty	DESCRIPTION	Cat. No.	ITEM No.	Qty	DESCRIPTION	Cat. No.
				12	1	SUBSTATION NUMBER LABEL	
23	4	RIVET POP S/S 4mm DIA 3.2 - 6.4 RANGE		11	6	WARNING LABEL HIGH VOLTAGE	
22	3	EMERGENCY CALL SIGN		10	2	BASE INFILL EE 4 WAY	
21	4	EXTERNAL COPPER BUSHING FLAG		9	1	PLINTH	
20	1	LV BAFFLE INSULATION BARRIER		8	1	DRAWING POCKET	
19	3	INSERT 22kV 200A ELASTIMOULD		7	1	TAP SWITCH HANDLE 7 POSITIONS	
18	1	BUSHING PAD RESIN 3000A		6	1	INTERNAL ARC CABLE BOX 3 WAY	
17	1	EARTH BAR		5	1	OIL PRESENCE INDICATOR	
16	1	HV SWITCHGEAR RM6		4	1	CAP S/STEEL Ø130mm HERM / SEAL	
15	1	LV SWITCH BOARD WEBER		3	1	3 PHASE RATING PLATE	
14	3	BUSH ASSEMBLY 33kV, 200A		2	1	OIL BUND ASSEMBLY	
13	1	TANK ASSEMBLY		1	4	5.0t SWIFT- LIFT MAIN LIFTING EYES	

AMENDMENT DETAILS

3	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
ADDED NOTE 8.		
2	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2016
CHANGES TO CAT NO 251734 DIAGRAM EARTH SWITCH.		

SCALE	NTS
ISSUED	18/03/2015
DRAWN BY	SG
CHECKED BY	D.KELLY

AUTHORISED BY

Graeme Barnewall

PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

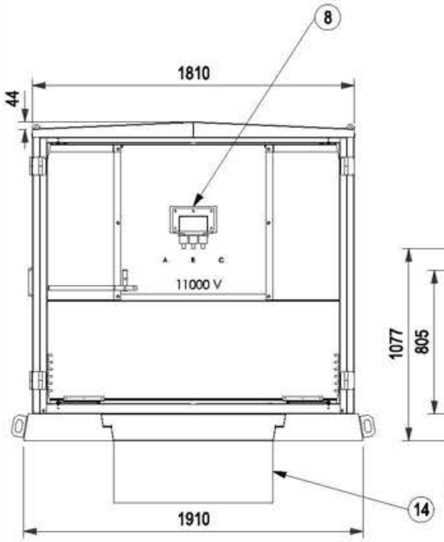
DATE 26/05/2018

CEOM7203.163

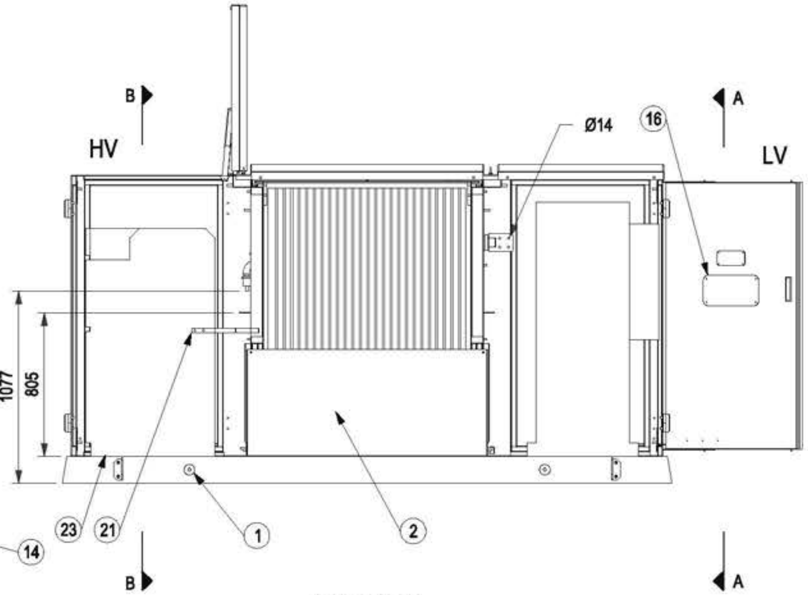
#	2 of 2	A4

PADMOUNT SUBSTATION 11kV, 1500kVA GENERAL ARRANGEMENT (SCHNEIDER) ELONGATED

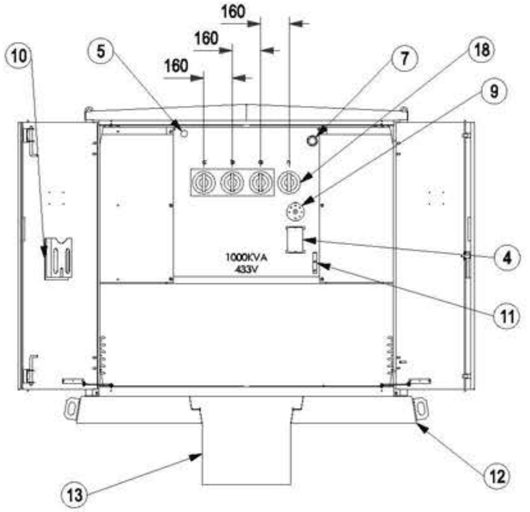
essential energy



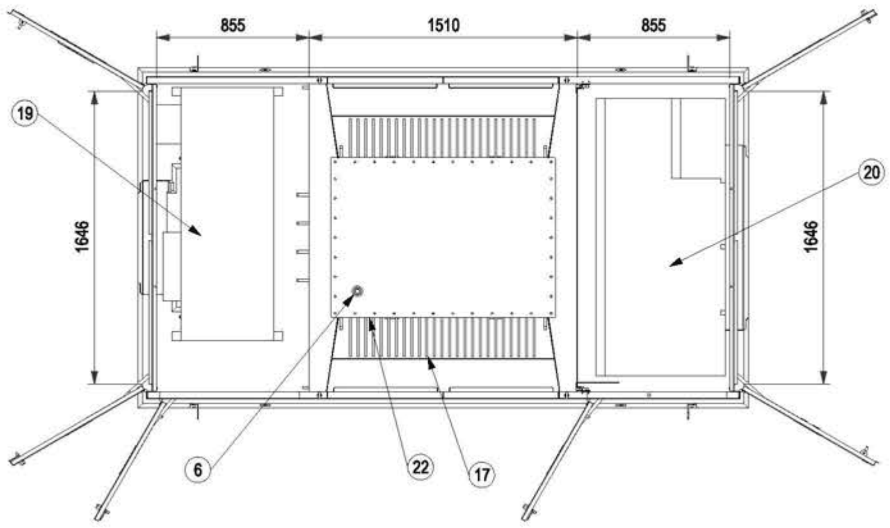
VIEW B-B
END VIEW HV
SWITCHGEAR REMOVED



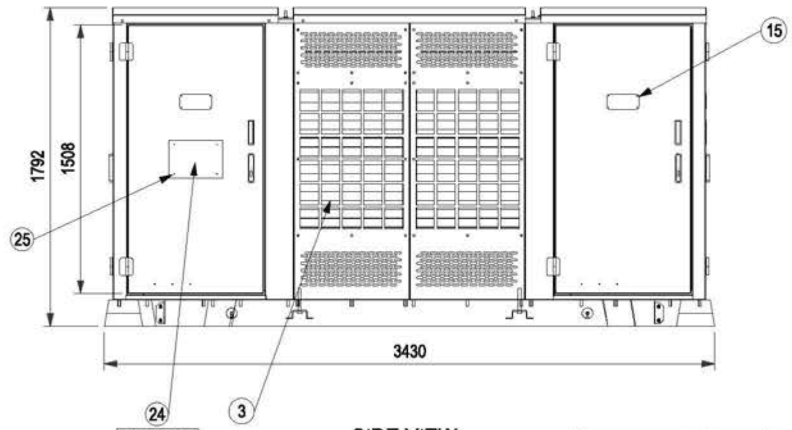
SIDE VIEW



VIEW A-A
END VIEW LV
SWITCHGEAR REMOVED



TOP VIEW



REFER TO NOTE 7

SIDE VIEW

MASSES	kg
TANK AND FITTINGS	965
ENCLOSURE AND PLINTH	2635
OIL VOLUME (1020 Litre)	885
CORE AND COIL	1630
SWITCHGEAR	750
TOTAL	6865

ELECTRICAL CLEARANCES IN AIR (mm)		
	PHASE-PHASE	PHASE - EARTH
HV	INSULATED	INSULATED
LV	100	60

AMENDMENT DETAILS		
6	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	13/09/2019
REFER SHEET 2		
5	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	18/07/2019
REFER SHEET 2		
4	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
REFER TO SHEET 2.		
3	DRAWN	J.DOWLING
	CHCKD	D.KELLY
	DATE	07/05/2014
ITEMS 24 & 25 ADDED. REFER TO SHEET 2.		
2	DRWN	K.SMITH
	CHCKD	D.KELLY
	DATE	05/10/2012
REFER TO SHEET 2.		

SCALE	NTS
ISSUED	19/09/2012
DRAWN BY	S.G / W.G
CHECKED BY	D.KELLY

AUTHORISED BY

Graeme Barnewall

PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

DATE	26/05/2018

CEOM7203.87

#	1 of 2	A4

PADMOUNT SUBSTATION 11kv, 1000kVA (4 way) GENERAL ARRANGEMENT (TYREE) ELONGATED

ESSENTIAL ENERGY
essential energy
ABN 37 428 185 226

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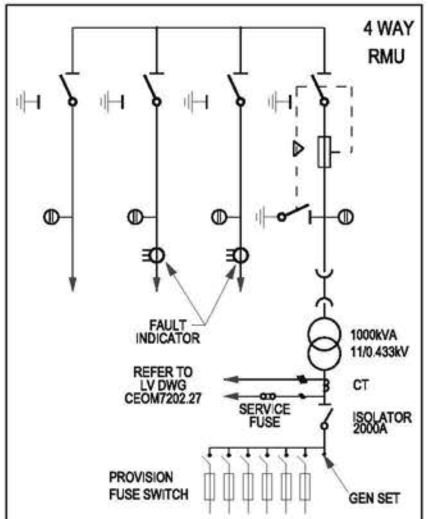
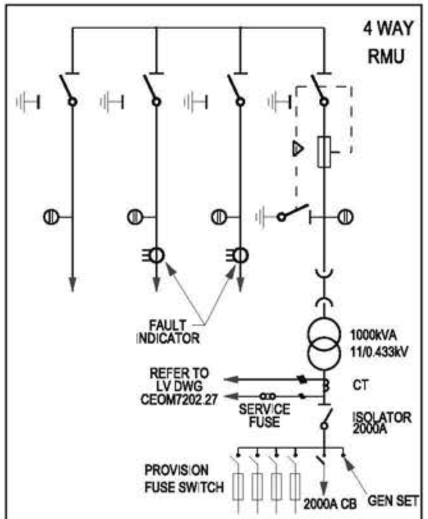


SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_6_4WEF

CAT No 251719

TYREE REF DWG 0750-0294 & 0804-0056



SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_CB 4_4WEF

CAT No 251733

TYREE REF DWG 0750-0298 & 0804-0058

Item No.	Qty	Description	Cat. No.
25	4	RIVET POP S/S 4mm DIA 3.2 - 6.4 RANGE	101920
24	3	EMERGENCY CALL SIGN	851302
23		RMU - MOUNTING PLATE	AS PER SINGLE LINE DIAGRAM
22		COVER ASSEMBLY	
21		EARTH BAR	
20		HV SWITCHGEAR - EFACEC FLOUOFIX	
19		LV SWITCHBOARD - WEBER	
18		#73 BUSHING ASSEMBLY 3.3kV 1050A	
17		TANK ASSEMBLY	
16		PADMOUNT SUBSTATION LABEL	
15		DANGER LABEL	
14		HV END-FILL PANEL	
13		HV END-FILL PANEL	
12		PLINTH	
11		EARTH BAR	
10		DRAWING POCKET	
9		TAPSWITCH HANDLE 7 POSITION	
8		REROLLE BUSHING EMC TBRA12	
7		25NB BRASS OIL SIGHT	
6		PLUG 25NB FLANGED BRASS	
5		25NB FILLER CAP	
4		3 PHASE RATING PLATE	
3		LOUVRE ASSEMBLY	
2		BUND ASSEMBLY	
1		2.5t SWITFT-LIFT MAIN LIFTING EYES	

NOTES

1. The EFACEC switchgear for the 1000kVA padmount will require three fuses (Cat No. 210016 - Fuse 12kV 80A Backup HRC).
2. The appropriate number of padlocks (Cat No. 112666) are required for the high voltage switchgear.
3. The appropriate number of padlocks (Cat No. 112666) are required for all doors.
4. This drawing to be read in conjunction with CEOM7203.48
5. All bolts, nuts and washers to be stainless steel.
6. Both transformer and plinth to be earthed back to main earth bar.
7. Danger and identification signs to be fitted to all doors and transformer access door.
8. Item 24 to be centrally located on the doors of the HV switchgear. Where there are two doors the label is to placed on the left hand door. Item to be fixed with item 25.
9. Low Voltage switch fuse modules and fuse cartridges/links will need to be ordered separately as per CEOM7202.12
10. Refer to CEOM7202.71 for cable clamp extension kit. This will allow for lower LV cable breakout.

AMENDMENT DETAILS

Rev		
6	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	13/09/2019
AMENDMENT TO DRAWING NUMBER IN NOTE 10		
5	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	18/07/2019
NOTE 10 ADDED		
4	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
ADDED NOTE 9.		
3	DRAWN	J.DOWLING
	CHCKD	D.KELLY
	DATE	07/05/2014
REFERENCE TO LV DRAWING WAS CORRECTED FROM CEOM7202.07. ITEMS 24 & 25 ADDED. NOTE 8 ADDED.		

SCALE	NTS
ISSUED	19/09/2012
DRAWN BY	S.G / W.G
CHECKED BY	D.KELLY

AUTHORISED BY

Graeme Barnewall

PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

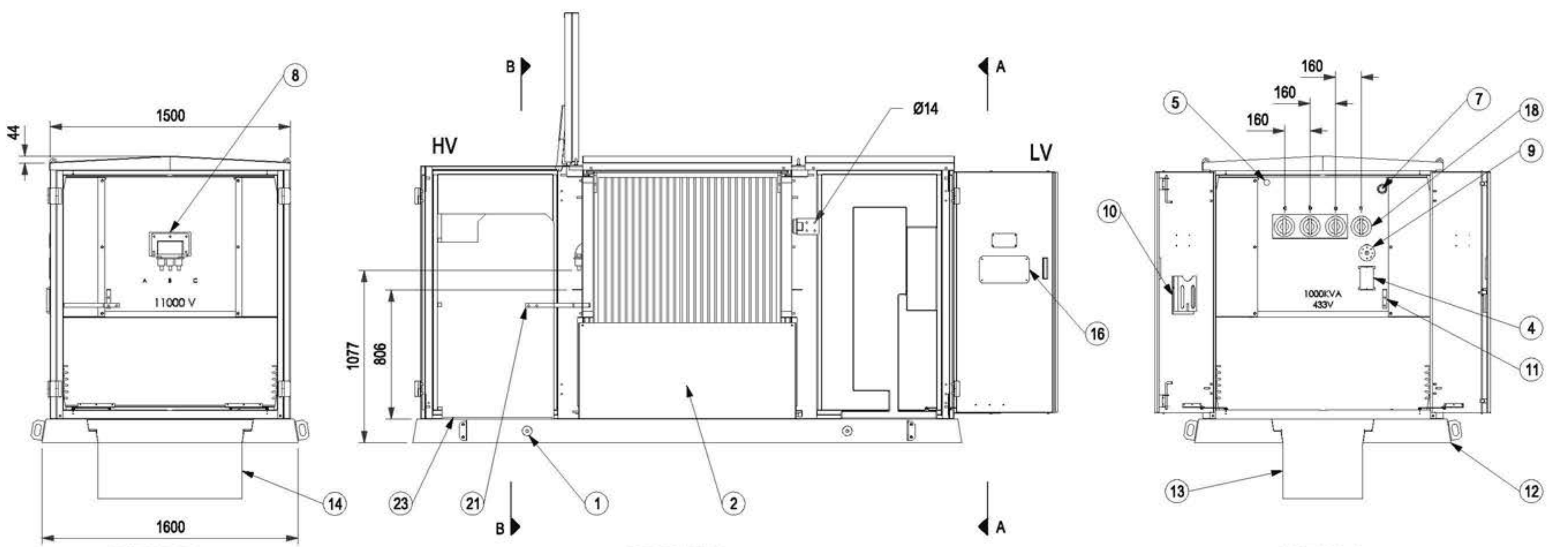
DATE	26/05/2018

CEOM7203.87

#	2 of 2	A4

PADMOUNT SUBSTATION 11kV, 1000kVA (4 WAY) GENERAL ARRANGEMENT (TYREE) ELONGATED

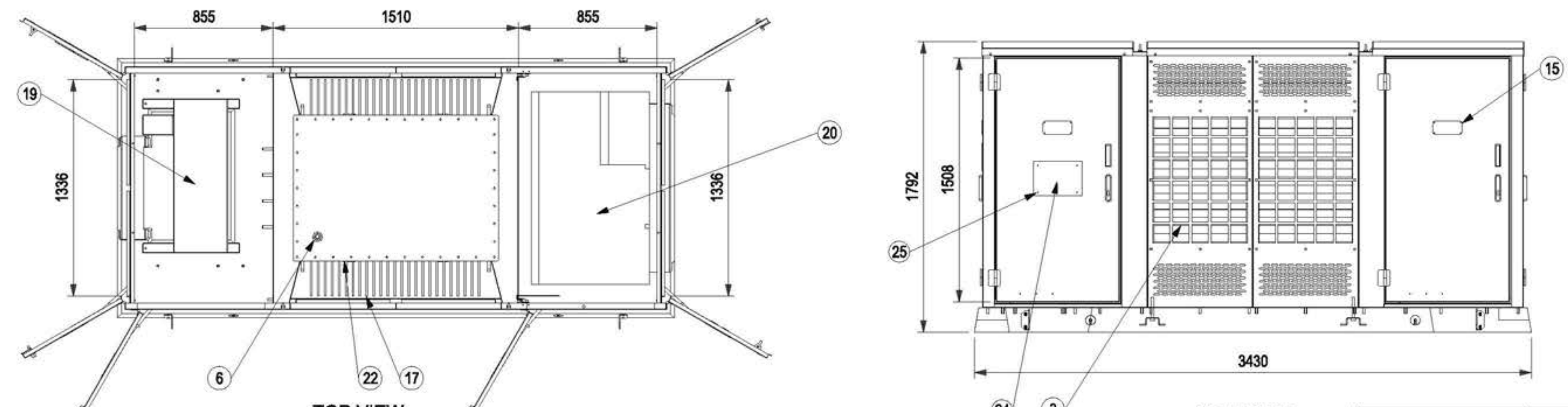
essential energy



VIEW B-B
END VIEW HV
SWITCHGEAR REMOVED

SIDE VIEW

VIEW A-A
END VIEW LV
SWITCHGEAR REMOVED



TOP VIEW

REFER TO NOTE 8

SIDE VIEW

MASSES	kg
TANK AND FITTINGS	965
ENCLOSURE AND PLINTH	2350
OIL VOLUME (1020 Litre)	885
CORE AND COIL	1630
SWITCHGEAR	700
TOTAL	6530

ELECTRICAL CLEARANCES IN AIR (mm)		
	PHASE-PHASE	PHASE - EARTH
HV	INSULATED	INSULATED
LV	100	60

AMENDMENT DETAILS

7	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	13/09/2019
REFER TO SHEET 2		
6	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	18/07/2019
REFER TO SHEET 2		
5	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
REFER TO SHEET 2.		
4	DRAWN	W.GATLEY
	CHCKD	D.KELLY
	DATE	28/08/2014
REFER TO SHEET 2.		
3	DRAWN	J.DOWLING
	CHCKD	D.KELLY
	DATE	07/05/2014
ITEMS 24 & 25 ADDED. REFER TO SHEET 2.		

SCALE	NTS
ISSUED	19/09/2012
DRAWN BY	S.G / W.G
CHECKED BY	D.KELLY

AUTHORISED BY
Graeme Barnewall
PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

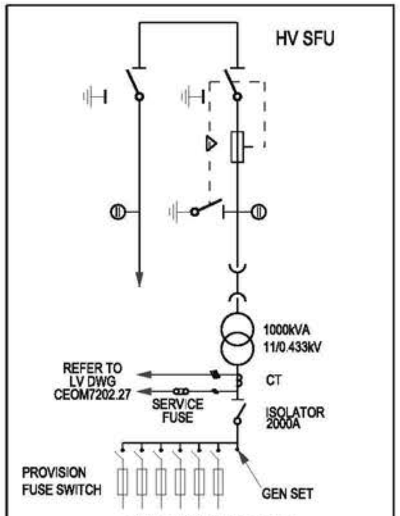
DATE	26/05/2018

CEOM7203.86

#	1 of 2	A4

PADMOUNT SUBSTATION 11kV, 1000kVA GENERAL ARRANGEMENT (TYREE) ELONGATED

essential energy

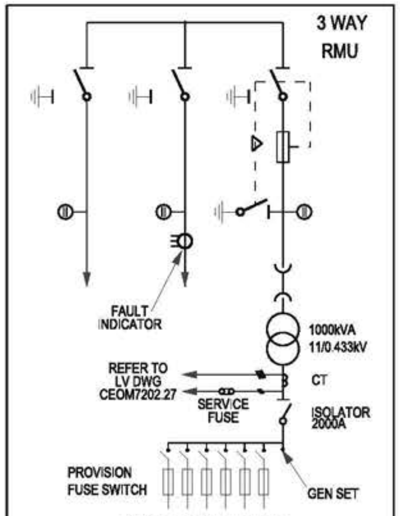


SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_6_SFEF

CAT No 251722

TYREE REF DWG 0750-0294 & 0804-0056

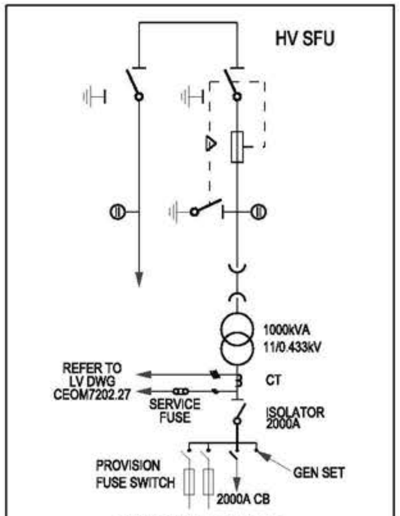


SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_6_3WEF

CAT No 251725

TYREE REF DWG 0750-0293 & 0804-0056

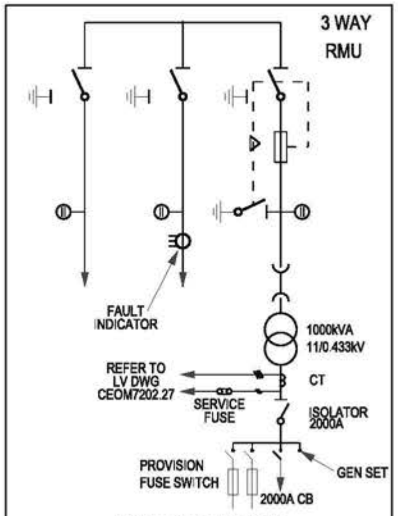


SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_CB 2_SFEF

CAT No 251731

TYREE REF DWG 0750-0295 & 0804-0057



SINGLE LINE DIAGRAM

SUBPAD_11_1000_EL_CB 2_3WEF

CAT No 251732

TYREE REF DWG 0750-0296 & 0804-0057

Item No.	Qty	Description	Cat. No.
25	4	RIVET POP S/S 4mm DIA 3.2 - 6.4 RANGE	101920
24	3	EMERGENCY CALL SIGN	851302
23		RMU - MOUNTING PLATE	AS PER SINGLE LINE DIAGRAM
22		COVER ASSEMBLY	
21		EARTH BAR	
20		HV SWITCHGEAR - EFACEC FLOUOFIX	
19		LV SWITCHBOARD - WEBER	
18		#73 BUSHING ASSEMBLY 3.3kV 1050A	
17		TANK ASSEMBLY	
16		PADMOUNT SUBSTATION LABEL	
15		DANGER LABEL	
14		HV END-FILL PANEL	
13		HV END-FILL PANEL	
12		PLINTH	
11		EARTH BAR	
10		DRAWING POCKET	
9		TAPSWITCH HANDLE 7 POSITION	
8		REROLLE BUSHING EMC TBRA12	
7		25NB BRASS OIL SIGHT	
6		PLUG 25NB FLANGED BRASS	
5		25NB FILLER CAP	
4		3 PHASE RATING PLATE	
3		LOUVRE ASSEMBLY	
2		BUND ASSEMBLY	
1		2.5t SWITFT-LIFT MAIN LIFTING EYES	

NOTES

1. The EFACEC switchgear for the 1000kVA padmount will require three fuses (Cat No. 210016 - Fuse 12kV 80A Backup HRC).
2. The appropriate number of padlocks (Cat No. 112666) are required for the high voltage switchgear.
3. The appropriate number of padlocks (Cat No. 112666) are required for all doors.
4. This drawing to be read in conjunction with CEOM7203.48
5. All bolts, nuts and washers to be stainless steel.
6. Both transformer and plinth to be earthed back to main earth bar.
7. Danger and identification signs to be fitted to all doors and transformer access door.
8. Item 24 to be centrally located on the doors of the HV switchgear. Where there are two doors the label is to placed on the left hand door. Item to be fixed with item 25.
9. Low Voltage switch fuse modules and fuse cartridges/links will need to be ordered separately as per CEOM7202.12
10. Refer to CEOM7202.71 for cable clamp extension kit. This will allow for lower LV cable breakout.

AMENDMENT DETAILS

7	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	13/09/2019
AMENDMENT TO DRAWING NUMBER IN NOTE 10		
6	DRAWN	S. HAYNES
	CHCKD	D. KELLY
	DATE	18/07/2019
NOTE 10 ADDED		
5	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	21/05/2018
ADDED NOTE 9.		
4	DRAWN	W.GATLEY
	CHCKD	D.KELLY
	DATE	26/08/2014
CAT NO 251725 & 251731 SWAPED ON SINGLE LINE DIAGRAM.		

SCALE	NTS
ISSUED	19/09/2012
DRAWN BY	S.G / W.G
CHECKED BY	D.KELLY

AUTHORISED BY

Graeme Barnewall

PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS

DATE	26/05/2018

CEOM7203.86

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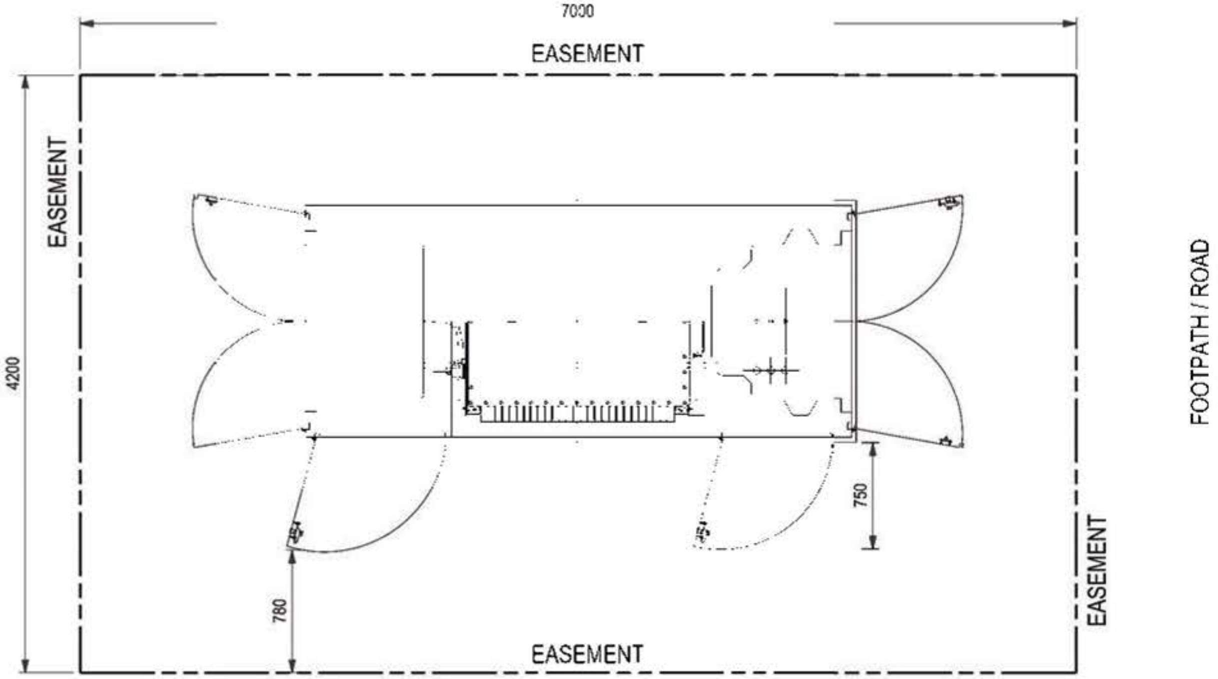
PADMOUNT SUBSTATION 11kV, 1000kVA GENERAL ARRANGEMENT (TYREE) ELONGATED

essential energy



PLAN VIEW
11kV AND 22kV ELONGATED
PADMOUNT SUBSTATION

NOTES

1. It is preferable for the land adjacent to the substation site to be levelled such that any batters at the edge of the site be eliminated. However if the slopes are too great to allow this to be done, & the site must be cut into the bank, The developer shall erect retaining walls around the substation site

2. If the substation site is filled soil & compaction shall be to the satisfaction of Essential Energy. The site shall be free of rock to a depth of 2m to allow the installation of the padmount footing.

3. The substation easement must be free of any other services.

4. The site shall be completed to the satisfaction of Essential Energy two (2) weeks prior to the commencement of the electrical reticulation works.

5. A minimum clearance of 780mm shall be maintained from an open door on the sub to the easement extremities

6. FOR FOOTPATH INSTALLATIONS
This option shall only apply to areas where the local councils have no objections to the placement of padmounts on the footpath.

7. For alternative options refer to
CEOM7098 Underground Design & Construction Manual

ALL DIMENSIONS IN MILLIMETRES

AMENDMENT DETAILS		
8	DRAWN	S.HAYNES
	CHCKD	D.KELLY
	DATE	27/07/2018
EARTH RING AREA REMOVED AMENDMENTS MADE TO NOTE 7		
7	DRAWN	A.SHEPHERD
	CHCKD	D.KELLY
	DATE	01/09/2015
AMMENDMENT TO DIMENSIONS AND NOTES. REMOVE DRAWING. AUTHORISATION WAS W. JOHNSON		
6	DRAWN	W. GATLEY
	CHCKD	D. KELLY
	DATE	18/03/2011
NOTE 7 WAS CLAUSE 3.6. DRAWING BORDER UPDATED TO ESSENTIAL ENERGY BORDER. ALL REFERENCE TO "COUNTRY ENERGY CHANGED TO "ESSENTIAL ENERGY"		

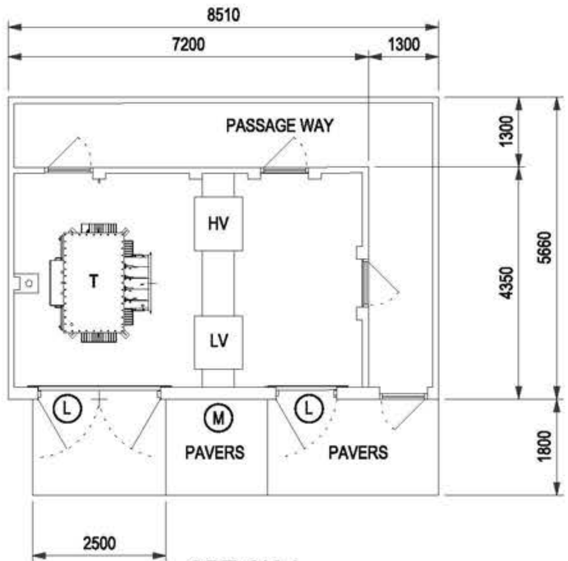
SCALE	NTS
ISSUED	30/07/2004
DRAWN BY	CH/LRW
CHECKED BY	W.JOHNSON
AUTHORISED BY	Graeme Barnewall, PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS
DATE	27/07/2018

CEOM7203.03

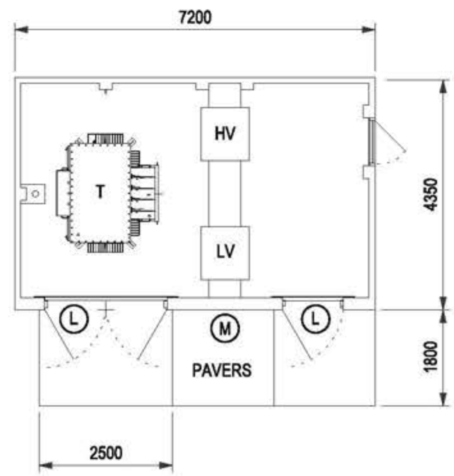
#	1 of 1	A4

PREPERRED LOCATION OF PADMOUNT SUBSTATION (ELONGATED STYLE)

essential energy



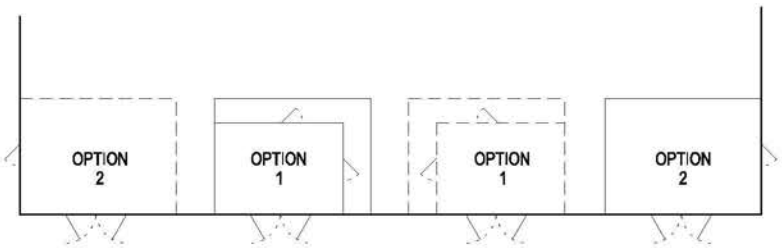
OPTION 1



OPTION 2

LAYOUT LEGEND

- (L) LOUVRE PANEL AND/OR LOUVRE DOOR OPENING.
- (M) ESSENTIAL ENERGY MAINS ENTRY POINTS
- (LV) LV DISTRIBUTION PANEL
- (HV) HV SWITCHGEAR
- (T) 1500kVA TRANSFORMER



CHOOSE OPTION AS PER INBUILDING LOCATION

TYPICAL LOUVRE DOOR AND PANEL ARRANGEMENT

NOTES

1. PURPOSE OF OPTION PLAN; THIS DRAWING ILLUSTRATES THE RANGE OF OPTIONS AVAILABLE FOR THIS TYPE OF SUBSTATION.
2. STEPS: THE STANDARD CONSTRUCTION DRAWING SHOWS STEPS UP TO FLOOR LEVEL AT THE CENTRE DOOR (FOR A TWO TRANSFORMER CHAMBER) THE OTHER DOORS (LEADING TO TRANSFORMER AREA) ARE AT FLOOR LEVEL ELIMINATING STEPS ALLOWING TRANSFORMERS TO BE WHEELED INTO POSITION.
3. ACCESS; UNLESS THE CHAMBER FRONTS ONTO A STREET, AN ACCESS ROAD FOR HEAVY VEHICLES IS REQUIRED FROM A STREET TO THE FRONT OF THE SUBSTATION CHAMBER.
4. SITE; THE KEY DIAGRAM SHOWS TYPICAL LOCATIONS SUITING THE USE OF PARTICULAR OPTIONS THE GROUND BENEATH THE SUBSTATION IS REQUIRED TO ACCOMODATE DEEP EARTHING ELECTRODES, IT MUST BE FREE OF ALL OBSTRUCTIONS INCLUDING SEWERS, PIPING AND UNDERGROUND CONSTRUCTION.
5. HEADROOM; ALL DIMENSIONS SHOWN ON OPTION LAYOUTS ARE INTERNAL

AMENDMENT DETAILS		
3	DRWN	E. MARTINSONS
	CHCKD	D. KELLY
	DATE	01/11/2013
TITLE INCLUDED "OIL TYPE". DRAWING WAS CEOS5005.05. DRAWING AUTHORISATION WAS WAYNE JOHNSON.		
2	DRWN	W.GATLEY
	CHCKD	D.KELLY
	DATE	11/05/2012
DRAWING BORDER UPDATED TO ESSENTIAL ENERGY BORDER. DRAWING AUTHORISATION WAS IAN THOMPSON. DRAWING NUMBER WAS CEPG5005.05.		

SCALE	NTS
ISSUED	04/03/2009
DRAWN BY	D. PIERA
CHECKED BY	W. JOHNSON
AUTHORISED BY	Graeme Barnewall PRINCIPAL ENGINEER UNDERGROUND CONSTRUCTION STANDARDS
DATE	30/11/2013

CEOM5005.05

#	1 of 1	A4

CHAMBER SUBSTATION STANDARD ONE TRANSFORMER UP TO 1500kVA FLOOR PLAN LAYOUT

essential energy

11.8 Hydraulics and Fire CD Report

Heath Infrastructure

Eurobodalla Health Service Redevelopment

Concept Report - Hydraulic and Fire Services

EHS-HY-RPT-00001

100% Issue | 26 July 2021

Job number 280718-00

Arup Pty Ltd ABN 18 000 966 165

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Australia
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ARUP

Contents

1 Acronym Definition

Project-specific definitions:

EHS	Eurobodalla Health Service
ERG	Expert Reference Group
LHD	Local Health District
SNSW LHD	Southern New South Wales LHD
HI NSW	Health Infrastructure NSW
CSP	Eurobodalla Clinical Services Plan
TfNSW	Transport for New South Wales
SoA	Schedule of Accommodation

Hydraulic and Fire services definitions:

AFSS	Annual Fire Safety Statement
AC	Asbestos Cement Pipe
ASE	Alarm signalling equipment
BCA	Building Code of Australia
CW	Cold Water
DtS	Deemed to satisfy
EWIS	Emergency Warning and Intercommunication System
FER	Fire Engineering Report
FEBQ	Fire Engineering Brief Questionnaire
FCR	Fire Control Room
FH	Fire Hydrant
FHR	Fire Hose Reel
FIP	Fire Indicator Panel
FDCIE	Fire Detection Control and Indicating Equipment
H&F	Hydraulic and Fire
HW	Hot Water
IL	Invert Level
NCC	National Construction Code
TWL	Top Water Level

3 Introduction

3.1 Background

The Eurobodalla Health Service (EHS) is part of the "Eurobodalla Clinical Services Plan (CSP)" formed in 2020. Currently, the Eurobodalla Shire is supported by 3 different campuses located at Batemans Bay, Moruya, and Narooma. With a growing and aging population, the current arrangement of campuses will have proved to be inefficient in providing adequate care to its surrounding community, as it suffers from a duplication and separation of services.

In 2020, the NSW Government announced a total of $200 million towards the development of a sustainable, modern, and purpose-built facility to support the needs of the entire Eurobodalla Shire from Narooma to Batemans Bay.

The EHS development will deliver new contemporary Medical, Surgical, Allied Health and Mental Health infrastructure along with new clinical and non-clinical support services. The development will include the following Clinical Services Configuration:

- Intensive Care Services
- Renal Dialysis
- Ambulatory Services
- Paediatrics
- Maternity and Neonatal Services
- Sub-Acute Care (Rehabilitation / GEM and Palliative Care)
- Acute Inpatient – Medical and Surgical
- Perioperative – Surgical Care

The full schedule of the Clinical Service Configuration is listed in EHS Redevelopment Report V1.2 dated 8 February 2021.

3.2 Site location and adjacencies

The EHS site is located in South-East Moruya and is bounded by Albert Street to the north, Princes Highway to the south, TAFE to the west and Congo Road to the east. The final layout of the EHS's facilities will be further developed based on the Option 8 as the preferred arrangement for the development.

The objective will be to provide opportunities for improved access for residents of the Batemans Bay and Narooma regions, to the TAFE, town, and new hospital. Interim and permanent options for patient access will be considered to accommodate for the later completion date of the Moruya Bypass.

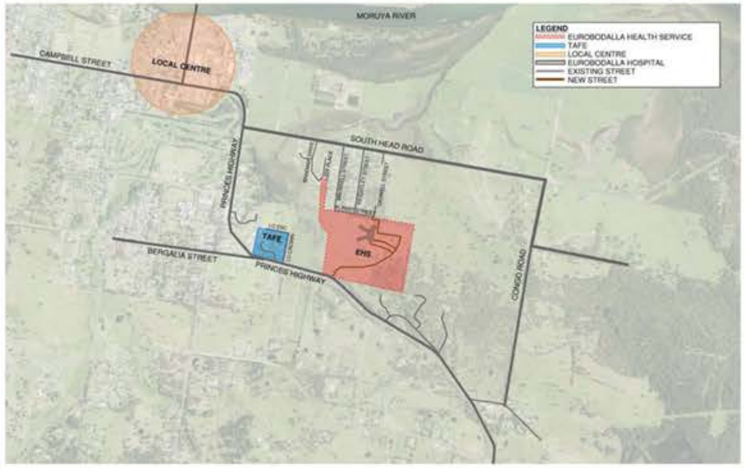


Figure 1: Site Overview

Figure 2: Precinct Overview – Option 8

3.3 Zone Locations

Zone locations allow for the identification of industrial, residential, environmental, and commercial areas around the site. This information will be used for the planning of decisions and the managing of the way land is used within the local government area.

The following zones have been identified around the EHS area.

- B2 Local Centre
- E2 Environmental Conservation
- IN1 General Industrial
- R2 Low Density Residential
- RE2 Private Recreation
- RU1 Primary Production
- RU4 Primary Production Small Lots
- SP2 Infrastructure

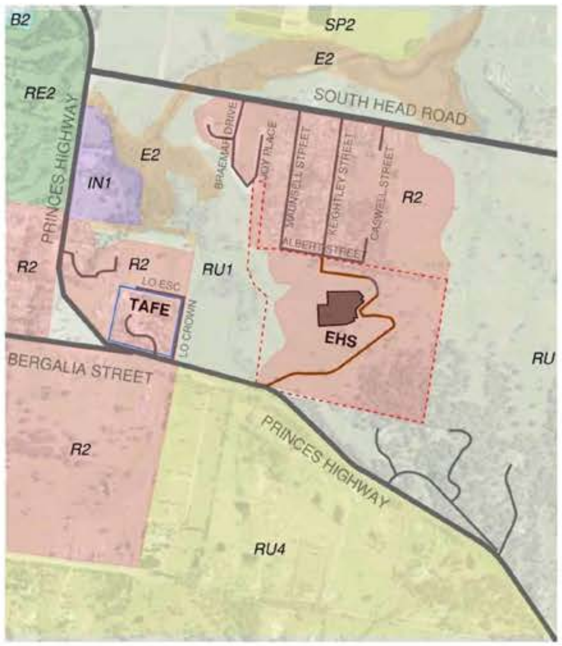


Figure 3: EHS zone locations and proposed EHS site location

3.4 Purpose of Concept Report

The focus of this hydraulic and fire services assessment has been to analyse the existing site and surrounding infrastructure to understand the existing constraints and available utilities around the site to inform the proposed concept planning and identify the risk and opportunities associated with the proposed development.

The opportunities identified in this report included various connections to utilities managed by Eurobodalla Shire Council, spatial planning associated with proposed building layout and input into ESD strategy including options for site electrification vs LPG supply for heating systems.

The content of this document should be read in conjunction with the documents produced by the Architect and other consultants for all other disciplines.

3.5 Sources of Information

The following sources of information have been used in preparation of this report

- Eurobodalla Health Service SoA based on CSPV3.0 dated 04/02/21.
- Architectural 'Eurobodalla Hospital Master Plan Presentation' dated February 2021.
- Eurobodalla Shire Council water and sewerage drawings dated March 2021.
- Eurobodalla Shire Council Pressure and Flow Statement May 2021
- Eurobodalla Health Service Master Plan Design Assumptions dated 11/03/21.
- Eurobodalla Health Services Redevelopment – Value Management Study – V1.1 dated February 2021.
- Level and Details Survey prepared by LTS dated 23/02/2021

It is noted the sources of information used in the preparation of this report do not provide a complete set of documentation. During the further stages of design, Arup will provide recommendations as to any further inspections and testing necessary.

3.6 Scope and Limitations

- This report is based on a desktop study. Additional surveys and investigations might be required if certain options are to be considered further.
- Any future fire engineering requirements that have not been considered during this phase should be considered and coordinated with the BCA Report.
- No detailed calculations or quantitative assessments of the adequacy or compliance of the building to current design codes or the National Construction Code (NCC) were carried out as part of this report, nor was any physical materials testing carried out or enquiries made of statutory authorities in connection with the building.

3.7 General Assumptions

a. Importance Level 4
b. Bushfire Hazard Assessment (to be advised)
c. National Construction Code 2019 (NCC)
d. Building classification as per Philip Chun Building Compliance BCA Report
e. All applicable Australian Standards

3.8 Stakeholders Consultation

- ERG#1 Architectural and Services Presentation – May 2021 incl. H&F Services Site Strategy
- ERG Services Presentation dated 14 July 2021
- FRNSW Introduction Meeting – 28 April 2021 Overall Fire Services Site Strategy and Access
- Workshops with ESC Manager Water and Waste - May and June 2021
- Coordination meeting with ESC Manager Water and Waste – 23 July 2021

3.9 Further Information Required

The following information will be required to inform Schematic Development and subsequent Stages of the Project:

- Updated BCA report(s) for next Stage
- Fire Engineering FEBQ/FER input and review fire compartments
- Detailed updated Arch blocking and stacking with the final options.
- Updated Cost Plan
- Coordination with other services including Civil/Structure, Mechanical, Electrical
- Agreement of gas or no gas option to develop hot water heating strategy
- ESD Strategy
- Project specific requirements including
    - Water tank configuration
    - Cold water meter configuration,
    - Filtration system and pre-water treatment
    - Architect's Room Data Sheets
    - Architect's General Arrangement Plans
    - Functional Design Briefs
    - Hazardous Material Register
    - Bushfire Hazard Assessment
    - Arborist Report.

4 Existing H&F Infrastructure

This section describes existing utility infrastructure located in proximity of the Eurobodalla Health Service area. The approximate location of utilities services has been determined based on data provided by the Eurobodalla Shire Council.

4.1 Cold Water for Domestic Cold Water and Fire Services

4.1.1 Existing Authority Infrastructure

Existing water mains are available running along roads adjacent to the site as follows:

- Eurobodalla Shire Council:
    - **Albert Street:**
        - 200mm asbestos-cement (AC) main, TWL 119.9m.
        - 200mm polyvinyl chloride (PVC) main, TWL 60m.
    - **Lo Crown:**
        - 200mm asbestos-cement (AC) main, TWL 119.9m.
        - 150mm polyvinyl chloride (PVC) main, TWL 60m.
    - **Princes Highway:**
        - 450mm ductile iron cement mortar lined (DICL) main, TWL 119.9m.
        - 100mm polyvinyl chloride (PVC) main, TWL 60m.
    - **South Head Road:**
        - Pipework to be determined, TWL 77.5m.

The water mains around the site are supplied from three different pressure zones. Moruya Low Pressure Zone (TWL 60m) and Moruya Heads Pressure Zone (TWL 77.5m) are the low-pressure zones and Moruya High Pressure Zone (TWL 119.9m) is the high-pressure zone servicing the site. The pressure from the cold-water pipework will govern if the fire or cold-water system for the EHS will require additional infrastructure requirements.

It should be noted that ESC is planning to upgrade the existing AC (Asbestos Cement) water mains in the next few years and it would be our recommendation that water mains supplying Eurobodalla Hospital are added on the priority list to mitigate any future disruption to new hospital.

See Appendix A for Existing Pressure Zone Reticulation of Cold-Water Mains

4.1.2 Existing Private Cold-Water Infrastructure

Based on the discission with Council Engineering team and review existing infrastructure we understand the there is no private cold water or fire services infrastructure crossing or connected to the EHS site.

The next sections of the report provide preliminary assessment of the current infrastructure and proposed options for service connections.

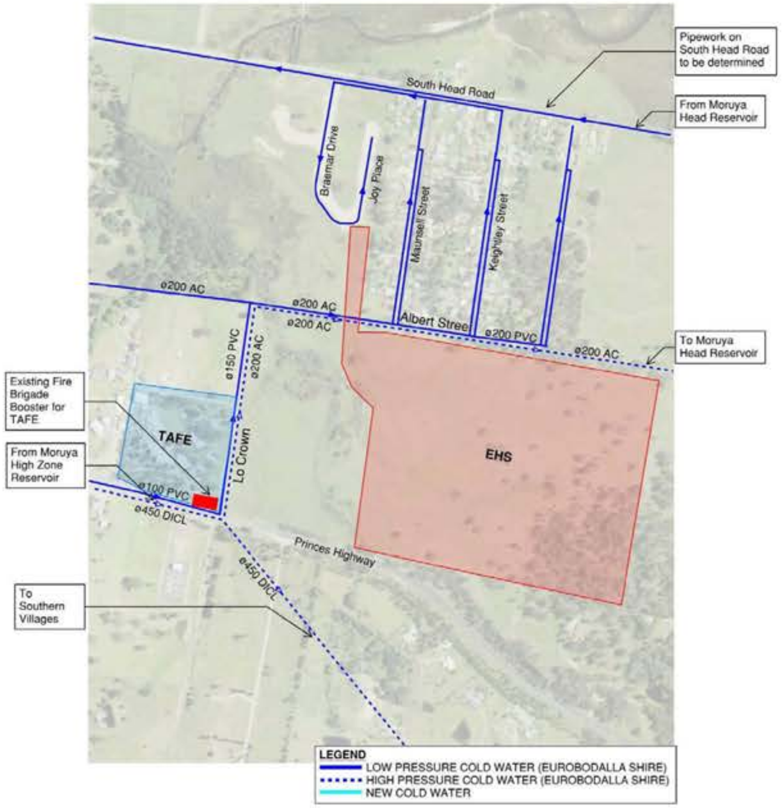


Figure 4: Cold water infrastructure around the hospital site indicating high and low pressure pipework

4.1.3 Water Quality

The Eurobodalla Shire Council regularly tests and monitors water quality to ensure community health and safety and the detailed information are listed on the Council website.

The drinking water supplied from Eurobodalla Council is safe and reliable, with drinking water being routinely tested throughout the water supply system. Analysis is undertaken at independent NATA certified laboratories, in accordance with the Australian Drinking Water Guidelines 2011 (ADWG).

See Appendix B for latest Drinking Water Quality Summary provided by Eurobodalla Shire Council.

4.1.4 Existing Cold Water Infrastructure Capacity

In order to assess the capabilities of the surrounding hydraulic services infrastructure, Arup has undertaken a preliminary load assessment for the new proposed Eurobodalla hospital.

The following loads have been calculated based on the floor area and proposed Clinical Service Configuration. The loads are preliminary at this stage and will be refined with design development.

From the estimated peak water demand, the preliminary minimum pipe size requirements, and spare capacity within that pipe have been calculated as seen below. The mechanical loads have been estimated based on previous hospital projects.

Building/Service	Peak Water Demand Flow (L/s)	Estimated Pipe Size (mm)
EHS	5.73	80
Mechanical Equipment	3	65
Total Water Requirement	**8.73**	**100**
Fire Hydrants	20	-
Fire Sprinklers	14*	-
Drenchers	6	-
Total Fire Requirement	**34**	**150**
Note: Preliminary figures based on similar sized hospitals and standard size of fire compartments (compartments under 10,000m2) subject to further assessment and hydraulic calculations. We assumed that OH3 retail space fire services requirements will		

The EHS building requires a 100mm water connection for domestic cold water and a 150mm water connection for fire services. These calculations are an estimate and will be developed further in the following stages.

4.1.5 Pressure and Flow Assessment

Application for the pressure and flow has been already lodged with Eurobodalla Shire Council and various scenario have been modelled by Council Engineering team to determine the most suitable option for water connection for domestic and fire services purposes.

See Appendix E for latest Pressure and Flow Summary provided by Eurobodalla Shire Council

- Option 1 (Moruya High Zone from Albert Street) and Option 2 (Moruya High Zone from Princes Highway 150mm main extension) can meet peak flow requirements but will require the installation of a Pressure Reduction Valve (PRV).
  - If option 1 is selected, the PRV(s) would be at the meter) If option 2 is chosen, the PRV could be in the Council main.
- Option 3 (Moruya Heads Reservoir Zone) was probably the best option for static head but is unable to provide peak flows.
- Option 4 (Moruya Low Zone) has low static head and can deliver only 30L/s.

Based on above outcomes and discussion with Council it is recommended that Option 1 (connection from Moruya High Pressure Zone - existing 200mm AC rising/pumping main in Albert Street) would provide suitable pressure and flow to the Hospital up to 60l/s meeting peak flow requirements for fire services. The connection would require installation of a pressure reduction valve at the meter.

4.2 Sewer Drainage

4.2.1 Existing Authority Sewer Infrastructure

Existing sewer mains are available running along adjacent streets at the locations shown below:

Eurobodalla Shire Council:

- Bergalia Street, John Street and Princes Highway:
  - 150mm vitrified clay (RL-VC) main
- Keightley Street, Maunsell Street, Joy Place and Braemar Drive:
  - 150mm vitrified clay (RL-VC) main
- Lo Esc
  - Sewage pumping station SPSMO05

It has been also discussed with the Council Engineering team to review other options for sewer connection from the proposed site. Council will review the overall strategy for the location of the pumping station considering shared infrastructure with other existing properties including TAFE and also future developments.

4.2.2 Existing Private Sewer Infrastructure

There is no existing private sewer infrastructure located on the proposed EHS site therefore new connection will be required and agreed with Council.

The extend of work and demarcation line needs to be agreed between the Project scope and Council.

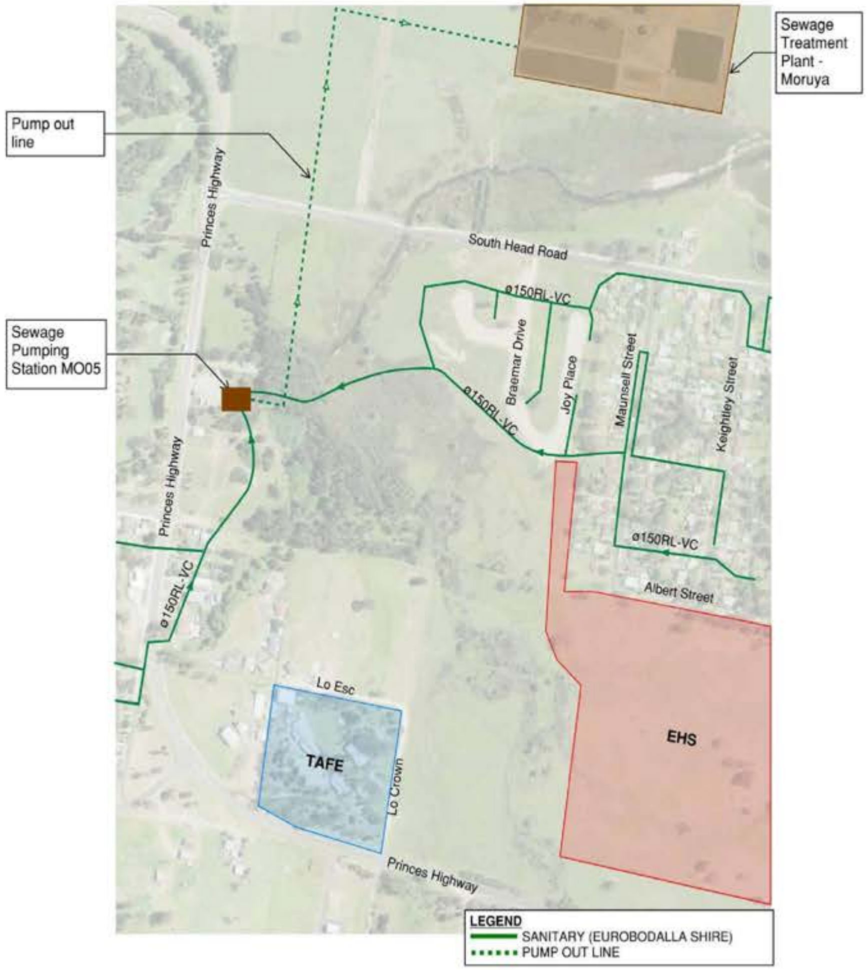


Figure 5: Council Sewer infrastructure around the hospital site

4.2.3 Existing Sewer Infrastructure Capacity

In order to assess the capabilities of the surrounding hydraulic services infrastructure, Arup has undertaken a preliminary load take down assessment for the new proposed Eurobodalla Hospital.

The following loads have been calculated based on the floor area and proposed departments. These loads are preliminary at this stage and will be refined with design development.

Building	Estimated Peak Sewer Discharge (L/s)	Minimum Pipe Size (mm) @ 1% slope
EHS	5.50	-
Mechanical Equipment	2.80	-
Combined	**8.30**	**225**
Note: Pipework sized to be 50% full.		

The required pipe size for the EHS building is 225mm. These loads are estimates and will be further developed in the concept design stage.

Further investigation will be undertaken during the schematic phase to establish existing main capacity and discussion with Council is currently underway. The proposed sewer connection options are described in the next sections of this report.

4.3 Gas Supply

4.3.1 Existing Authority Infrastructure

No existing reticulated gas supply is available in Moruya. The need for a gas supply will be dependent on the new development's requirements, ESD aspirations and services which require gas. These services could include (but not limited to) mechanical heating boilers, domestic hot water plant, hot water or cooking for commercial kitchen.

If the gas supply is required for the site it will be provided from LPG storage vessels supplied by Origin Australia – typical installation shown below.

Figure 6: LPG storage vessels on site

5 New Eurobodalla Health Service

5.1 Hydraulic Services Strategy

The proposed building will generally be designed as a standalone building with services interconnections being connected into existing Authority infrastructure. The key strategies for the EHS redevelopment have been summarised in the following pages.

The following section provides a description of the design criteria, systems and concept design considerations for hydraulic services.

5.1.1 Environmental Expectations

This section provides a brief description of the environmental aspirations proposed for the hydraulic systems. They are subject to development of the overall ESD and sustainability strategy for the building.

The hydraulic systems design will embrace water conservation measures and take steps to use renewable energy which include:

- Reducing town main water supply by:
  - Reuse / recirculation of fire test drain water
  - Harvest and reuse building rainwater for irrigation and cooling tower supply
- Reducing water usage at fixtures and fittings where possible.
- Reducing water usage across the site by using:
  - Smart metering and monitoring of water use throughout the building
  - Pressure reducing devices on system reticulation
- Exploring heat rejection recovery from mechanical chillers to pre-heat domestic hot water.
- It should be noted that a transition plan away from the fossil fuels will be developed and agreed with HI for the project.

5.1.2 Description of Systems

The following list of systems is described in the subsequent sections:

a. Domestic cold water supply
b. Domestic hot water supply
c. Reverse Osmosis Water
d. Sanitary plumbing and drainage
e. Grease waste and trade waste drainage
f. Rainwater roof drainage and Recycled Non-Potable Water
g. LPG supply
h. Fire hose reel system

5.1.3 Design Criteria

The following codes and standards will form the basis of the hydraulic services design:

a. Building Code of Australia (BCA) / National Construction Code (NCC) 2019
b. Plumbing Code of Australia 2019
c. AS 3500.1:2018 – Plumbing and drainage Part 1: Water Services
d. AS 3500.2:2018 – Plumbing and drainage Part 2: Sanitary plumbing and drainage
e. AS 3500.3:2018 – Plumbing and drainage Part 3: Stormwater drainage
f. AS 3500.4:2018 – Plumbing and drainage Part 4: Heated water services
g. AS 2441- 2005 Installation of Fire Hose Reels
h. AS 5601 – 2013 Gas Installations
i. Eurobodalla Council requirements
j. NSW Health Infrastructure: Standards, Policies, Procedures and Guidelines (SPPG)
k. NSW Health Infrastructure: Engineering Services Guidelines dated on 26 Aug 2016
l. NSW Health Infrastructure: Design Guidance Note 001 to 040 including No. 006 General Design Principles
m. Australian Health Facility Guidelines Part E: Building Services and Environmental Design 2016 (AusHFG)
n. International Health Facility Guidelines (iHFG)

A summary of the key design criteria is as follows:

Item	Parameter
Rain Water drainage	Intensity: 240mm/hr - 5min 1:100-year event CSIRO report, "Roof drainage" by K.G Martin. Australian Rainfall and Runoff AS3500.3-2015 Local Eurobodalla council requirements (gutters to incorporate measures to prevent failure from leaves and silt with minimal maintenance. Details of the gutters and safety overflow will be shown on architectural plans and indicated on hydraulic plans)
Domestic Hot Water Delivery Temperature	Hot water distribution: 60°C - 65°C *Patient use / access areas* • **Personal hygiene and hand washing utensils, cups, etc.:** 38 - 40.5 °C with 43.5 °C thermal shutoff for children, 40.5 - 45 °C with 46 °C thermal shutoff for adults. • **Beverage preparation:** boiling water 100 °C *Non-patient use (staff use only)* • **Beverage preparation:** boiling 100 °C • **Sinks for manual dishwashing:** 77°C min ** • **Cleaner's sink/laundry tub:** 60°C min • **Automatic dishwasher:** 60 - 70°C at inlet • **Automatic washer/disinfector:** 60 °C min at inlet • **Automatic clothes washer:** 70 - 85 °C at inlet ** • **Personal hygiene:** 50 °C max The above temperatures comply to Heath Infrastructure 'Water – Requirements for the Provision of Cold and Heated Water'. **Requirement TBC with HI. It may require an additional localised hot water boost.
Working velocities in water services pipes	Max 1.5 m/s due to noise sensitivity for domestic cold water and 0.6 to 1.0 m/s for domestic hot water, based on HI Engineering Services Guidelines.
Maximum operational water pressure	500kPa
Minimum operational water pressure	250kPa
Cold water average supply temperature	10°C
Velocities within storm-water drainage	Self-cleansing velocities between 0.75m/s and 2m/s
Hot water plant	Storage vessels – heat loss is not to exceed values within Table A1 of AS4692.2. Primary pipe work between heat source and storage vessels is to have 25mm Rockwool insulation. Heating plant minimum efficiency 80%
Fire Hose Reels	0.33l/s @ 230kpa minimum, located throughout building to provide full coverage in compliance with AS 2441-2005

5.1.4 Domestics Cold Water Supply

Three options have been explored to provide water to the EHS and all their respective sanitary fixtures and equipment's. Three options with different pressure mains have been considered to determine new infrastructure required to supply appropriate cold water to the site. These options have been discussed with Council and analysed based on the pressure and flow provided by Council to establish the most suitable connection point taking into consideration domestic and fire services requirements.

The summary of the options that have been discussed with Council Engineering team are listed below. Connection from Albert Street has been selected as the preferred connection.

Option 1: New connection into Eurobodalla Council main located on South Head Road with a cross connection to the 200mm AC main located on Albert Street. This is connection to the low-pressure cold water main.

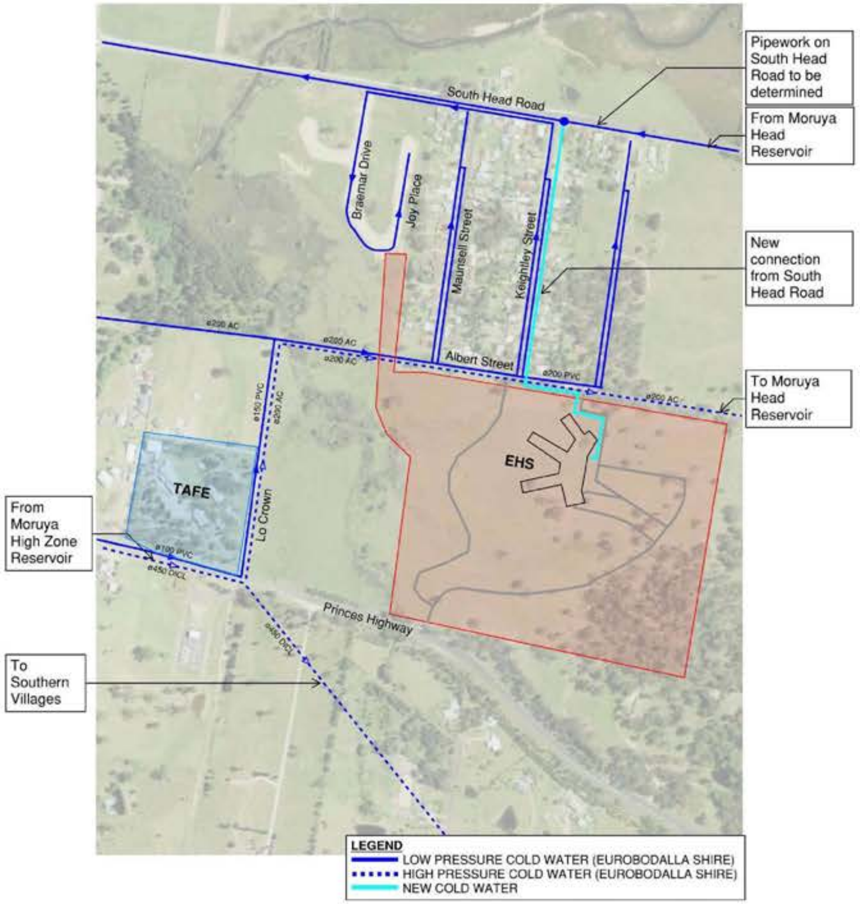


Figure 6: **Option 1** - New cold-water connection from South Head Road – Low Pressure Zone. New Connections shown in green.

Option 2A: New connection into Eurobodalla Council 200mm AC main located on Albert Street/Lo Crown. To be provided with a pressure reduction device near the new cold-water meter.

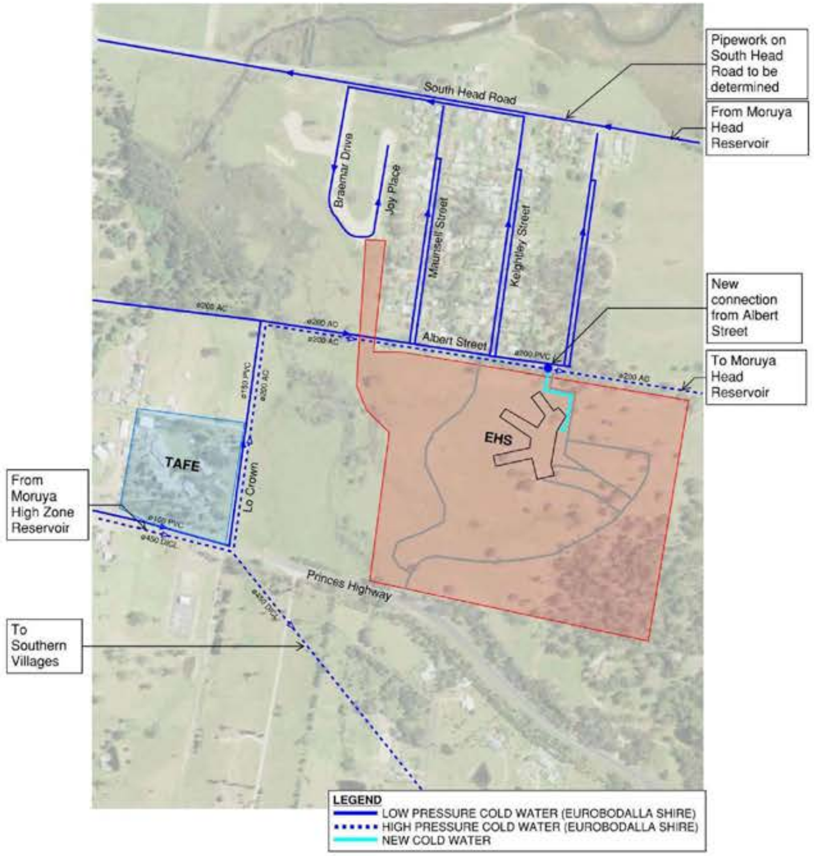


Figure 7: **Option 2A** - New cold-water connection from Albert Street – High Pressure Zone

Option 2B: New connection into 450mm DICL main located on the Princes Highway. To be provided with a pressure reduction device near the water meter.

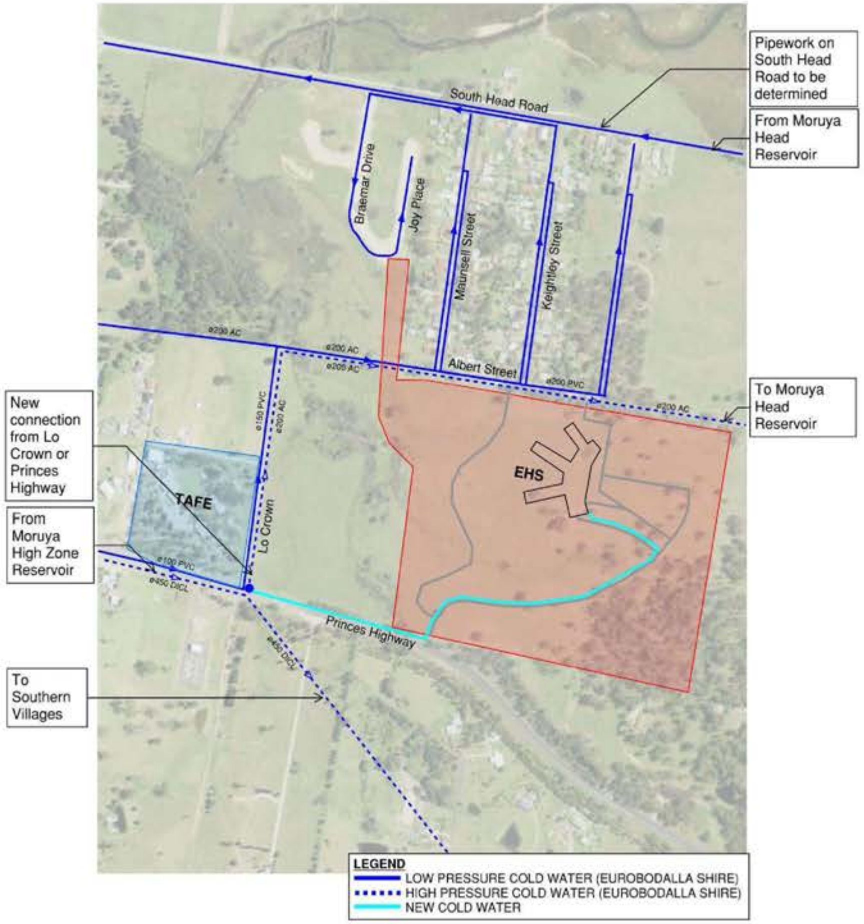
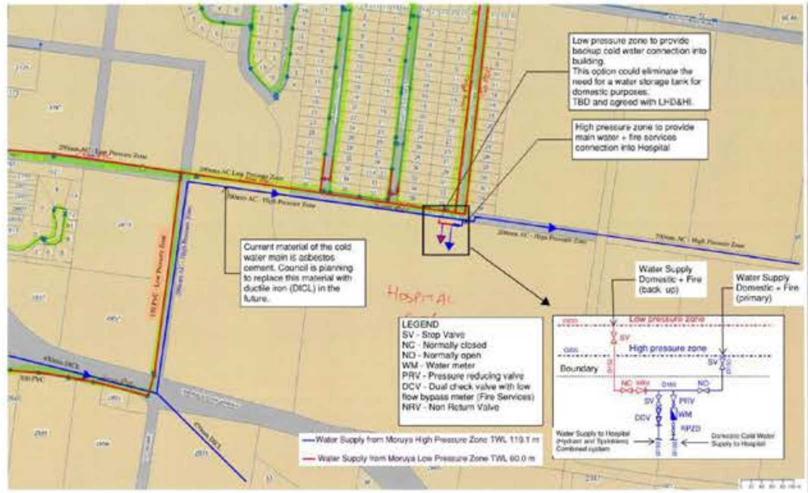


Figure 2: **Option 2B** - New cold-water connection from Princes Highway – High Pressure Zone

5.1.4.1 Proposed Cold Water Arrangement

Based on the review of above scenarios and discussion with ESC Engineering team the connection from **Albert Street 200mm AC water main** has been selected as the most hydraulicly suitable, cost effective, in line with location of the proposed Fire Brigade access and Booster and providing the best pressure and flow to the site. Also, 200mm Low Pressure Zone in Albert Street gives further opportunity for dual connection for domestic water supply.

Proposed arrangement has been already discussed with Council and has been issued to ESC Engineering team for final review and comments.



5.1.4.2 Cold Water Storage Tank and Back up Water Supply

The storage tank for cold water supply are usually provided to offer a buffer for peak demand in the system and redundancy in case of water shortage. The need for new tank requirements and size will have to be assessed based on considerations regarding various factors including reliability of water mains and the continuity for essential services/departments.

The NSW Health Infrastructure Engineering Services Guidelines (2016) specify 24 hour cold water storage needed for those building required to deliver service continuity in the event of civil emergencies only and on average 3-4hr storage tanks are adopted in Sydney area to provide sufficient response time by Authorities to fix and restore water supply. ESG also specify cold water storage needed when Council main supply is not considered a reliable source.

We are proposing to review three options associated with reliability of water supply for a new hospital including the following

1. Provide water storage tank – single supply plus volume and storage time to be agreed or
2. Provide dual water supply from Albert Street from two in-depended water mains:

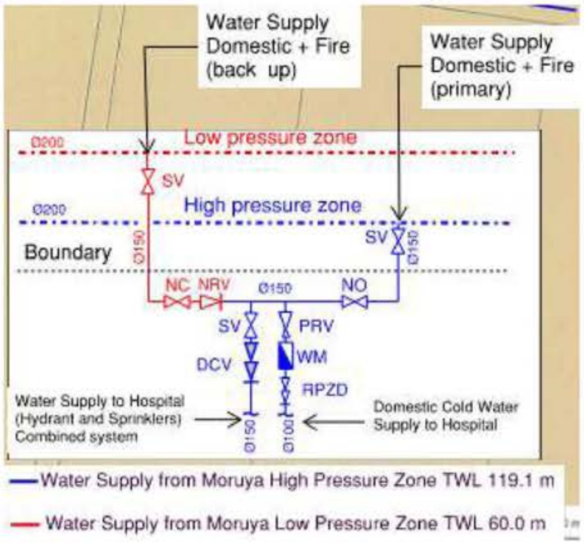
a. Moruya High Pressure zone – main supply

b. Moruya Low Pressure Zone – back up supply (with Stop Valve normally closed)

3. Provide water storage tank and dual water supply to mitigate any risk with reliability of water supply.

The proposed arrangement has been already discussed with Council and provides greater level of redundancy then single supply. The Low pressure Supply valve would be normally closed and would only be open if there is issue with the main supply (due to maintenance works, pipe replacement, pipe burst, etc).

It should be noted that ESC is planning to upgrade the existing AC (Asbestos Cement) water mains in the next few years and it would be our recommendation that water mains supplying future Eurobodalla Hospital are added on the priority list to mitigate any future disruption to new hospital.



Water storage requirements for the domestic purposes needs to be agreed as per ESG (Document Number GL2016_020. dated 26-Aug-2016) therefore we recommend risk assessment is prepared and further details about reliability of water supply obtained from the Council Engineering team so the details can be presented to LHD for approval.

This assessment will be completed at the beginning of the Schematic Design phase.

5.1.4.3 Domestic Cold Water Reticulation

The domestic cold water (DCW) service will be supplied from dual connections off the existing Ø200mm town's mains at Albert Street to Council Approval.

The incoming domestic cold water will pass through authority water meter assemblies and backflow prevention devices to the requirements of ESC to serve the new Eurobodalla Hospital.

A tee off and will also be supplied to the future extension. Based on the pressure and flow it appears that booster pumps will not be required (duty and standby) and further hydraulic calculation will be provided to verify this initial investigation for both main and back up supply.

The incoming mains water supply will provide water to fixtures, fittings and hose taps requiring potable water, fire protection systems, mechanical cooling systems and make-up to the recycled water systems during times of insufficient rainfall / wastewater yield.

Water will pass through a 3 stage particle filtration unit to remove any fine particles within the water main before being reticulated through the building via dedicated hydraulic services to serve all fixtures and plant requiring potable water including connections to the fire hose reel system.

Separate unmetered capped connections will be provided to the retail tenancies for the tenants to arrange their own meter for billing purposes if required.

DCW supplied to mechanical system, main plant equipment and high use areas will be individually metered via pulse type water meters and monitored by the BMCS.

Flow control regulators will be provided, where required to limit water consumption.

Isolation valves will be provided at each branch line off the main reticulation pipework for each group of fixtures and individual mini stop valves for individual fixtures and tapware shall be provided to allow isolation for maintenance without undue affect to the other fixtures.

All new fixtures and fittings will be as specified in the architectural documentation. All new pipework is to be copper type B.

Backflow prevention to be provided as per AS3500.1-2018. Backflow prevention to be provided to all hand wash basins in treatment areas, as per HI guidelines.

5.1.5 Sewerage Drainage System

The EHS site is currently located approx. distance of 700-800m from the existing Moruya Sewerage Pumping Station MO05 which discharging via sewer rising main to Moruya Sewerage Treatment Plant.

The existing sewer line located north of Albert Street is not suitable for connection due to the limited capacity. Based on the discussion with Council and review of the existing sewer network, there are no available existing gravity sewer main connection points located in close proximity to the Hospital Site.

For this reason, a new connection into the existing Sewage Pumping Station SPSMO05 has been proposed by Council. We have also explored option for connection to the existing

Sewerage Pumping Station SPSMO08 located in Keightley Street however this has not been recommended on this stage due to the limited capacity of the unit.

The new connection to Council SPSMO05 could be either gravity or pumped from EHS site. Due to the existing invert levels and significant travel distance between the site and SPSMO05 we believe that gravity connection would be problematic to fully service the new EHS site and to allow for future expansions. This will be confirmed by Council who owns and operate the network. Based on the workshop with Council dated 23 July 2021 Council will provide detailed assessment of the sewer connection.

Figure 9: Sewer network around Eurobodalla Hospital Site

If gravity connection is not possible a new dedicated sewerage pumping station is to be installed on the proposed site in accordance to Eurobodalla Shire Council requirements. It should be also noted that the existing and future portion of the residential lots located at the end of Albert Street have similar issues to achieve gravity connection into the existing Council network.

Further to above the proposed sewer design for new Hospital should also consider provision points to enable future connections for the buildings identified as part of the Architectural Master Planning including future Accommodation, Ambulance NSW, Education facilities and Private providers.

During discussion with Council these and the future lots could be also connected the new sewerage pumping station and the final arrangement would need to be discussed with Council Engineers. Council would own and operate the pumping station if the sewerage pumping station is built to Council's standards and requirements.

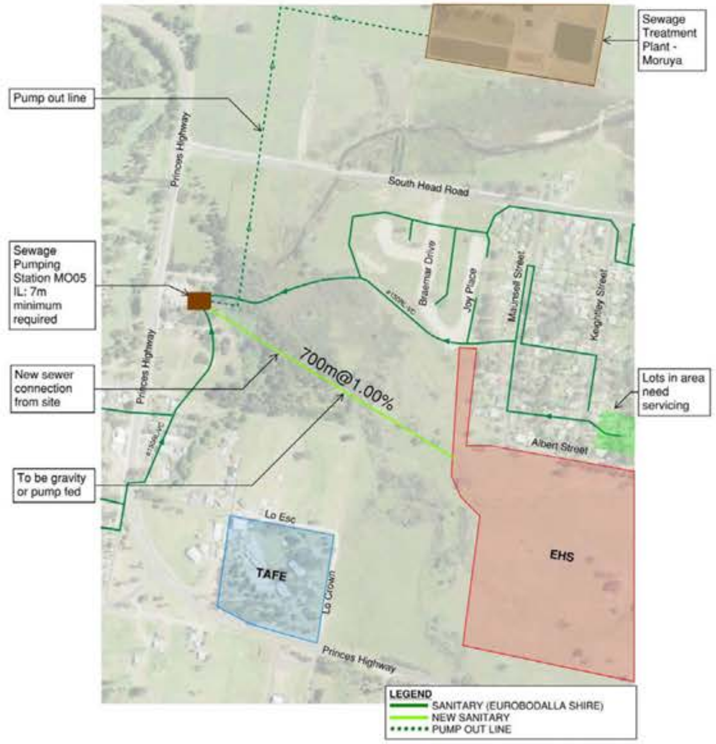


Figure 10: New sewer connection to existing sewer pumping station MO05

See Appendix C for Eurobodalla Shire Council Pump Station Sizing and Requirements.

As part of the concept design we have explored additional options as follow:

- **Option 1:** Gravity connection to nominated by Council SMH in close proximity to ex Pumping Station SPSMO05
- **Option 2:** Gravity connection to Hospital Sewer Pump Station (location to suit site conditions) then pumped to Council SMH / SPSMO05
- **Option 3:** Gravity connection to the existing gravity network & upgraded upstream sewer main to ex Council Pumping Station SPSMO05
- **Option 4:** Gravity connection to Hospital Sewer Pump station, pumped to the existing Council gravity network & upgraded upstream sewer main to to ex Council Pumping Station SPSMO05
- **Option 5:** Gravity connection to Hospital Sewer Pump Station near Albert Street then Council to continue connection from the boundary to the nearest suitable location.

Option 5 is the most suitable for the project taking into consideration cost, approval, design and associated risks around Council network. This option should be presented to Council to obtain initial comments and agree on the delineation between the work required to be completed by Council vs Project team.

It would be our recommendation to bring the connection point to the site boundary and all the upgrades, modifications and connections to external sewer network would be completed by Council. This work would need to be done as part of the early works to ensure no impact on the program.

See Appendix E for the proposed option including Option 5

5.1.6 Sanitary Drainage Systems

A new Ø225mm sanitary drainage service is proposed for the facility with the final connection to be agreed with Council.

Multiple locations of hydraulic risers are required to achieve full coverage. Riser locations will be coordinated with floor layout. Drainage pipework and wet areas above Operating Theatres or Electrical Rooms are to be avoided.

The sanitary drainage system will convey waste water from sanitary fixtures, floor wastes and water appliances to the Council sewer main. All sanitary stack systems will be located within ducts and wet areas. Riser locations will be coordinated with structure and acoustic requirements, with acoustic treatment being provided for all noise-sensitive spaces.

Wet areas that cannot drain by gravity to the sewer will be pumped to the gravity network via a wet well and sewer sump pump. Sewer pumps will be monitored by the BMCS and supported from the base building's back-up power supply. Sumps will be provided with sufficient storage to allow either part or full operation of the building during system failure.

Branches, main drains and pump pits will be provided with sewer vents which will terminate to atmosphere above roof level.

The sewer drainage system will be provided with overflow relief gullies to protect the building from mains surcharge.

All fixtures and fittings are to be as specified in the architectural documentation.

Tundishes for mechanical condensate drainage to be provided in accessible wall cavities, where required.

A PVC or S/S plaster arrestor will be provided to nominated plaster or treatment rooms to trap solids, located in a convenient position under the sink.

5.1.7 Kitchen Grease Waste

Grease waste is anticipated to be collected from the commercial kitchen and from retail food tenancies producing hot food (quantity and location TBC).

Grease waste will be collected via a dedicated gravity grease waste drainage system and pass through a grease treatment device prior to connection to the Council sewerage infrastructure. Grease treatment capacities will be confirmed subject to the final retail requirements.

5.1.8 Domestic Hot-Water Supply

The Domestic Hot Water (DHW) system will be installed in accordance with Health NSW requirements for the provisions of cold and hot water. The DHW system is to be a flow and return system, with pipework reticulating to all nominated fixtures and fittings.

The system will be supplied by either a large LPG vessels or by an electric heating system. Below are some indicative high level options that would need to be further discussed and agreed as part of the future electrification of the building.

Items	**LPG storage with instantaneous heaters**	**Heat pumps with electric boost**	**Electric storage**
Heat transfer	Combustion of gas to heat water	Electrically generated refrigerant cycle transfers heat absorbed through the air to heat the water	Use electric resistance coils to heat water
Electrical demand	240V, 22 amps single phase	4 X 10.25 kW for heat pumps 415V, 40 amps per phase, three phase 5 x 30kW heating elements in storage tanks 415V, 42 amps per phase , three phase Total = 191kW	5 x 60 kW for storage tanks 415V, 83 amps per phase, three phase Total = 300kW
LPG demand	3280 MJ/hr	-	-
Spatial requirement (m)	x *25 sqm* 3.3 x 2 for LPG heaters (installed back to back) 5.5 x 2.6 for storage tank (installed in line)	xxx *60 sqm* 7.2 x 3.3 for heat pumps (installed parallel) 9 x 3.3 for storage tanks (installed in line)	xx *30 sqm* 9 x 3.3 for storage tanks(installed in line)
Efficiency/COP		2.6~4.5	N/A
Capital cost - APPROX	$ $100k	$$$ $220k	$$ $150k
Average running cost	$	$$$	$$$$$
Life expectancy (Years)	15-20	10-15	15-20

The installation of the DHW system is to be in accordance with the Health NSW requirements for the provisions of cold and heated water. Flow control regulators will be provided, where required to limit water consumption. Pipework will be insulated against heat loss and provided with adequate allowance for expansion.

All hot water pipework is to be thermally insulated with at least 25mm of Rockwool insulation, flow and return. All hot water dead legs shall be kept to a maximum of 5 meters.

Circulating hot water plant delivery temperatures will be between 60°C - 65°C. The thermostatic mixing valves (TMVs) will be provided to all fixtures that require warm water in accordance with the statutory codes. The TMV's shall be mounted 1500mm AFFL for maintenance purposes. The TMV shall be installed in a lockable, hinged, stainless steel wall boxes recessed into wall or built-into cupboards to facilitate servicing. Where practical and where the length of dead legs is deemed to be acceptable, the TMVs shall be accessible from corridors for ease of maintenance. Reducing dead legs shall take precedent over TMV accessibility.

All TMVs are to be provided with temperature monitoring via a smartflow system. This system is to be accessed via a web-based interface for temperature monitoring.

All new fixtures and fittings are to be as specified in the architectural documentation. All new pipework is to be copper type B to all fixtures. Where required, RPZD's will be installed to comply with AS3500 and local code requirements.

5.1.9 Stormwater and Rainwater Harvesting

A new stormwater and rainwater harvesting system is proposed, with rainwater tanks being sized to hold the desired catchment area on the roof. The stored water will undergo council approved rainwater treatment and will only serve non-potable services, mechanical equipment and irrigation. The size of the rainwater harvesting system and the collected roof areas into the tank(s) shall be optimised to maximise water re-use without oversizing the system.

The building will be provided with roof drainage design consisting of gravity and/or siphonic drainage systems and full flow emergency overflows discharging to a visible place via the building facade.

Rainwater will be collected from roof gutters, balconies and terraces via gravity flow or siphonic rainwater downpipe systems. Rainwater drainage strategy is to be further developed in line with the architectural and landscaping design.

Where rainwater is collected for reuse it will be directed to the rainwater harvesting tank, otherwise rainwater will connect directly to the external stormwater drainage network provided by Civil engineer. The on-site detention tank(s) if required and associated stormwater drainage, filtration devices, subsoil, external stormwater drainage system (1 m away from the building line) and overland flow paths will be documented by the Civil Engineer.

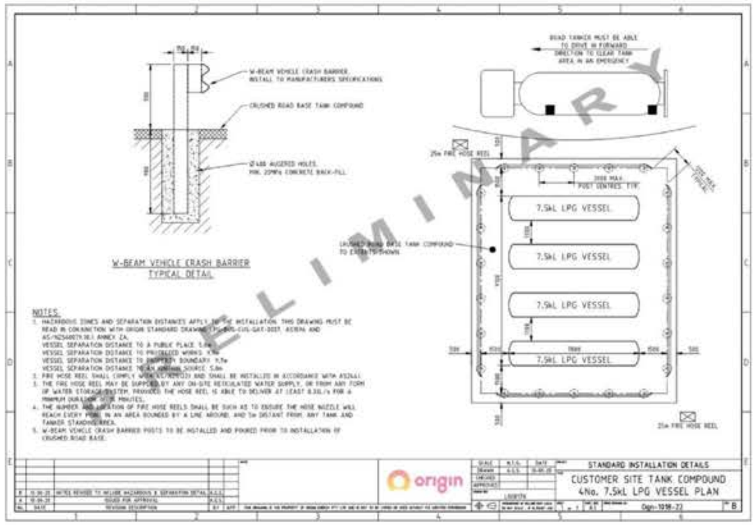
5.1.10 Helipad Surface Water Drainage

The helipad drainage system located outside the building will form part of the Civil design.

5.1.11 Gas Supply

No existing reticulated natural gas supply is available in Moruya. The need for a gas supply will be dependent on the new development's requirements, ESD aspirations and services which require gas for heating systems. This could be needed (but not limited to) to mechanical heating boilers, domestic hot water plant or hot water for commercial kitchen.

If gas is provided, Liquefied Petroleum Gas (LPG) will be used to supply gas requirements to building services. External area for storage tanks will be required, with the gas piping system needing to comply with AS5601-2013. Example of the installation and requirements has been provided by Origin Energy.



Alternatively, if all services are supplied from electrical sources, an LPG supply will not need to be installed.

5.1.12 RO Water

RO water will be provided to operating theatres within the operating department, type of units will depend on the layout and shall be selected as the design progresses.

5.1.12.1 Renal Dialysis

The Reverse Osmosis (RO) water will be provided for nominated beds / chairs via portable dialysis station units. The quantity of RO outlets will be confirmed during user group meetings, however the current requirement is for a total of 12 chairs requiring RO provisions.

If Reverse Osmosis (RO) central plant is required, the on-floor plant should be centrally located, and a circulated RO service provided to beds as required.

Pre-testing and regular testing of the water quality is required to ensure compliance with the manufacturer's standard for water entering the machine. If pre-testing shows that the water quality is poor additional pre-treatment or water softening will be required.

5.1.13 Decontamination shower

A holding tank and pump out facility will be provided for the decontamination shower(s) within the ambulance bay. The size of the decontamination shower collection pit will be further established once the total number of showers is available. Currently, the size of the holding tank has been estimated to be 3,000L, calculated as 2x shower heads flowing at 75L/min for 15mins. An automatic water shut-off valve will be provided at the shower water supply, interfaced with a level sensor in the holding pit.

5.1.14 Sanitary Fixtures and Taps

Sanitary fixtures throughout the new building will be prepared by Architect in line with NSW Health Guidelines and User Group requirements.

Refer to the Architects documentation for final selection of the sanitary fixtures and tapware.

5.2 Fire Services Strategy

5.2.1 Introduction

The following section provides a description of the design criteria, systems and proposed design considerations for fire services.

5.2.2 Environmental Expectations

The project will aim to achieve high environmental aspirations. This will include minimising fire testing water consumption by reusing of fire test drain water and use of sustainable materials where appropriate to the project.

5.2.3 Design Criteria

The following codes and standards will form the basis of the fire services design:

a. Building Code of Australia (BCA) / National Construction Code (NCC) 2019 - TBA

b. AS 1670.1:2018 Fire Detection, Warning, Control and Intercom Systems – System Design, Installation and Commissioning – Fire

c. AS1670.4:2018 Fire Detection, Warning, Control and Intercom Systems – System Design, Installation and Commissioning – Emergency warning and intercom systems

d. AS 2118.1:2017 Automatic Fire Sprinkler Systems Part 1: General Requirements

e. AS 2118.6:2012 Automatic Fire Sprinkler Systems Part 6: Combined sprinkler and hydrant systems in multistorey buildings

f. AS 2419.1-2005 Fire hydrant installations Part 1: System design, installation and commissioning

g. AS2941 – 2013 Fixed fire protection installations – Pump set systems

h. Fire and Rescue NSW requirements

i. NSW Health Infrastructure: Engineering Services Guidelines dated on 26 Aug 2016

j. NSW Health Infrastructure: Design Guidance Note 001 to 040

k. Fire Engineering project specific requirements.

A summary of the key design criteria is as follows:

Item	Parameter
Fire hydrants type	Attack Hydrants
Fire hydrants flow rate	2 x hose streams @ 5 L/s each when boosted by on-site pumps 2 x hose streams @ 10 L/s each when boosted by fire brigade pumps (As per AS 2419.1-2005)
Fire hydrants flow velocity through pipes	$\leq$ 4 m/s in compliance with AS 2419.1-2005 (after booster)
Residual Pressure at Hydrant outlets	700 – 1200 kPa, in compliance with AS 2419.1-2005.
Largest Fire Compartment	> 1000 m^2 and < 10 000 m^2
Fire Sprinklers Hazard Classifications	Hospital – Light Hazard Plant rooms – OH1 (As per AS 2118.1-2017 Appendix A)
Fire Sprinkler spray densities	Light Hazard – 70kPa and K=8.0 or larger for 6 x most hydraulically unfavourable sprinklers OH1 – 6 sprinkler heads at 60L/min each; OH2 - 12 sprinkler heads at 60L/min each; OH3 – 18 sprinkler heads at 60L/min each Wall-wetting sprinklers (requirement TBD) – 75 L/min per sprinkler for worst case of 18 x sprinklers, resulting in flow rate of 1350 L/min. (As per AS 2118.1-2017 sections 9, 10 & 3)
Fire alarm and detection systems	To AS 1670.1 – 2018
Sound System & Intercom System for Emergency Purposes	To AS1670.1 – 2018
Extinguishers and blankets	To Table E1.6 of the NCC 2019 & AS2444-2001

5.2.4 Water Supply for Fire Services

Based on the pressure and flow outcomes the water storage tanks and pumps for the fire services would not be required as the water main is capable of providing sufficient supply to met peak demand – see option 1 table. This is subject to discussion and agreement with the BCA Consultant and FRNSW and risk assessment of the Council Network.

new 100mm Hydrant Fire Flow (l/s)	new 100mm Hydrant Residual Pressure (m)	new 100mm Hydrant Fire Flow (l/s)	new 100mm Hydrant Residual Pressure (m)
0	94.44	0	45.35
0.01	94.44	0.01	45.35
5	92.21	5	43.49
10	89.56	10	40.8
20	83	20	32
30	74.94	25	25.95
40	65.52	30	18.75
60	43.48	35	10.44
		40	1.02

The fire flows test has been completed by EHS using methodology Forced Fire Flow.

5.2.5 Fire Hydrant and Fire Sprinkler System

A new combined fire hydrant and sprinkler infrastructure is proposed, with water supply for fire services obtained by new connection into Eurobodalla Council pipework. This would also include new fire booster and pumps.

Proposed strategy has been captured on the sketch below. Refer to attachment for full details

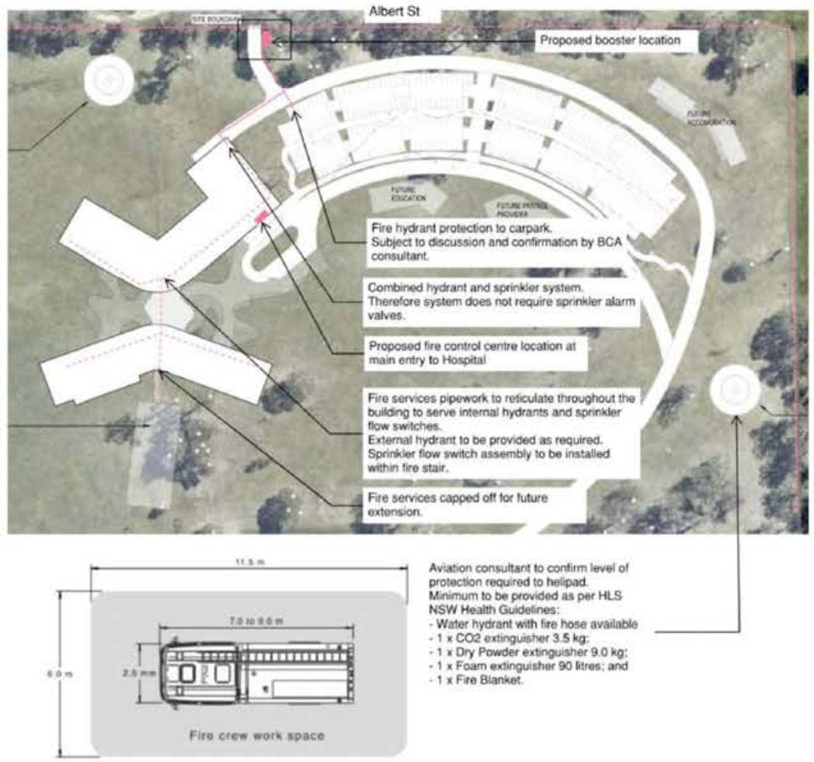


Figure 11: New Fire Services connection from Albert Street with external and internal hydrants to achieve a full coverage.

The authority mains pressure and flow demands have been confirmed and based on details provided water storage tanks and pump for fire services supply is not required. A new fire hydrant ring main is proposed to serve the site with internal and external hydrants located around the hospital where requried and with the fire brigade booster to be placed at the entryway to the site or the buildng from Albert Street.

The fire services strategy needs to be agreed and developed in consultation with the BCA Consultant and FRNSW.

5.2.6 Fire Detection Systems

A new and dedicated FDCIE will be provided for the Building, to be located at Fire Control Centre, Ground Level Main entry to the Building.

Fire protection devices which will be monitored by the fire indicator panel and emergency warning and intercom system (EWIS) include but not limited to sprinkler flow switches, monitored isolation valves, break-glass manual call point, smoke and heat detectors, input/output modules, speakers, fire pumps status, fire water tank levels, etc.

The system shall incorporate smoke detection throughout and where applicable to initiate the smoke control system within the building. Thermal detectors shall be installed to shower rooms and areas where nuisance tripping of smoke detectors may exist.

All interfaces, e.g BMCS, VT, etc. needs to be reviewed during Schematic Design Phase.

The detectors will be positioned to suit the final reflected ceiling plans, including all remote control equipment for interfacing with the base building addressable / distributed detection loops / circuits for the correct operation of the fire detection and alarm system.

Fire trips will be provided to interface with the mechanical equipment switchboard and lockable doors for the fire mode operation as part of the base-build scope of works.

Fire trips might also be required to the AV system, subject to further coordination with the Acoustic Consultant.

5.2.7 Emergency Warning and Intercom System

An Emergency Warning and Intercom System (EWIS) will be installed throughout the building.

The Emergency Warning Control and Indicating Equipment (EWCIE) panel will be located next to the FDCIE.

The system will incorporate break glass alarm points on each floor for use by the occupants for early warning, speakers for emergency broadcasting and warden intercom phones for fire.

The EWIS system will be divided into several zones or as determined by the fire engineered solution, each shall have its own messages directing occupants to the nearest exit.

All speakers will be recessed within the ceiling where possible. Sound systems and intercom systems for emergency purposes will be configured to minimise patient trauma in inpatient areas.

Where speakers are removed from inpatient areas to minimise patient trauma, remote display units and mimic panels will be provided in the nurses' station together with visual indication with T3 strobe and audio annunciation with mute facilities at the mimic panel. The extent of this needs to be reviewed and agreed during Schematic Design Phase.

5.2.8 Fire Extinguishers

Portable fire extinguishers and fire blankets will be provided in accordance with Table E1.6 of the NCC 2019 and located and distributed in accordance with AS2444 and the Health NSW guidelines.

In general, portable fire extinguishers shall be distributed throughout the levels in areas of specific hazard, and within FHR cupboards whenever possible.

5.2.9 Fire Brigade Access

The fire brigade access to all new boosters around the site shall be maintained at all times during construction and after completion of the new building.

This requirement is essential as, in the event of a fire, fire fighters will need to be able to park the fire truck on a hardstand within 8m from the booster in order to connect into it.

5.2.9.1 Consideration on Fire Brigade Hardstand Area and Access

The fire brigade access around the site shall be maintained at all times and need to be designed taking into consideration future buildings and other emergency vehicles.

Designated *hardstand* areas are to provide a safe working space for firefighters to exit the vehicle and move around the fire appliance to remove and use equipment, including connecting fire hoses to the *fire appliance* (see Figure 13).

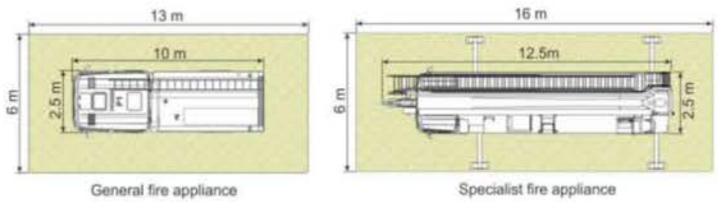


Figure 13 Minimum working space for hardstand area

Hardstand locations

A *hardstand* is to be provided as required by *AS 2419.1—2005 Fire hydrant installations – System design, installation and commissioning*, and as otherwise nominated by the relevant authority having jurisdiction, including:

- within 20 m of any feed fire hydrant
- within 8 m of any fire hydrant booster assembly
- within 50 m of an external attack fire hydrant
- within 20 m of the access door to any external fire pumproom
- in front of any *suction-connection outlet* (e.g. tank, river, lake, dam, sea).

Note: The location must also consider other required factors such as firefighter access to the building and maximum hose coverage requirements.

Appendix D indicates the full requirements for the fire brigade booster location and access options.

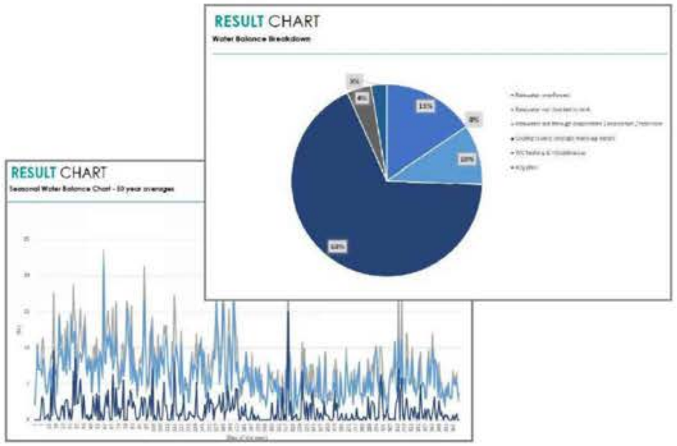
6 Sustainable Initiatives and Opportunities

The new development will be subject to the recently developed HI self-certified ESD process therefore early discussion will be needed to agree and inform budget.

Below are some of the strategies that could be embedded within the ESD Framework and can be presented with pros and cons. Early evaluation of these will be required during feasibility stage to ensure they fit within the budget or if additional funds are available. This early advice can be based on the traffic light scheme (green – orange – red).

RAINWATER HARVESTING AND RE-USE

We see an opportunity to investigate rainwater re-use for irrigation and mechanical purposes (cooling towers supply). Detailed water balance calculations will be needed to provide a full water cycle and a cost benefit analysis would be performed to inform capital costs and pay back periods. Condensate recovery drainage system can be considered to supplement the rainwater harvesting.



FIRE TEST WATER RECYCLING

Measures will also be considered to reduce the amount of water used during regular maintenance of fire protection systems. At this purpose, it is proposed that the water from fire pump testing will be recycled back to the fire tank.

REDUCE POTABLE COLD WATER CONSUMPTION

The proposed design will strive for minimum water main consumption. Water saving initiatives in addition to those already detailed above could include use of ultra-low flow devices and fixtures (subject to Architect/HI approval) and sub-meters provided to all areas/ items where major water consumptions are expected.

SOLAR HOT WATER SYSTEM

Option of using solar thermal energy will be explored to heat domestic hot water for potable or not potable use, through solar collectors located on roof to estimate saving or electric consumptions.

POTENTIAL CARBON NEUTRAL DESIGN ASPIRATIONS

If the project will have carbon neutral aspirations, it will be important that the design of the new facility will support these ambitions, whilst at the same time providing value for money and robust and resilient solutions.

Alternatives to move to all electric or mainly electric solutions could be explored by the team in order to meet potential carbon neutral targets. To full-fill such aspirations, the domestic hot water (DHW) system would need to change from traditional gas-fired to electrical heaters including options for instantaneous, storage heaters and heat pumps option.

Additional considerations could involve reducing the use of high embodied energy materials such as steel or plastic.

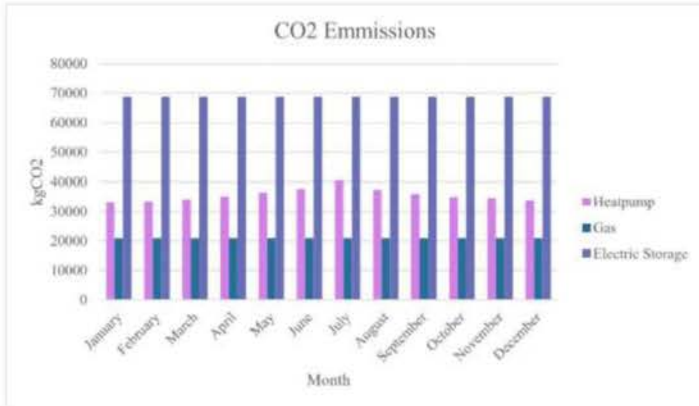


Figure 1: Carbon Emission Graph for Each System

7 Early Works

Early works packages will be required to manage the approval process and to mitigate risks associated with delay of the upgrading of the Council the sewer connection to site.
Extent of required works is to be determined however it is anticipated that this will include the modification of approx 700-900m of Council network using gravity or more likely sewer rising main.

It is our recommendation that these works are discussed with Council and agreed on the scope and delineation between internal and external sewer network.

8 Next Steps

- A more detailed plant massing exercise will be done as part of the next stage to inform the specific services requirements
- The next stage will include the review of any additional information received from Council including connection to sewer network and need for sewerage pump station
- A more detailed review of the hydraulic and fire services loads will be undertaken in the next phase to confirm the capacity of the existing infrastructure around the site.
- Review and provisions for future building extension and impact on the cost
- Coordination with the BCA Consultant to agree on the Fire Brigade access to site and location of the Fire Brigade Booster Valve Assembly. Another meeting with FRNSW would be recommended to present the proposed option and strategy.

9 Appendices

9 Appendices

Appendix A: Existing Water and Sewerage Diagrams

TO SOUTHERN VILLAGES

MORUYA HIGH PRESSURE ZONE

TWL 119.9m

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Scale 1:4038 at A3

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MORUYA HEADS PRESSURE ZONE TWL 77.5m

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Scale 1:4038 at A3

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MORUYA LOW PRESSURE ZONE TWL 60.0m

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eurobodalla shire council

Scale 1:4038 at A3

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Appendix B: Drinking Water Quality Summary

Drinking Water Quality Summary – August 2020

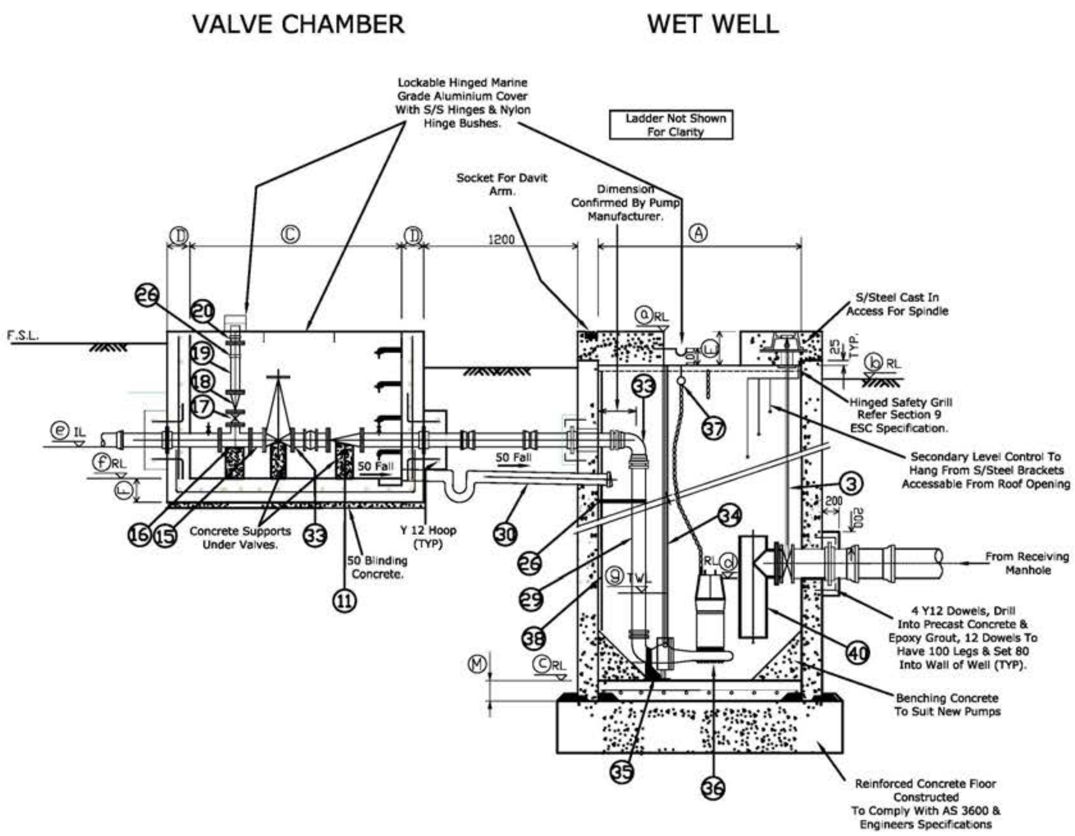
Eurobodalla Shire Council provides safe and reliable drinking water to approximately 35,000 customers on a daily basis. The drinking water we supply is routinely tested throughout our water supply system with analysis undertaken at independent NATA certified laboratories as per the 2011 Australian Drinking Water Guidelines (ADWG).

Results are based on samples representative of water supplied to customer's taps. Microbiological results and key physical/chemical parameters are summarised below:

Sample Type	Parameter	Units	Health/ Aesthetic	Australian Drinking Water Guideline Value	Whole of Eurobodalla		Northern Eurobodalla		Southern Eurobodalla	
					Monthly Average	12 month compliance	Monthly Average	12 month compliance	Monthly Average	12 month compliance
Microbiology	E.coli	mpn/100mL	Health	0	0	100%	0	100%	0	100%
	Total Coliforms	mpn/100mL	Health	0	0	99.5%	0	99.3%	0	100%
Chemistry	Aluminium	mg/L	Aesthetic	0.2	0.0500	95.8%	0.0900	100%	0.0100	91.7%
	Antimony	mg/L	Health	0.003	0.0001	100%	0.0001	100%	0.0001	100%
	Arsenic	mg/L	Aesthetic	0.01	0.0010	100%	0.0010	100%	0.0010	100%
	Barium	mg/L	Health	2	0.0155	100%	0.0134	100%	0.0176	100%
	Boron	mg/L	Health	4	0.0143	100%	0.0144	100%	0.0141	100%
	Cadmium	mg/L	Health	0.002	0.0001	100%	0.0001	100%	0.0001	100%
	Calcium	mg/L	Health	10000	26.0500	100%	25.0000	100%	27.1000	100%
	Chloride	mg/L	Aesthetic	250	26.0000	100%	26.0000	100%	26.0000	100%
	Chromium	mg/L	Health	0.05	0.0005	100%	0.0005	100%	0.0005	100%
	Copper	mg/L	Health	2	0.0040	100%	0.0050	100%	0.0030	100%
	Fluoride	mg/L	Health	1.5	0.8900	100%	0.9200	100%	0.8600	100%
	Fluoride (WU result)	mg/L	Health	1.5	0.9700	100%	0.9300	100%	1.0100	100%
	Fluoride Ratio	-	-	0.8-1.2	1.0900	90.5%	1.0100	100%	1.1700	80.0%
	Iodine	mg/L	Aesthetic	0.15	0.0100	100%	0.0100	100%	0.0100	100%
	Iron	mg/L	Aesthetic	0.3	0.0075	100%	0.0100	100%	0.0050	100%

Sample Type	Parameter	Units	Health/ Aesthetic	Australian Drinking Water Guideline Value	Whole of Eurobodalla		Northern Eurobodalla		Southern Eurobodalla	
					Monthly Average	12 month compliance	Monthly Average	12 month compliance	Monthly Average	12 month compliance
Chemistry (Continued)	Lead	mg/L	Health	0.01	0.0002	100%	0.0002	100%	0.0002	100%
	Magnesium	mg/L	Health	10000	4.9000	100%	4.8200	100%	4.9800	100%
	Manganese	mg/L	Health	0.5	0.0010	100%	0.0019	100%	0.0002	100%
	Mercury	mg/L	Health	0.001	0.0004	100%	0.0004	100%	0.0004	100%
	Molybdenum	mg/L	Health	0.05	0.0001	100%	0.0001	100%	0.0001	100%
	Nickel	mg/L	Health	0.02	0.0002	100%	0.0002	100%	0.0002	100%
	Nitrate	mg/L	Health	50	1.0000	100%	1.0000	100%	1.0000	100%
	Nitrite	mg/L	Health	3	0.0500	100%	0.0500	100%	0.0500	100%
	pH	pH Units	Aesthetic	6.5-8.5	7.9000	100%	7.8000	100%	8.0000	100%
	Selenium	mg/L	Health	0.01	0.0035	100%	0.0035	100%	0.0035	100%
	Silver	mg/L	Health	0.1	0.0001	100%	0.0001	100%	0.0001	100%
	Sodium	mg/L	Aesthetic	180	15.0000	100%	14.0000	100%	16.0000	100%
	Sulfate	mg/L	Health	500	5.5000	100%	6.0000	100%	5.0000	100%
	Total Dissolved Solids (TDS)	mg/L	Aesthetic	600	120.0000	100%	128.0000	100%	112.0000	100%
	Total Hardness as $CaCO_3$	mg/L	Aesthetic	200	85.2500	100%	82.3000	100%	88.2000	100%
	True Colour	Hazen Units (HU)	Aesthetic	15	0.5000	100%	0.5000	100%	0.5000	100%
	Turbidity	NTU	Aesthetic	5	0.2500	100%	0.4000	100%	0.1000	100%
	Uranium	mg/L	Health	0.017	0.0001	100%	0.0001	100%	0.0001	100%
	Zinc	mg/L	Aesthetic	3	0.0900	100%	0.0900	100%	0.0900	100%
Field	Free Chlorine	mg/L	Health	0.2-5	0.6233	87.5%	0.6061	85.4%	0.6630	92.4%
	Total Chlorine	mg/L	Health	5	0.7309	100%	0.7187	100%	0.7590	100%
	pH	pH Units	Aesthetic	6.5-8.5	7.9439	98.7%	7.8065	100%	8.2600	95.8%
	Turbidity	NTU	Aesthetic	5	0.4109	99.2%	0.4100	99.3%	0.4130	99.2%

Appendix C: Eurobodalla Shire Council Pump Station Sizing and Requirements



SECTION 1

TABLE 1: DESCRIPTION

ITEM No.	ITEM DESCRIPTION	DIA(mm)
1	DICL SO&FL PIPE WITH PUDDLE FLANGE L.T.S.	-
2	DICL SO&SP PIPE 600 LONG	-
3	EXTENDED SPINDLE KNIFE GATE VALVE	-
4	DICL FL&FL PIPE LENGTH TO SUIT	-
5	DICL SO&SO CONNECTOR	-
6	DICL SP&SP PIPE LENGTH TO SUIT	-
7	DICL SP&FL PIPE LENGTH TO SUIT	-
8	B.S.P. TAPPING FOR PRESSURE GAUGES	-
9	GIBAULT JOINT	-
10	DICL FL&FL PIPE LENGTH TO SUIT	-
11	CAST IRON SINK BALL CHECK VALVE	-
12	EPOXY COATED RESILIENT GATE VALVE	-
13	DICL FL&SP PIPE LENGTH TO SUIT	-
14	PUDDLE FLANGE	-
15	DICL FL&FL PIPE LENGTH TO SUIT	-
16	DICL ALL FLANGE TEE	-
17	GATE VALVE	-
18	REFLUX VALVE-FLOATING BALL TYPE	-
19	DICL FL&FL PIPE LENGTH TO SUIT	-
20	FEMALE BAUER FLANGE FITTING-150 MM ABOVE LID	-
21	DICL FL&SP PIPE LENGTH TO SUIT	-
22	DICL SOCKETED 90^ BEND	-
23	DICL SP-SP PIPE LENGTH TO SUIT	-
24	DICL ALL SOCKETED TEE	-
25	DICL SP&FL PIPE LENGTH TO BE MIN 5x PIPE DIA.	-
26	PIPE SUPPORT BRACKET	-
27	EMFLUX FLOW 2060 INTERCONNECTED TO EMFLUX TRANSMITTER LOCATED IN SCA. FLOWMETER TO BE LOCATED IN PIT.	-
28	RISING MAIN	-
29	FL & FL DICL/SS PIPE TO SUIT	-
30	50MM DIA BRONZE DRAIN WITH NON-RETURN VALVE	-
31	S/S STEEL MESH SCREEN - HINGED	-
32	STAINLESS STEEL ACCESS LADDER	-
33	DICL/SS FITTINGS	-
34	316 S/STEEL GUIDE RAIL - REMOVABLE	-
35	FIX PUMP DISCHARGE SUPPORT WITH 316 SSTEEL FITTINGS	-
36	PUMPS TO BE FLYGHT OR AJAX	-
37	LIFTING CHAIN AS PER CLAUSE 4.6 OF SPECIFICATION	-
38	HYDROSTATIC OR ULTRASONIC LEVEL SENSOR	-
39	WET WELL WASHERS TO ENGINEERS SPECIFICATIONS	-
40	DROP TUBE	-

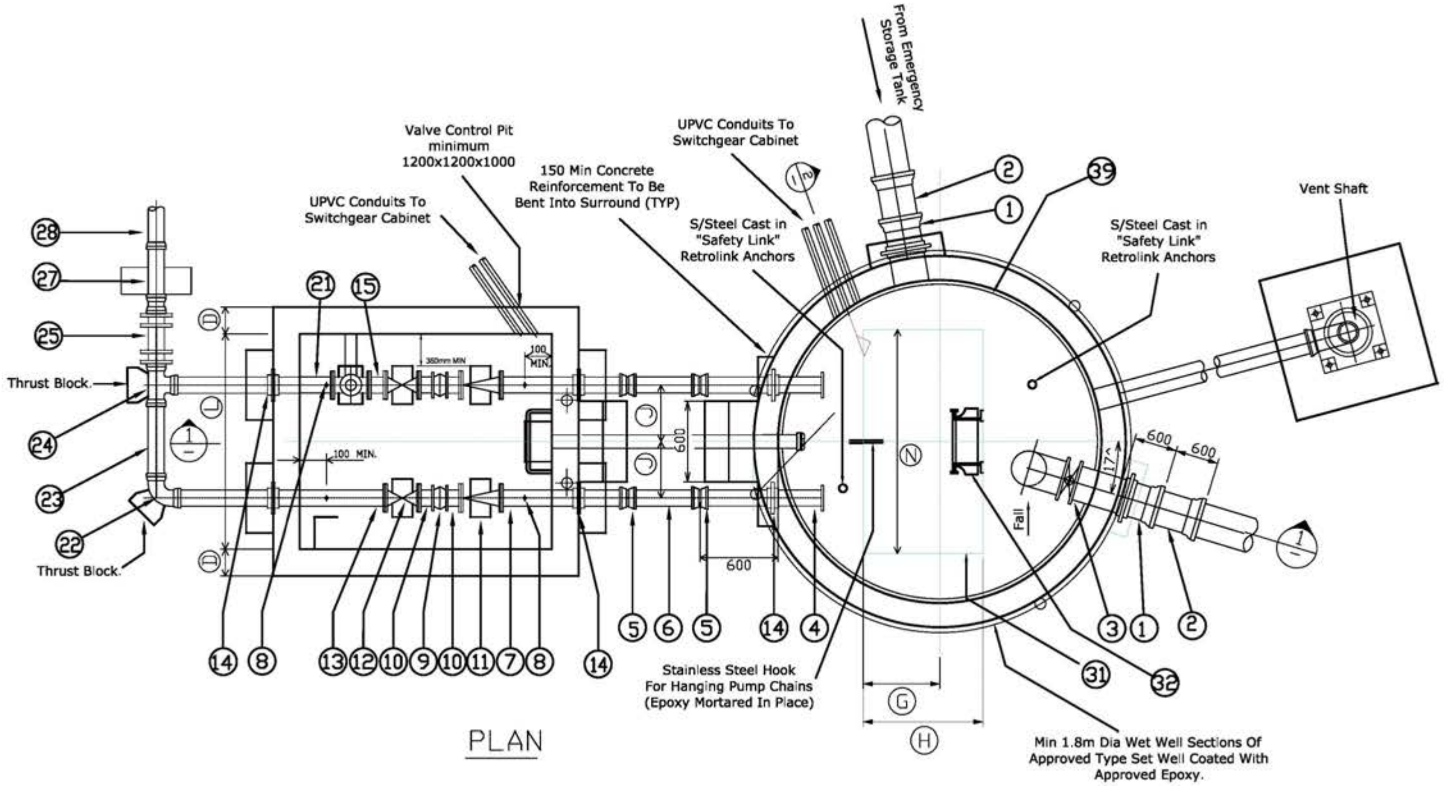
TABLE 2: DIMENSIONS&R.L.'s

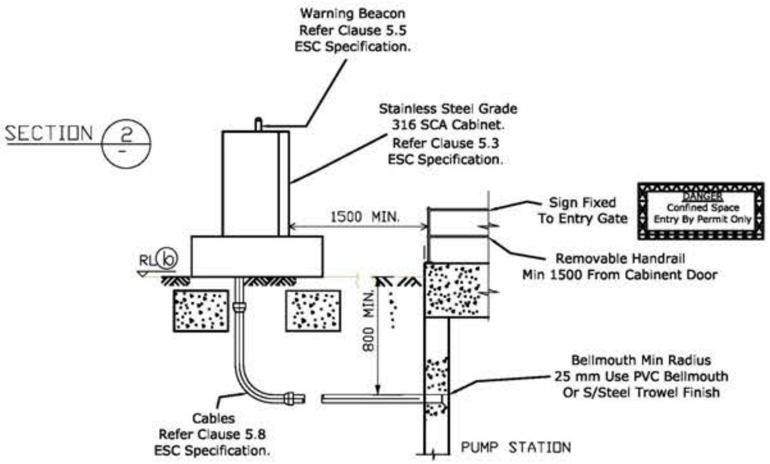
DIMENSION	PS ?
A	-
C	-
D	-
E	-
F	-
G	-
H	-
J	-
K	-
L	-
M	-
N	-

PLUG DEPTH	-
FLOOD LEVEL	-
RL a	-
RL b	-
RL c	-
RL d	-
RL e	-
RL f	-
TWL g	-

Cad Reference	Datum	Reduction Ratio		Approved On Behalf Of	No.	Amendment Details	A B C D	By	Appd	Date			Set	Sheet
G:\W&W\subdivisionCode \StandardESCDrawings \ESC WW-10 sheet 1.dwg	ASSUMED	NOT TO SCALE	EUROWATER	EUROBODALLA SHIRE COUNCIL OPERATIONS MANAGER Date 29th May 2006							EUROBODALLA SHIRE COUNCIL Good Government, Better Living.	EUROBODALLA SHIRE COUNCIL EUROBODALLA SHIRE PUMP STATION STANDARD DRAWING SECTION PLAN	A	1
Checked	Drawn J R T												Project No. ESC-WW-10	

Appendix D: Sewer Pumping Station Requirements





NOTES

1. Stilling tube for hydrostatic sensor to be accessable to outside by offset from wall using stainless steel brackets
2. All references are to current ESC Sewage Pumping Station Design & Construction Specifications.
3. Compliance with Sewage Pumping Station Code of Australia WSA 04 - 2005.
4. Provide 1400 fall to roof and SCA slabs.
5. Flytt or Ajax Pumps Only.

100 m Below Australian Height Datum

Drawing Not To Scale

Cad Reference G:\W&W\subdivisionCode\StandardESCDrawings\ESC-WW-10 Sheet 2.dwg	Datum ASSUMED	Reduction Ratio NOT TO SCALE	EUROWATER	Approved On Behalf Of EUROBODALLA SHIRE COUNCIL — OPERATIONS MANAGER — Date 29th May 2006
Checked	Drawn J.R.T.			

No.	Amendment Details	A	B	C	D	By	Appd	Date

EUROBODALLA SHIRE COUNCIL — Good Government, Better Living.

EUROBODALLA SHIRE COUNCIL

EUROBODALLA SHIRE PUMP STATION STANDARD DRAWING PLAN DETAILS

Set	Sheet
A	2

Project No. ESC-WW-10

Appendix E: Pressure and Flow Summary

South Coast Regional Office
66 Campbell Street, PO Box 670, Moruya, NSW 2537
Tel 02 4474 7555 | TTY 1300 301 181
ABN 81 913 830 179 | www.publicworksadvisory.nsw.gov.au

[redacted]
Water and Sewer Technical Officer
Eurobodalla Shire Council
PO Box 99
MORUYA NSW 2537

Dear [redacted]

Eurobodalla Water Pressure Modelling – Moruya Hospital

Find attached the modelling results for supply of water to the proposed base hospital at Moruya. The modelling was based on the 4 options provided.

For option 1 flows of up to 60 l/s with satisfactory pressure were achieved with 100mm main connection.

For option 2 a 100mm main could only deliver flows up to 30 l/s with satisfactory pressure and larger mains of 150mm and 200mm were modelled. Both of these provided satisfactory pressures at flows up to 60 l/s.

Option 3 could only supply satisfactory pressures up to flows of 25 l/s even with increasing the connection main.

Option 4 was modelled on the current data in the model for a 100mm being the connection point. This option could only deliver flows up to ~30 l/s at satisfactory pressures.

As detailed in the email of 18th May 2021 Bailey/Corven the cost of this work is $3,200 GST exclusive and will be billed as a separate line item in next months invoice.

Yours sincerely

[redacted]

South Coast
24th May 2021

CC:

[redacted]
Manager Water & Sewer

Attachment:

Modelling Results

Statement of Available Pressure and Flow

Arup
Level 5
151 Clarence Street
Sydney NSW

Attention: [redacted] Date: 20/05/2021

Pressure & Flow Application Number: ???

Your Pressure and Fire Flow Inquiry Dated:

Property Address: Albert St, Moruya, NSW ?

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency firefighting, and are not to be construed as availability for normal domestic supply for any proposed development.

CURRENT CONNECTION DETAILS

Street Name: Option 1&4: Albert St; Option 2: Lo Crown; Option 3: South Heads Rd, Moruya	Side of Street: South of Albert St (Option 1&4), or East of Lo Crown (Option 2), or South of South Head Rd (Option 3)
Distance & Direction from Nearest Cross Street	See below
Approximate Ground Level (AHD):	10-15m
Nominal Size of Water main (DN):	See below

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	See below
Minimum Pressure at current Peak Day Demand (PDD) Maximum Pressure (PDD)	Option 1: 91 - 109 m Option 2: 102 – 112 m Option 3: 63 – 64 m Option 4: 45 - 48 m

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow (l/s)	Pressure head (m)
Fire Hose Reel Installations (two hose reels simultaneously)	N/A	N/A
Fire Hydrant / Sprinkler Installations	N/A	N/A
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	See Table 1 & figures below	See Table 1 & figures below

Four options were modelled as follows, of which the connection mains were sized for Option 2 and Option 3:

- Option 1: connected to existing 200mm AC rising/pumping main in Albert Street with a new connection main 100mm diameter and 50m long to the Moruya Hospital.

- Option 2: connected to existing 200mm AC rising/pumping main in Lo Crown with a new connection 100mm diameter and 510m long to the Moruya Hospital.

- Option 3: connected to existing 150mm AC reticulation main from Moruya Heads Reservoir Zone in South Head Road with a new connection 150mm diameter and 520m long to the Moruya Hospital.

- Option 4: connected to existing 100mm AC reticulation main from Moruya Town Reservoir Zone in Albert Street with a new connection 100mm diameter and 50m long to the Moruya Hospital.

Refer to the results in **Table 1** and **Table 2**.

Table 1 *Fire Flow Test Model Result & Comparison for Option 1 and Option 2

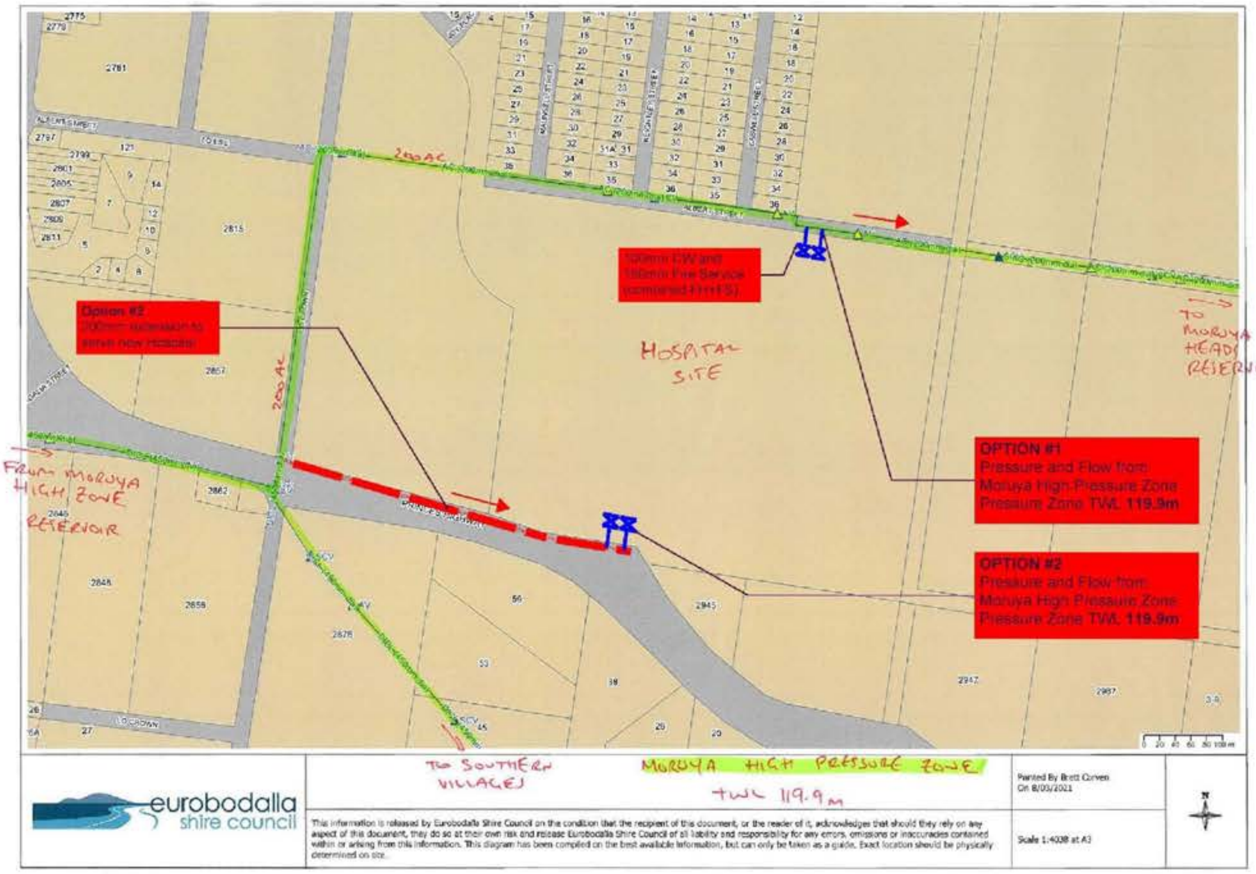
Option 2	Option 2	Option 2	Option 2	Option 2	Option 2	Option 1	Option 1
new 200mm	new 200mm	new 150mm	new 150mm	new 100mm	new 100mm	new 100mm	new 100mm
Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)
0	107.16	0	107.16	0	107.16	0	94.44
0.06	107.16	0.03	107.16	0.01	107.16	0.01	94.44
5	106.96	5	106.68	5	104.42	5	92.21
10	106.64	10	105.76	10	98.34	10	89.56
20	105.65	20	102.48	20	74.71	20	83
30	104.22	30	97.4	30	36.51	30	74.94
40	102.35	40	90.52	40	-16.33	40	65.52
60	97.28	60	71.33	60	-165.8	60	43.48

*Fire flows test at Peak Instantaneous Demand (PID) using methodology Forced Fire Flow (a snapshot in modelling).

Table 2 *Fire Flow Test Model Result & Comparison for Option 3 and Option 4

Option 3	Option 3	Option 3	Option 3	Option 3	Option 3	Option 4	Option 4
new 450mm	new 450mm	new 250mm	new 250mm	new 150mm	new 150mm	new 100mm	new 100mm
Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)	Hydrant Fire Flow (l/s)	Hydrant Residual Pressure (m)
0	63.1	0	63.1	0	63.1	0	45.35
0.22	63.03	0.07	63.08	0.02	63.1	0.01	45.35
5	59.81	5	59.76	5	59.43	5	43.49
10	53.63	10	53.54	10	52.46	10	40.8
20	32.67	20	32.34	20	28.44	20	32
25	18	25	17.52	25	11.59	25	25.95
30	0.43	30	-0.24	30	-8.63	30	18.75
35	-19.98	35	-20.88	35	-32.13	35	10.44
40	-43.23	40	-44.38	40	-58.92	40	1.02

Appendix ESC provision

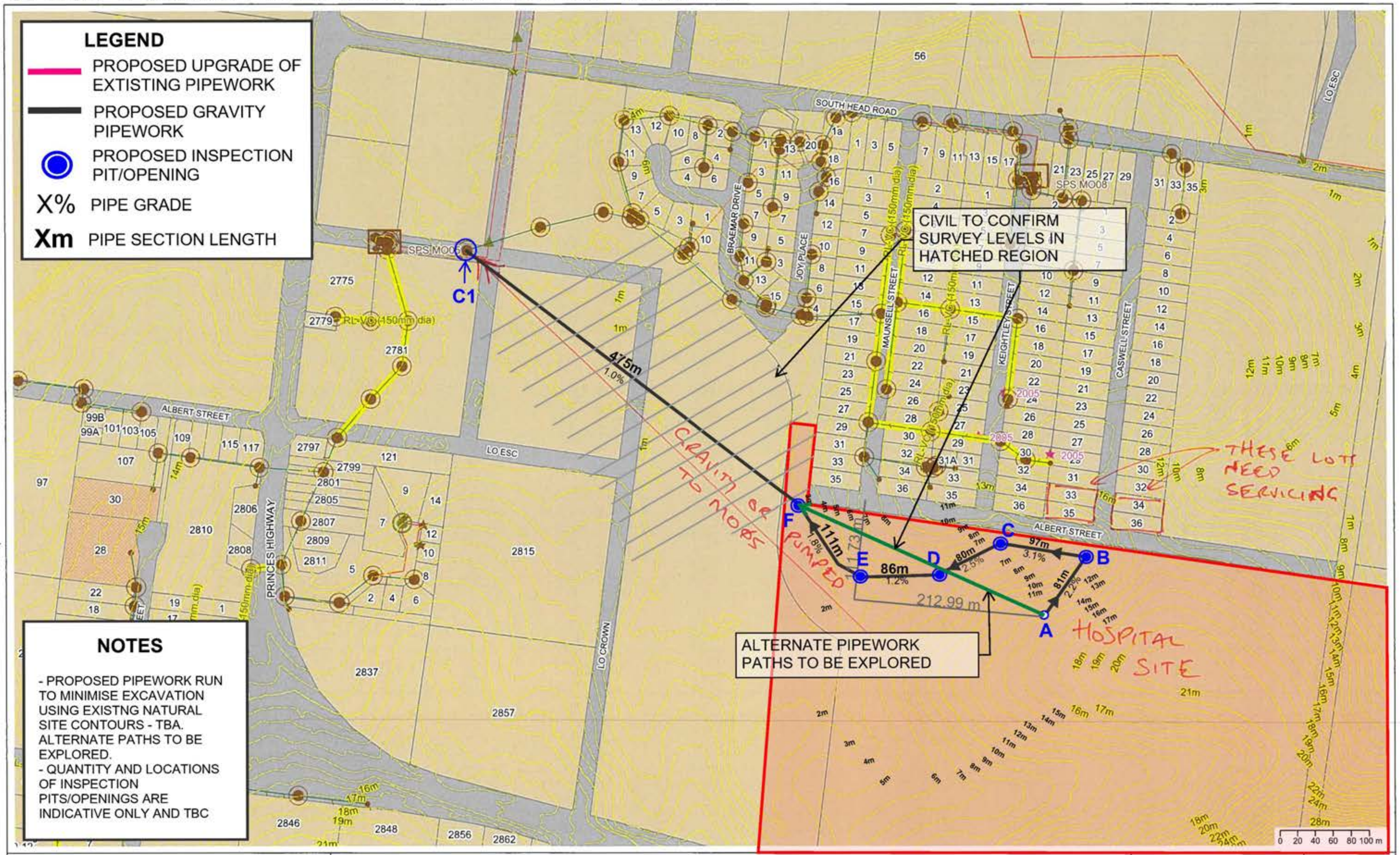


eurobodalla shire council	MORUYA LOW PRESSURE ZONE TWL 60.0M	Printed By Brett Corven On 8/03/2021	
	This information is released by Eurobodalla Shire Council on the condition that the recipient of this document, or the reader of it, acknowledges that should they rely on any aspect of this document, they do so at their own risk and release Eurobodalla Shire Council of all liability and responsibility for any errors, omissions or inaccuracies contained within or arising from this information. This diagram has been compiled on the best available information, but can only be taken as a guide. Exact location should be physically determined on site.	Scale 1:4038 at A3	N

If you require further information please contact Senior Technical Officer (Operations), Eurobodalla Shire Council, Moruya Depot, Araluen Road or telephone (02) 4474 1000

Appendix F: Sewer Connection Options

OPTION 1: GRAVITY FEED TO COUNCIL Ex PUMP STATION



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MORUYA SEWERAGE

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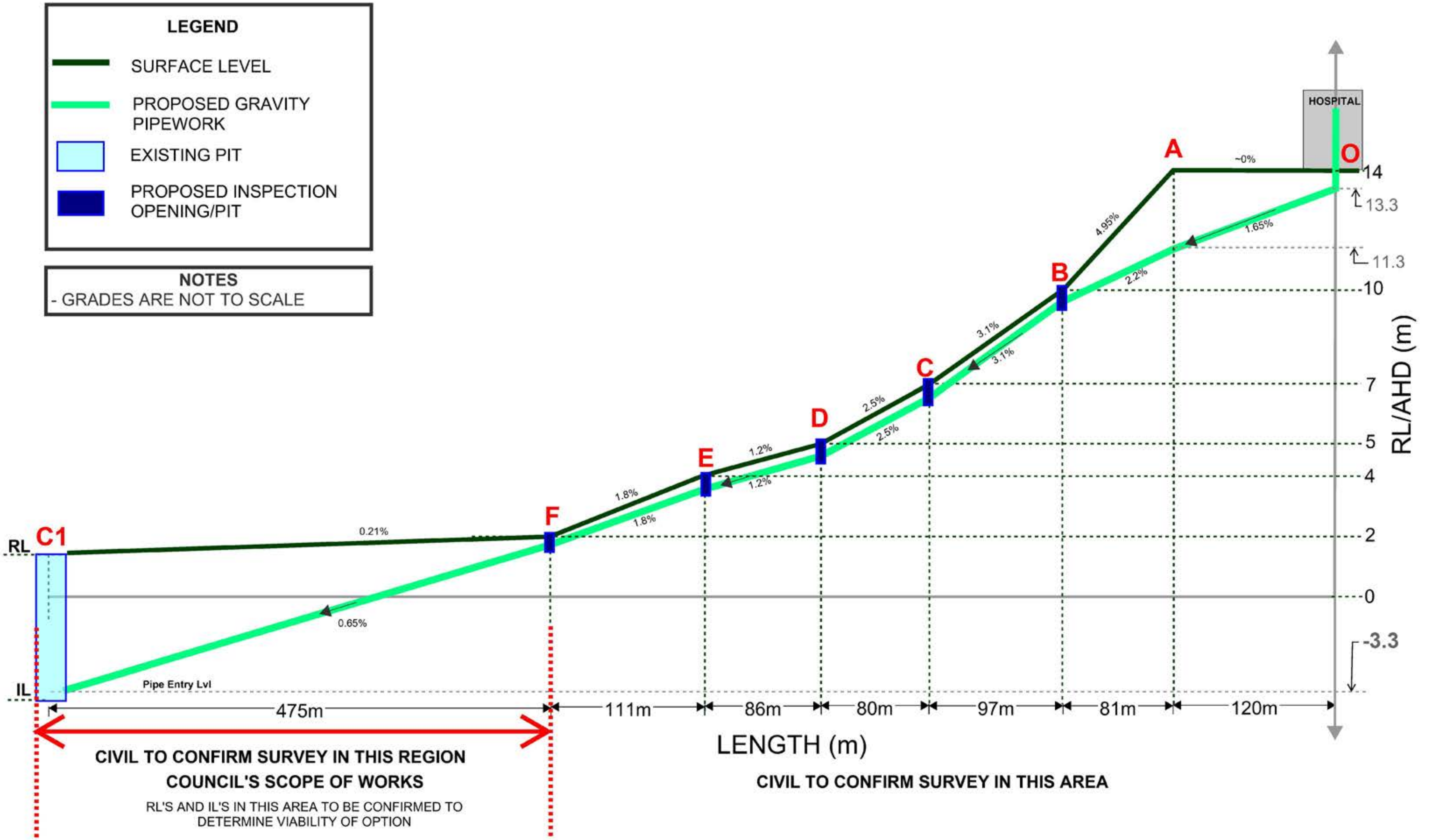
On 8/03/2021

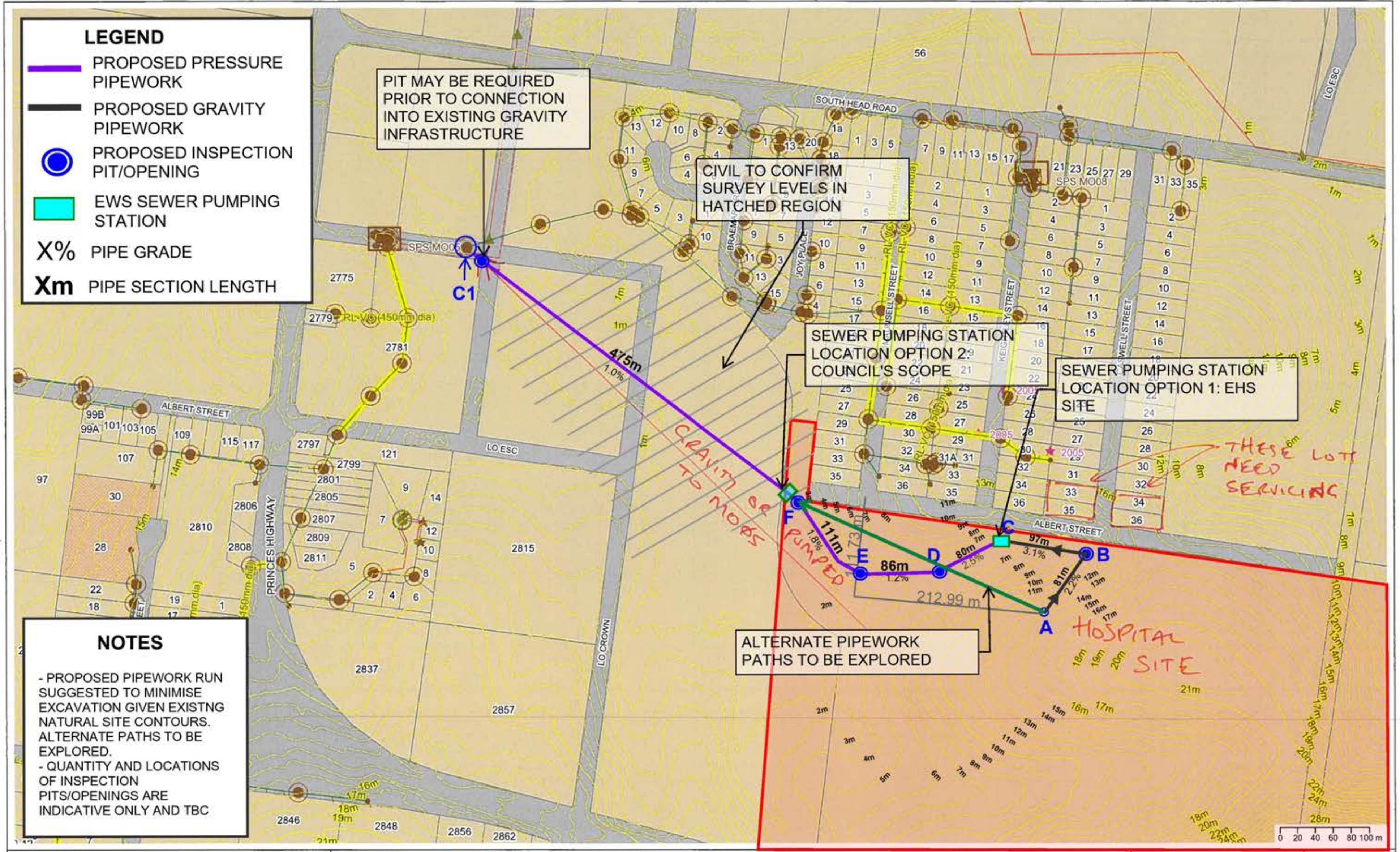
Scale 1:4038 at A3

N

OPTION 1: GRAVITY FEED TO COUNCIL EX PUMP STATION



OPTION 2: GRAVITY FEED TO POINT C or F AND PUMPED TO C1 (ex Council Sewer Pump Station pit)



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MORUYA SEWERAGE

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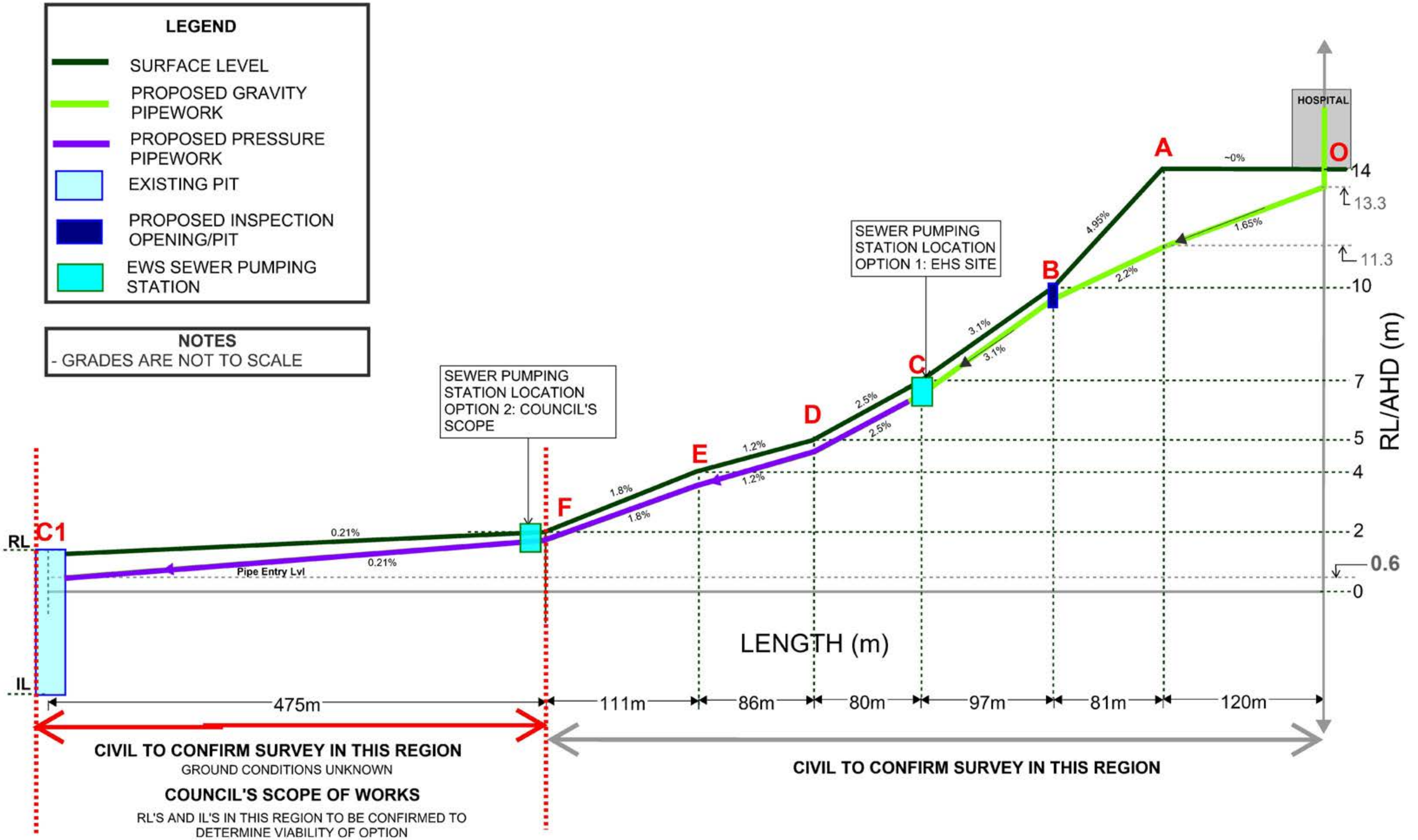
On 8/03/2021

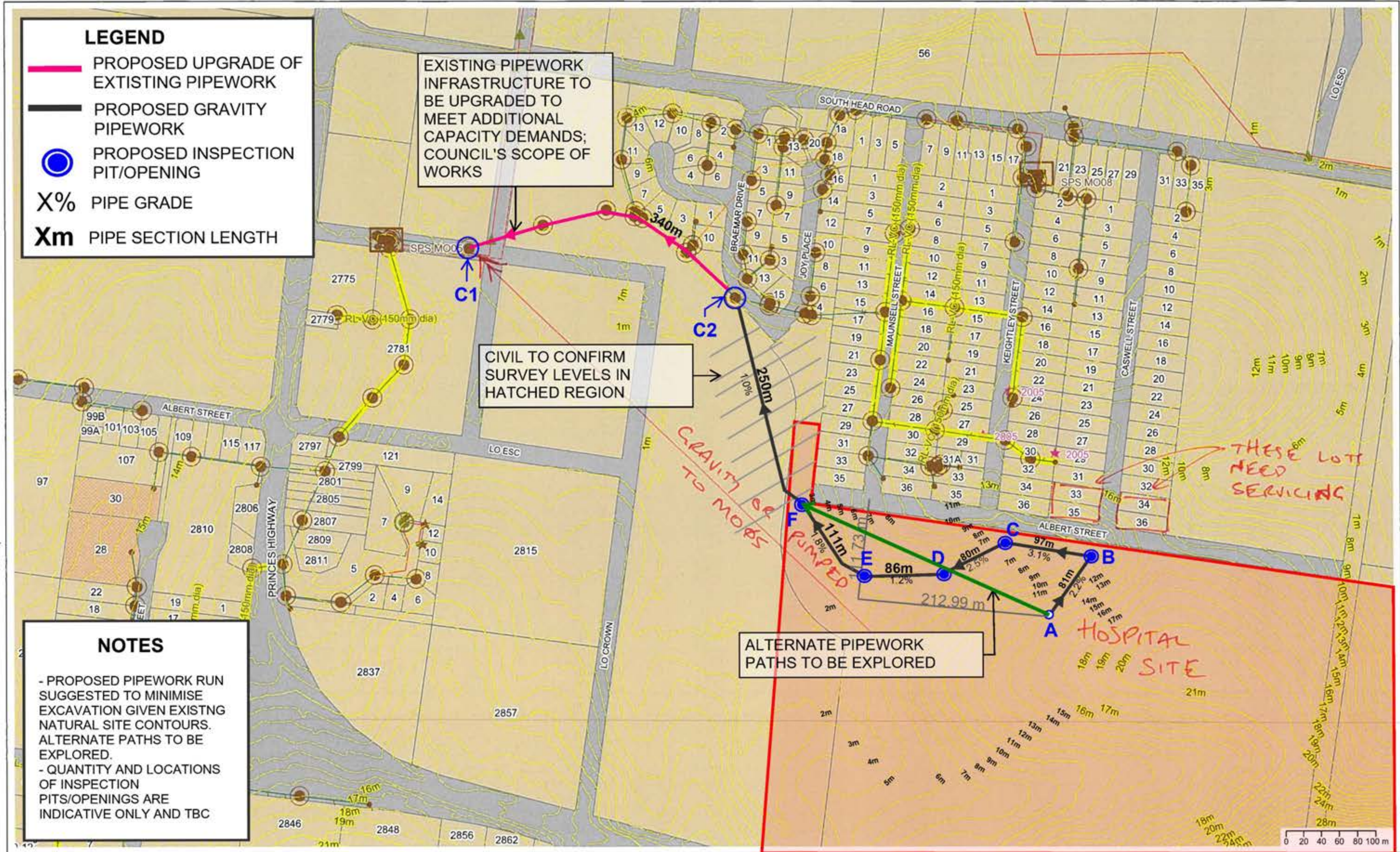
Scale 1:4038 at A3

N

OPTION 2: GRAVITY FEED TO POINT C or F AND PUMPED TO C1 (ex Council Sewer Pumping Station)



OPTION 3: GRAVITY FEED TO F or C2 & UPGRADED UPSTREAM SEWER MAIN TO C1 - by Council



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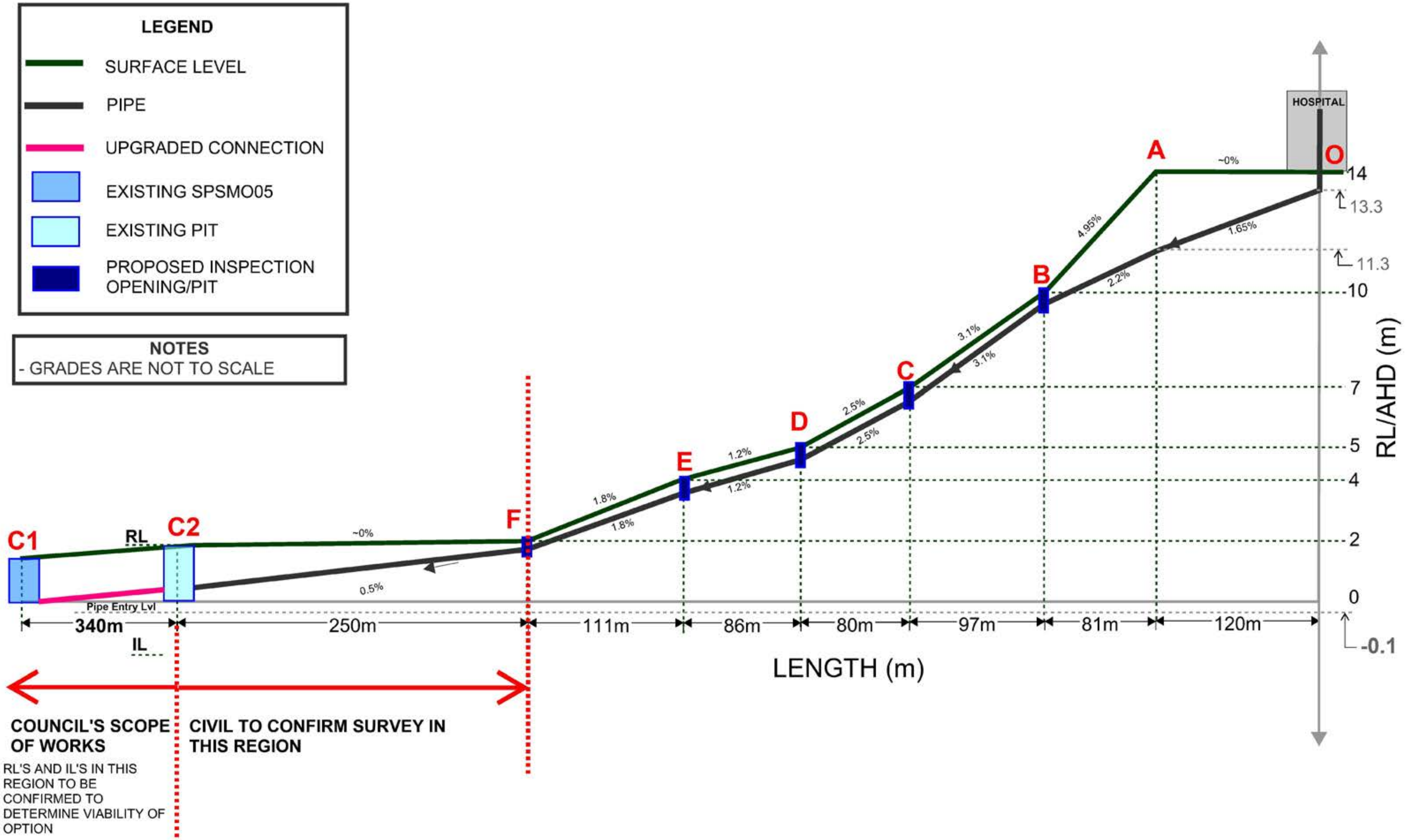
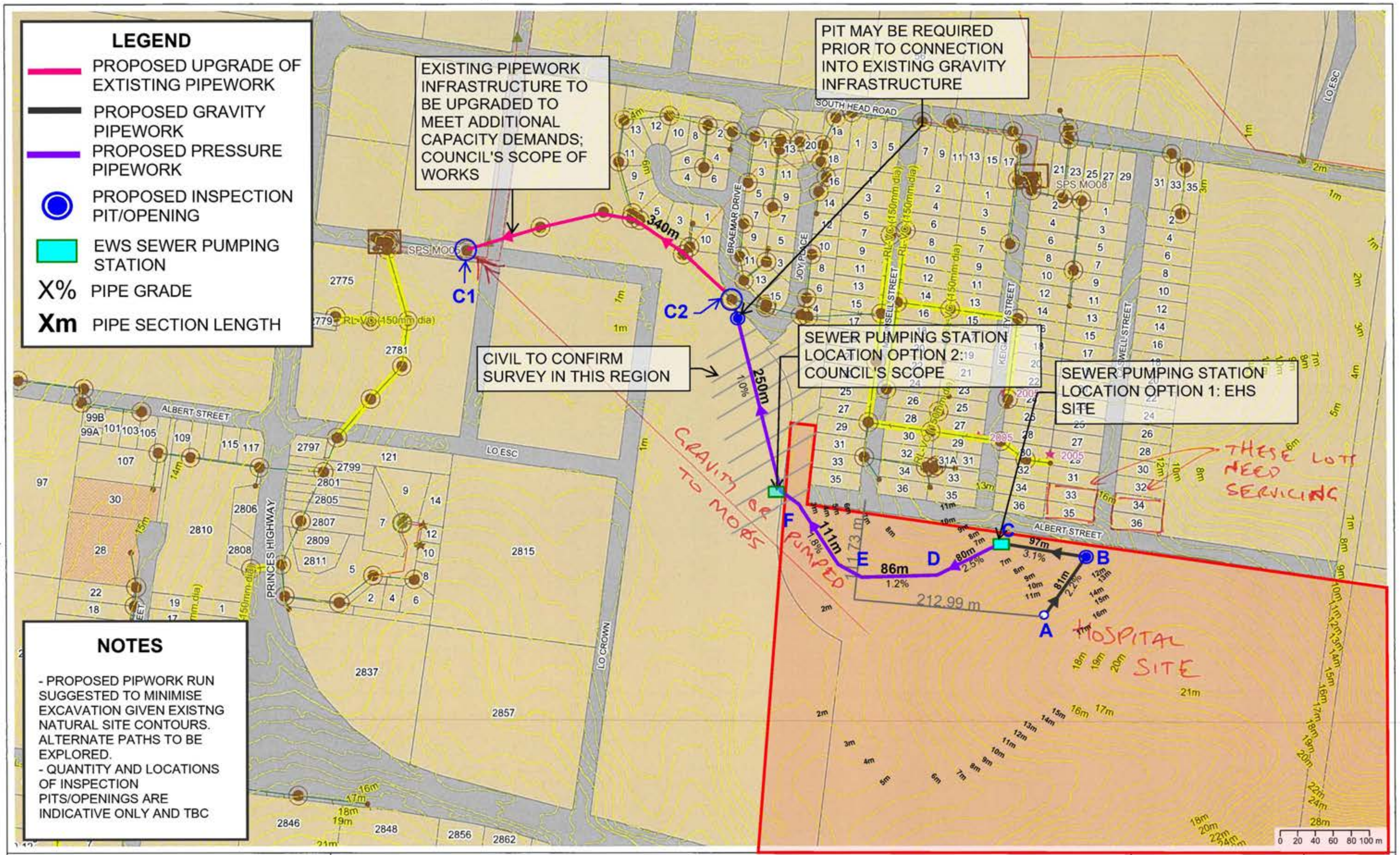
Scale 1:4038 at A3

N

OPTION 3: GRAVITY FEED TO C2 & UPGRADED UPSTREAM SEWER MAIN TO C1



OPTION 4: GRAVITY FEED TO POINT C, PUMPED TO C2 & UPGRADED UPSTREAM SEWER MAIN TO C1



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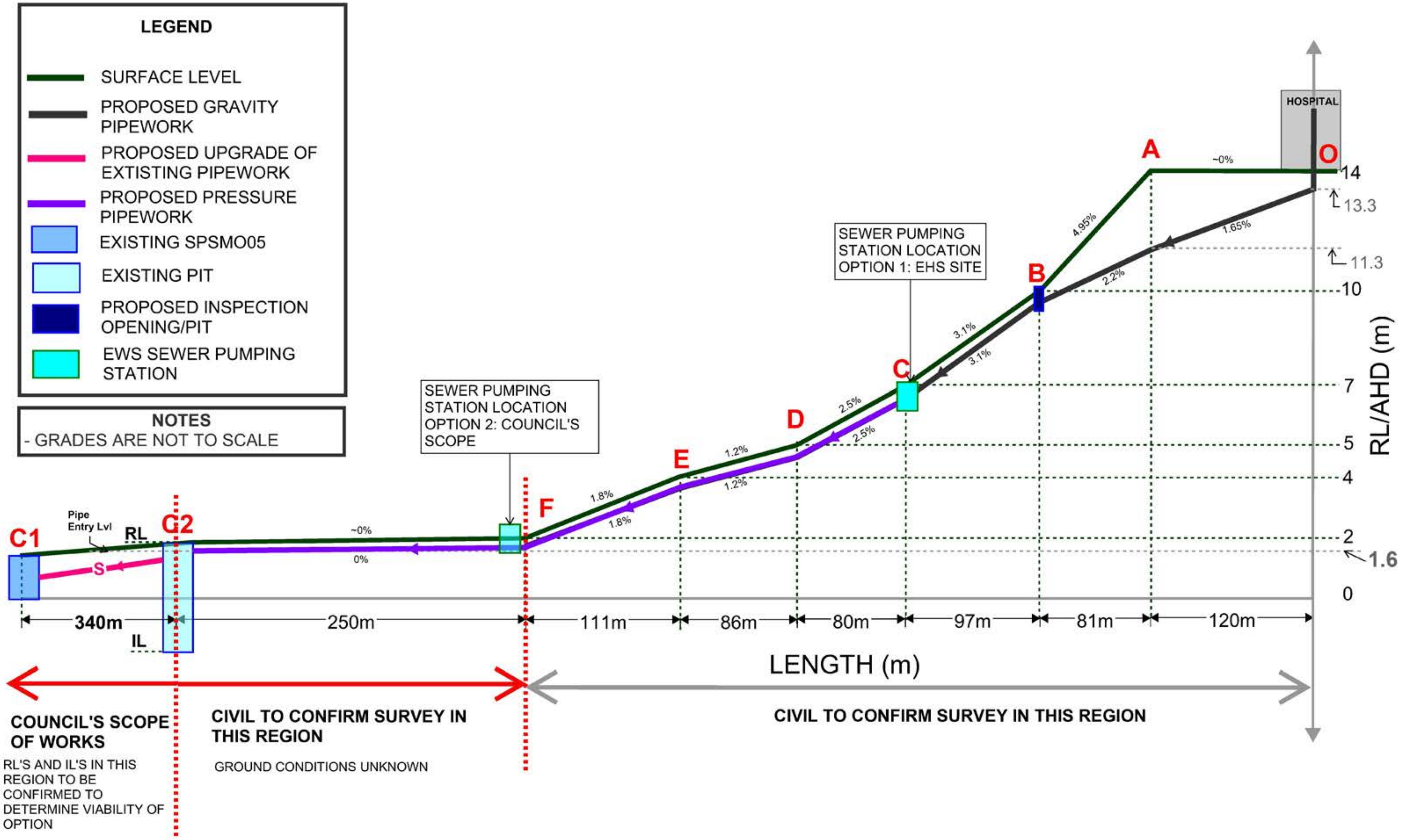
On 8/03/2021

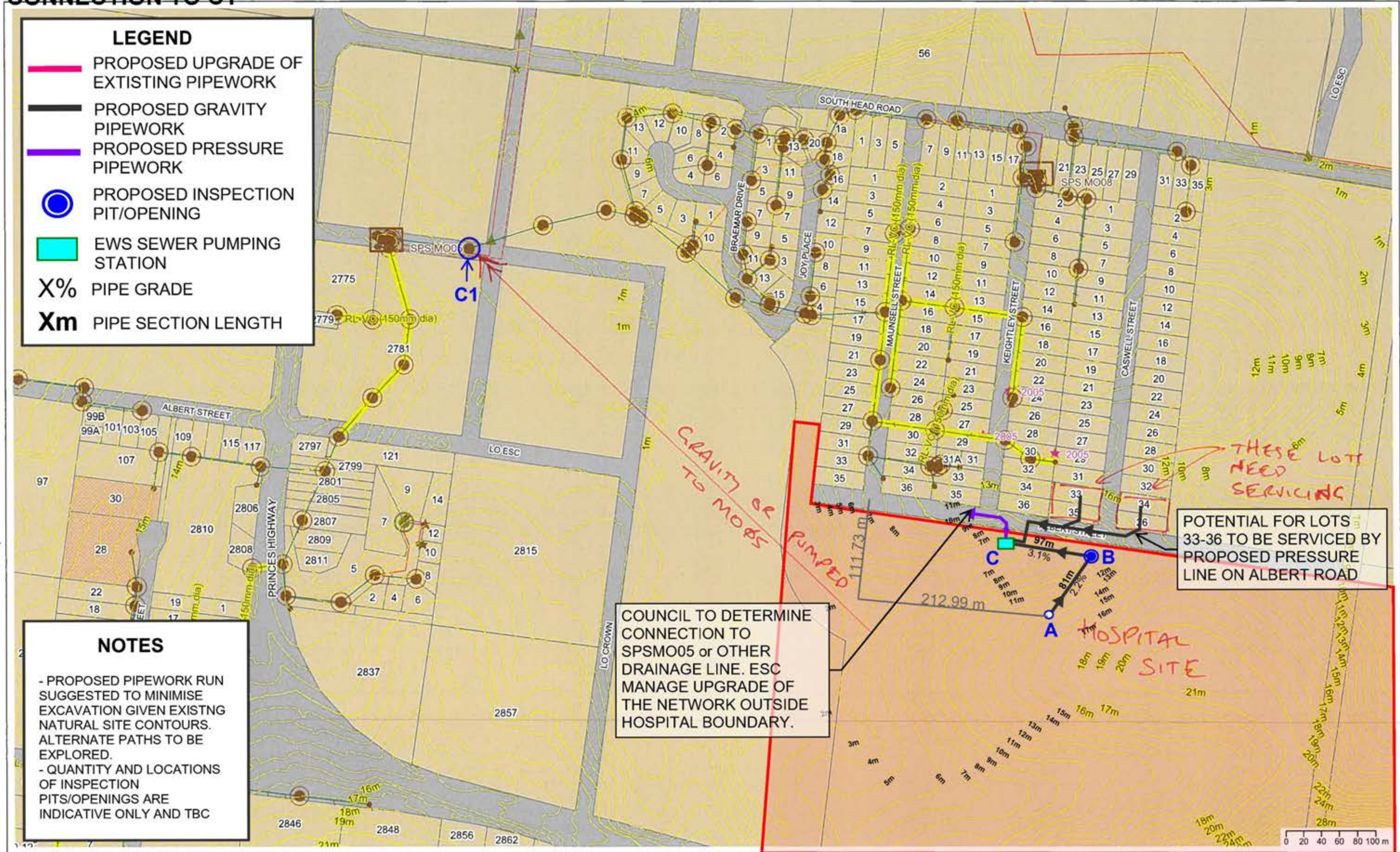
Scale 1:4038 at A3

N

OPTION 4: GRAVITY FEED TO POINT C or F, PUMPED TO C2 & UPGRADED UPSTREAM SEWER MAIN TO C1



OPTION 5: GRAVITY FEED TO POINT C, PUMPED TO INGROUND ON ALBERT STREET & COUNCIL TO CONTINUE CONNECTION TO C1



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Appendix G: Hot Water Options – LPG vs Electrical System

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Sydney NSW 2000
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f +61 2 9320 9321
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Project title	Eurobodalla Health Service	Job number	280718-00
to	Project Team via Aconex	File reference	
Prepared by	[redacted], [redacted]	Date	15 June 2021
Subject	**Domestic Hot Water System Review**		

1 Executive Summary

Various hot water systems have been assessed against a range of key performance criteria to find the most suitable system for the Eurobodalla Hospital. Based on this assessment, the most cost effective and spatially favourable system for the hospital is the LPG fired storage tank system with instantaneous units.

Provided that the stakeholders have expressed interest in achieving a fully electric building, commercial air to water heat pumps with electric boost can be considered the most suitable option due to its relatively low energy consumption and future clean grid. Due consideration should be given to the spatial constraints and higher initial capital cost for this system.

2 Introduction and Objective

The Eurobodalla site is currently a greenfield site and therefore has no provision of electrical or gas infrastructure to service the hot water system for the hospital. Whilst both options are suitable heating sources, the stake holders have expressed an interest in achieving full electrification for services to lower the greenhouse gas emissions. The objective of this memo is to present each option and compare it against key criteria, particularly cost, energy requirements, spatial allowance and carbon emissions to assess the feasibility of each option to determine the most suitable hot water system for the hospital.

The hot water system will be centralised, with a flow and return system. The proposed options analysed in this memo are the following:

- LPG fired storage tanks with instantaneous heaters
- Commercial heat pumps with electric boost
- Electric storage tanks

There is also an opportunity to provide the solar preheat plant in addition to provided options. For the purpose of this memo this has not been analysed yet and can be included into the selected system.

It is important to note that the current NSW grid composition is such that it produces its energy from coal power plants however, in the near future once the grid converts its energy production to 100% renewables, the carbon emissions will be expected to reduce drastically with electrical systems.

3 Design Data and Assumptions

The hot water demand has been estimated based on the number of wards/theatres, beds and staff. The kitchen hot water demand has been estimated based on the number of meals.

The plant for each option has been sized for a peak two hour demand. The plant consists of two components. The storage component is the amount of hot water that is stored inside the vessels and the recovery component is the heaters that are selected based on the amount of water it can heat in an hour i.e recovery rate. Ideally the recovery rate should produce the full storage component before the next subsequent peak occurs.

Energy requirement, carbon emissions and operational cost for each system has been based on the daily demand.

Capital cost estimations for each system have been based on information provided by manufactures of the equipment and Rawlinson's Construction Cost Guide 2021. The following list summarises the key assumptions.

3.1 Assumptions and allowances

Table 1 below summarises the assumptions and allowances used for the calculation of the hot water demand for a two hour peak period. The typical usage information in table 1 has been based on previous projects and detailed analysis will be further required.

Areas within hospital	**Litres per Item**
165 Beds	42 Litres per bed
2 Operating Theatres	50 Litres per theatre
2 Maternity Ward Delivery Rooms	200 Litres per delivery room
100 Café Meals	3 Litres per meal
330 Kitchen Meals	6 Litre per meal
1500 Basin/Kitchenette Use	1 Litre per person

Table 1: Hot water consumption per type

As per the IOP design guide (2002) the peak hourly demand typically corresponds to 20% of the total daily demand. A such the daily demand has been calculated as 5 x peak demand.

3.2 Hot water Demand

As mentioned previously domestic hot water (DHW) to the building will be distributed from a centralised hot water plant via a flow and return system. The hot water demand for each system is as per below.

Hospital Plant:

- Peak demand (2 hour peak with 20% additional capacity) – 16,584 L
- Daily demand – 41,460 L (5 x peak hourly demand).

4 Centralised Hot Water System Options

All the hot water options outlined below are centralised systems. The hot water will be reticulated throughout the building via a flow and return system delivering the hot water to the amenities. The pipework will be located in a dedicated hydraulic risers within the core of the building

4.1 Option A: LPG gas fired storage tanks with instantaneous heaters

Option A consists of a centralised hot water system that will use LPG (gas combustion) as the heating source. It is important to note that this option will require the installation of LPG vessels on site, therefore separate consideration will need to be given in terms of installation requirements, facility costs and spatial allowances for these vessels. Instantaneous water heaters will be installed in areas that are further away from the core to avoid the need for additional pipework reticulation. The number of instantaneous units required will be determined as the design progresses at the next stage.

The LPG fed system will comprise of:

- 16 x 205 MJ gas continuous flow internal water heaters
- 4 x 1000L stainless steel storage cylinders

The recovery rate for this system is 13,165 L/hr and the hot water storage capacity is 3,640L. This amounts to a total of 33, 690L over the 2-hour peak period with a 50C rise.

4.2 Option B: Commercial Heat Pump with Electric Boost

Option B consists of a standalone commercial air to water heat pump plant. This technology heats the water by absorbing the heat from the air and passing it through the refrigerant cycle. Heat pumps are relatively efficient due to the COP's (coefficient of performance) ranging from 2.6-4.5..It is worth noting that the efficiency is largely dependent on the ambient temperature. This means that the recovery rate can drop during the winter periods. As a mitigation measure, heating elements will be installed within the storage tanks to boost the top third of the tank to the required temperature.

The plant shall comprise of:

- 4 x 35kW commercial heat pumps supplied with 3 phase power.
- 5 x 3000L stainless steel storage cylinders each with a 30kW heating unit installed in the top flange fitting for boost .

The heat pumps will provide a total combined recovery rate of 2,720L/hr (based on an ambient temperature of 20ºC) and the total stored water during the peak period is 14,800 L. The heating elements will provide an additional 2,580 L/hr of hot water with a 50ºC rise. This amounts to a total of 25,400L over the 2-hour peak period. The system would take 2.8 hours to recover for the subsequent peak.

4.3 Option C: Electric Storage Tanks

Option C consists of a heavy-duty electric storage tank system. Each tank contains a heating element that transfers the heat from the element to the water.

The plant shall comprise of:

- 5 x 3000L storage water heaters each with 60kW heating elements.

The total recovery rate for this system is 5,160L/hr for a 50 ⁰C rise and the hot water storage capacity is 14,800L. This amounts to a total of 25,120 L of hot water with a 50ºC rise over the 2-hour peak period. The system would take 2.9 hours to recover for the subsequent peak.

5 Summary of Results

The options described above have been assessed against the following key performance indicators to determine the optimal hot water strategy for the building;

- Total energy required to heat the water (which is the energy the client is paying for)
- Capital and ongoing costs
- Required plant space

Figure 1 presents the energy required to produce the daily hot water demand for each system. The heat pump has a coefficient of performance (COP) of 2.5 on a 5ºC day. As such it requires a much lower energy input compared to gas and electric storage to produce the same amount of hot water, proving to be a very efficient system. The gas system in comparison has the lowest efficiency as it has inherent inefficiencies within the system (approximately 80%). As it is a centralised system all three options will have heat losses such as standing losses from the tanks (which has been incorporated in this calculation) and heat losses through pipework (this has not been considered at this stage).

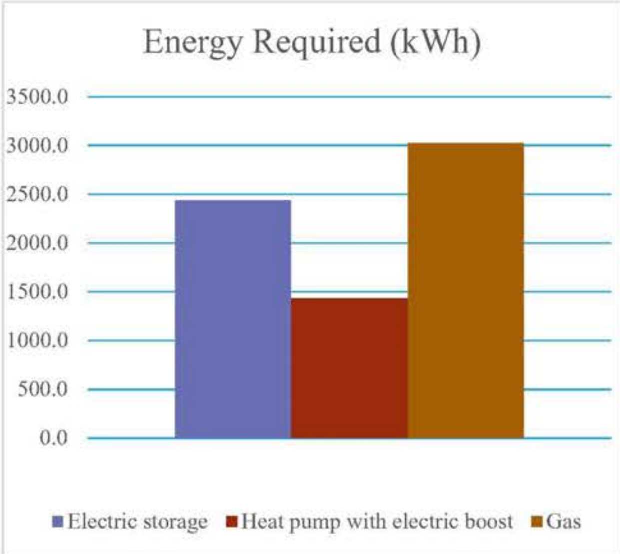


Figure 1: Energy Requirements

Figure 2 below presents the cumulative cost for each system. This cost is inclusive of the capital cost and annual running cost. Note that the capital cost is inclusive of heaters, heat pumps, storage tanks, ancillaries and commissioning only. The heat pump system has the highest capital cost but has a much lower running cost due to the lower energy consumption. Ultimately due to the relatively low cost of LPG and low capital cost, the gas system proves to be the most cost effective system.

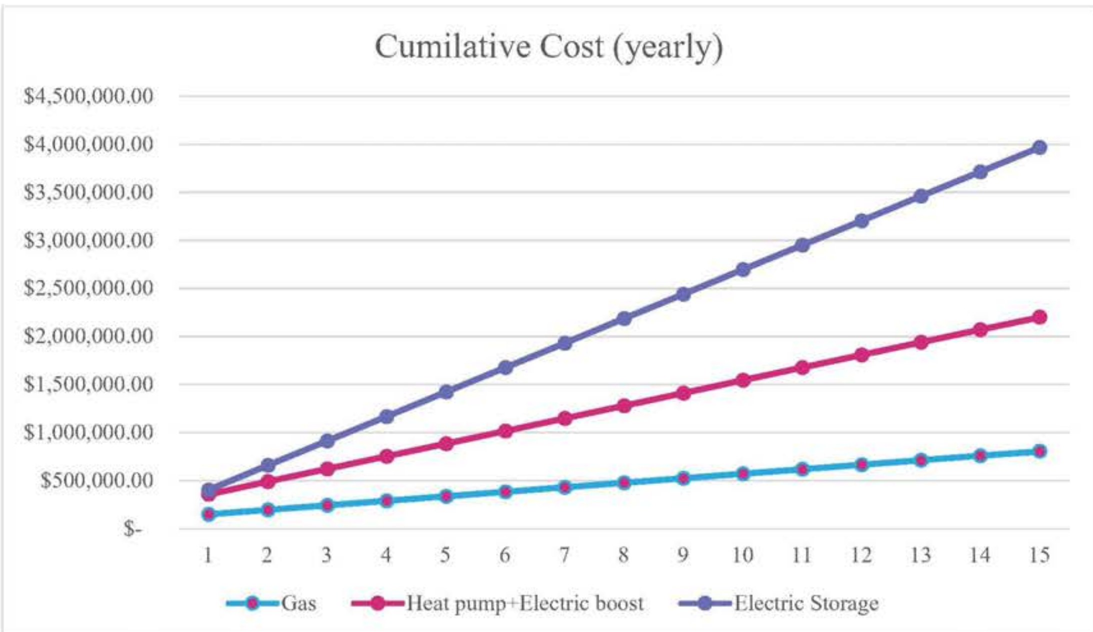


Figure 2: Cumulative Cost of Each System

Figure 3 presents the monthly carbon emissions for each system. This is based on 0.23 kgCO2/kwh for LPG and 0.94 kgCO2/kwh for electric. Note that the results below are based on the current NSW grid composition.

The current grid produces its energy from coal power plants. In the future once the grid converts its energy production to 100% renewables, the carbon emissions will be expected to reduce drastically.

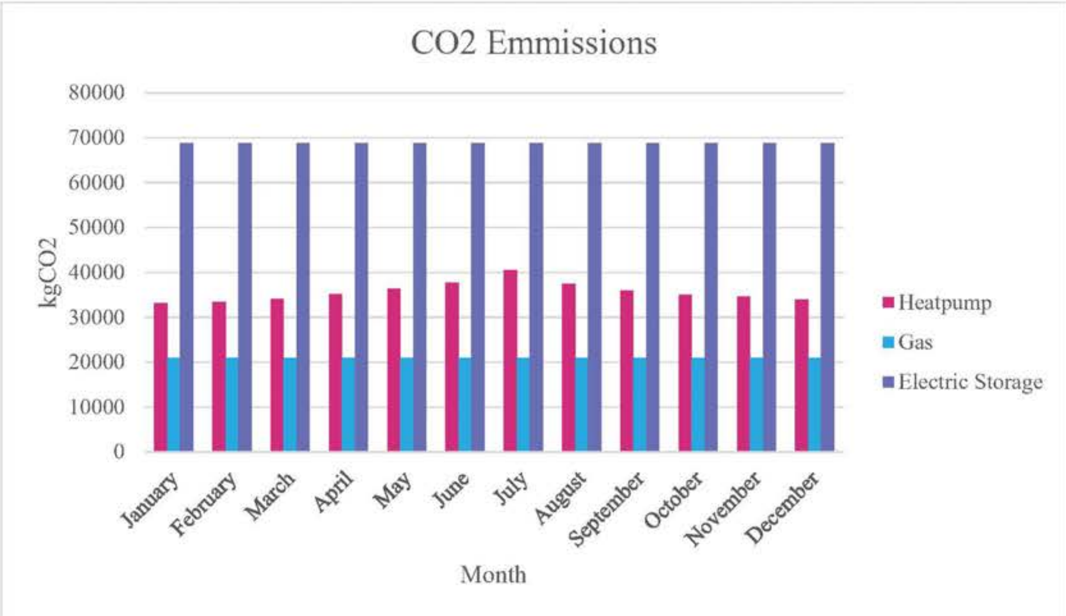


Figure 1: Carbon Emission Graph for Each System

The table below summarises the comparison between each option and includes spatial requirements and thermal performance.

Table 2: Comparison of each system

Items	**LPG storage with instantaneous heaters**	**Heat pumps with electric boost**	**Electric storage**
Heat transfer	Combustion of gas to heat water	Electrically generated refrigerant cycle transfers heat absorbed through the air to heat the water	Use electric resistance coils to heat water
Electrical demand	-	10.25 kW per heat pump 30kW heating element per storage tank	60 kW per storage tank
LPG demand	3280 MJ/hr	-	-
Spatial requirement (m)	× *25 sqm* 3.3 x 2 for LPG heaters (installed back to back) 5.5 x 2.6 for storage tank (installed in line)	××× *60 sqm* 7.2 x 3.3 for heat pumps (installed parallel) 9 x 3.3 for storage tanks (installed in line)	×× *30 sqm* 9 x 3.3 for storage tanks(installed in line)
Efficiency/COP		2.6~4.5	N/A
Capital cost - APPROX	$ $100k	$$$ $220k	$$ $150k
Average running cost	$	$$$	$$$$$
Life expectancy (Years)	15-20	10-15	15-20

Table 3 summarises the maintenance requirements and warranty periods for each type of equipment. These figures have been based on the advice provided by the manufacturer.

Equipment	**Heat pump**	**Heating element**	**Storage tank**
Warranty period (years)	2	2	8
Warranty extension (add 20% on top of capital cost) (years)	4	4	10
Maintenance	Annual service	Minor service every 6 months	Minor service every 6 months Major service every 5 years

Table 3: Maintenance and warranty periods of equipment

6 Conclusion and Recommendation

Based on the assessment of the above centralised hot water systems against key performance criteria relevant to the hospital and the projects aspirations, we believe the most suitable hot water system to be either option B - heat pumps with electric boost or option A - LPG system with instantaneous units.

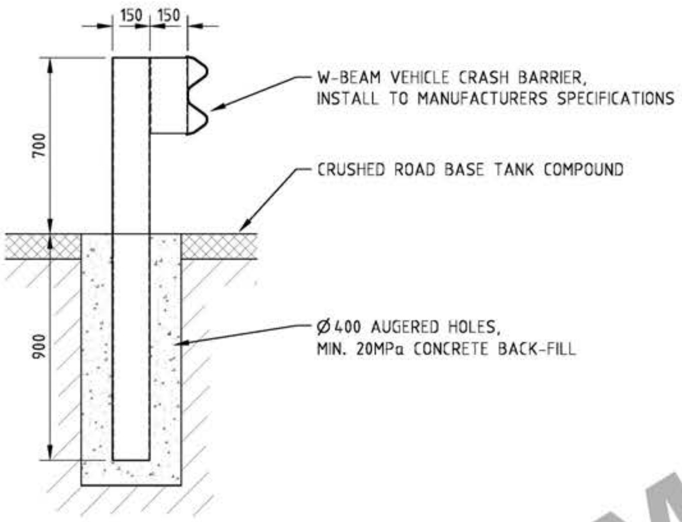
Heat pumps have the highest capital cost but have a lower running cost due to the lower energy requirements as a result of the COP's. It has the drawback of greater space requirements and a lower recovery rate during winter periods. The installation of electric heating elements can reduce this dependency on ambient temperatures however results in a higher energy consumption. It will also provide further resilience to the system as the system can operate independently should the heat pumps be offline for repair or maintenance, albeit at lower volumes.

The LPG system proves to be the most cost effective system due to the low capital and running costs. It has the smallest space requirement with a reliable and fast recovery rate. However, this option does not allow electrification and needs large space for the LPG storage vessels.

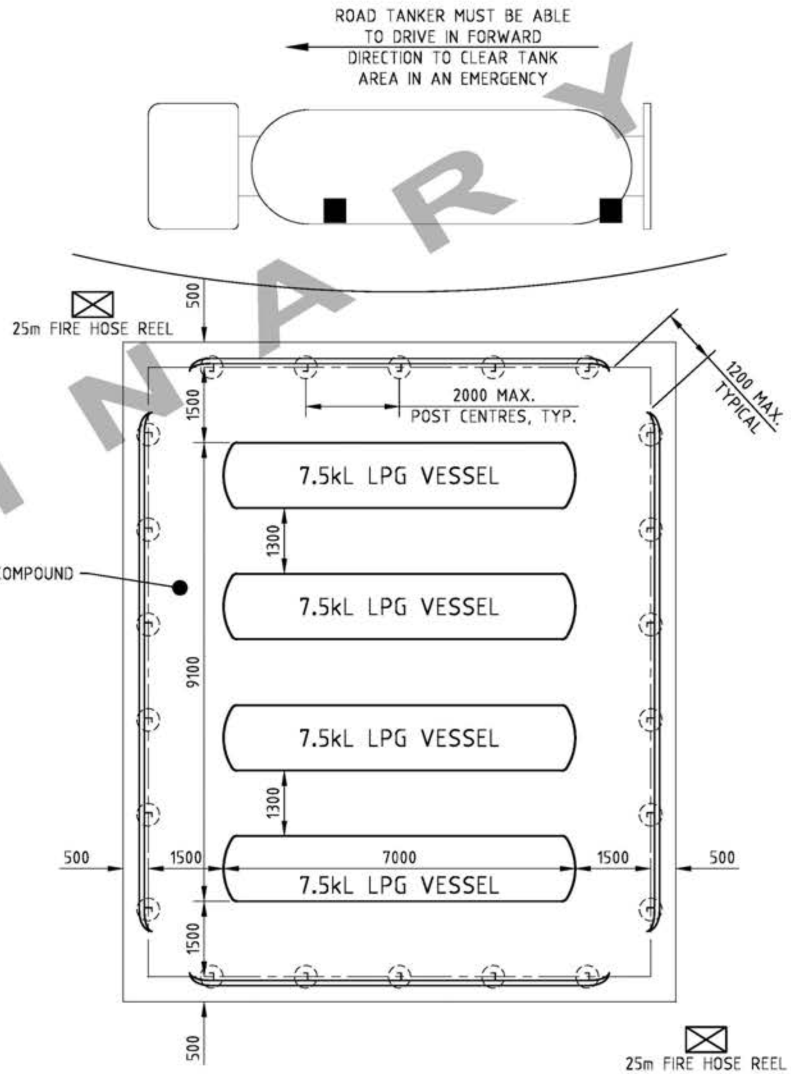
Ultimately consideration needs to be given to the stakeholders aspirations towards a fully electric building and this will influence the final decision.

Project No. : 280718-00		EHS				ARUP
Subject : Preliminary Electrical Loads for Hydraulic and Fire Services						
Date : 25/05/2021						
By: RM	Rev 2					

Level	Room	Equipment Description	Loading	Essential	Non-essential	Remarks
FIRE SERVICES						
Ground Level (TBC)	Fire Pump Room	Fire jockey pump (FJP-01)	15kW,three phase, 380-420V	✓		Based off a 1L/s @ 950kPa
Ground Level (TBC)	Fire Pump Room	Fire booster electric pump (FBP-01)	160kW, three phase, 380-420V	✓		Based off a pump of 38L/s @ 950kPa - Subject to change
Ground Level (TBC)	Fire Pump Room	Fire booster diesel pump (FBP-02)	240V, 10Amps	✓		Based off a pump of 38L/s @ 950kPa - Subject to change
Ground Level	Fire Control Room	Fire Indicator Panel (FDCIE)	240V, 10 Amps	✓		Dependent on number of loops and devices
Ground Level	Fire Control Room	EWIS Panel (MCPE)	240V, 10 Amps	✓		Dependent on number of loops and devices
Ground Level	Fire Control Room	Fire fan control panel (FFCP)	240V, 10 Amps	✓		
Ground Level	Security Room	MIMIC FDCIE panel in security room	240V, 10 Amps		✓	
All Levels (TBC)	All nurse stations	MIMIC FDCIE panel to all nurse stations	TBC x 240V, 10 Amps	✓		One panel to each nurse station - locations TBC
All Comm Rooms (TBC)	Comms Room	VESDA (Aspirating smoke detector) panel - comms room	240V, 10 Amps	✓		One panel in each comms room
All Levels	Fire Stair landing on each floor	Zone check device for on-floor sprinklers	240V, 10 Amps		✓	One device per floor
Various - TBC	TBC	Zone check device for internal and/or external wall wetting sprinklers	240V, 10 Amps		✓	Number of devices and floors TBC pending confirmation of drenchers requirements from Architect/ BCA Consultant & Fire Engineer
HYDRAULIC SERVICES				Business Continuity		
External Undergound(TBC)	External	Subsoil/stormwater pumpout station #1 (2 duty / 1 standby submersible pumps)	3 x 5.5kW, three phase, 380-420V	✓		For 50kL Sewer Pump Station - 3 Pumps required (TBC)
Ground (TBC)	Rainwater re-use plantroom	Recycled water booster pump (1 duty / 1 standby)	15kW, three phase, 415V		✓	
Ground (TBC)	Rainwater re-use plantroom	Recycled water treatment/filtration plant	3 x 240V GPOs, 10 Amps		✓	
Ground (TBC)	DCW Plantroom	Triplex Variable Speed Domestic Cold Water Pumpset	25kW, three phase, 415V	✓		Dependent on pressure and flow from water main.
Ground (TBC)	DCW Plantroom	Domestic cold water filtration plant	3 x 240V GPOs, 10 Amps	✓		
Ground (TBC)	DHW Plantroom	**Option 1** - Instantenous water heater + storage tank supply from LPG	240V, 22 Amps	✓		
Ground (TBC)	DHW Plantroom	**Option 2** - Heat pumps with electric boost	HP 4 x 11kW, three phase, 415V HE 5 x 30kW, three phase, 415v	✓		
Ground (TBC)	DHW Plantroom	**Option 3** - Electric storage tanks	HE 5 x 60kW, 3 phase, 415V, 80Amps per phase	✓		
Ground (TBC)	DHW Plantroom	Domestic hot water recirculation pumps (1 duty / 1 standby)	2x 3kW, 1 phase, 240V	✓		Based on maximum circulation length of 50m. Based of the UPS 20-60.
Same as Dialysis + Renal (TBC)	RO Plantroom	Reverse Osmosis plantroom serving Renal dialysis beds	TBC x 240V GPOs, 10 Amps	✓		Centrally Located for nominated beds . Chairs via portable dialysis station units. Requirement TBC pending manufacturer's advice.
TBC	TBC - All staff rooms, beverage bays & kitchenettes	Localised Boiling/Chilled water unit	TBC x 10 Amp GPO		✓	Located under kitchen bench, Architect to nominate locations
All levels	As required	Power connection to TMV monitoring hubs			✓	Connection from TMVs to central hubs - locations TBC
NOTES						
For essential services all wiring associated with an essential switchboard, which powers or controls systems required to operate during fire alarm conditions shall be fire rated cable, selected and installed in accordance with AS 1668.1 and AS 3013						



W-BEAM VEHICLE CRASH BARRIER
TYPICAL DETAIL



NOTES:

1. HAZARDOUS ZONES AND SEPARATION DISTANCES APPLY TO THE INSTALLATION. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ORIGIN STANDARD DRAWING LPG-BUS-CUS-GAT-0007, AS1596 AND AS/NZS60079.10.1 ANNEX ZA.
   VESSEL SEPARATION DISTANCE TO A PUBLIC PLACE: 5.8m
   VESSEL SEPARATION DISTANCE TO PROTECTED WORKS: 9.7m
   VESSEL SEPARATION DISTANCE TO PROPERTY BOUNDARY: 9.7m
   VESSEL SEPARATION DISTANCE TO AN IGNITION SOURCE: 5.8m
2. FIRE HOSE REEL SHALL COMPLY WITH AS/NZS1221 AND SHALL BE INSTALLED IN ACCORDANCE WITH AS2441.
3. THE FIRE HOSE REEL MAY BE SUPPLIED BY ANY ON-SITE RETICULATED WATER SUPPLY, OR FROM ANY FORM OF WATER STORAGE SYSTEM, PROVIDED THE HOSE REEL IS ABLE TO DELIVER AT LEAST 0.33L/s FOR A MINIMUM DURATION OF 15 MINUTES.
4. THE NUMBER AND LOCATION OF FIRE HOSE REELS SHALL BE SUCH AS TO ENSURE THE HOSE NOZZLE WILL REACH EVERY POINT IN AN AREA BOUNDED BY A LINE AROUND, AND 5m DISTANT FROM, ANY TANK AND TANKER STANDING AREA.
5. W-BEAM VEHICLE CRASH BARRIER POSTS TO BE INSTALLED AND POURED PRIOR TO INSTALLATION OF CRUSHED ROAD BASE.

No.	DATE	REVISION DESCRIPTION	BY	APP
B	13-08-20	NOTES REVISED TO INCLUDE HAZARDOUS & SEPARATION DETAIL	A.G.S.	
A	10-08-20	ISSUED FOR APPROVAL	A.G.S.	

NOTES

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origin

SCALE	N.T.S.	DATE
DRAWN	A.G.S.	10-08-20
CHECKED		
APPROVED		
VENDOR REF.	LN18178	

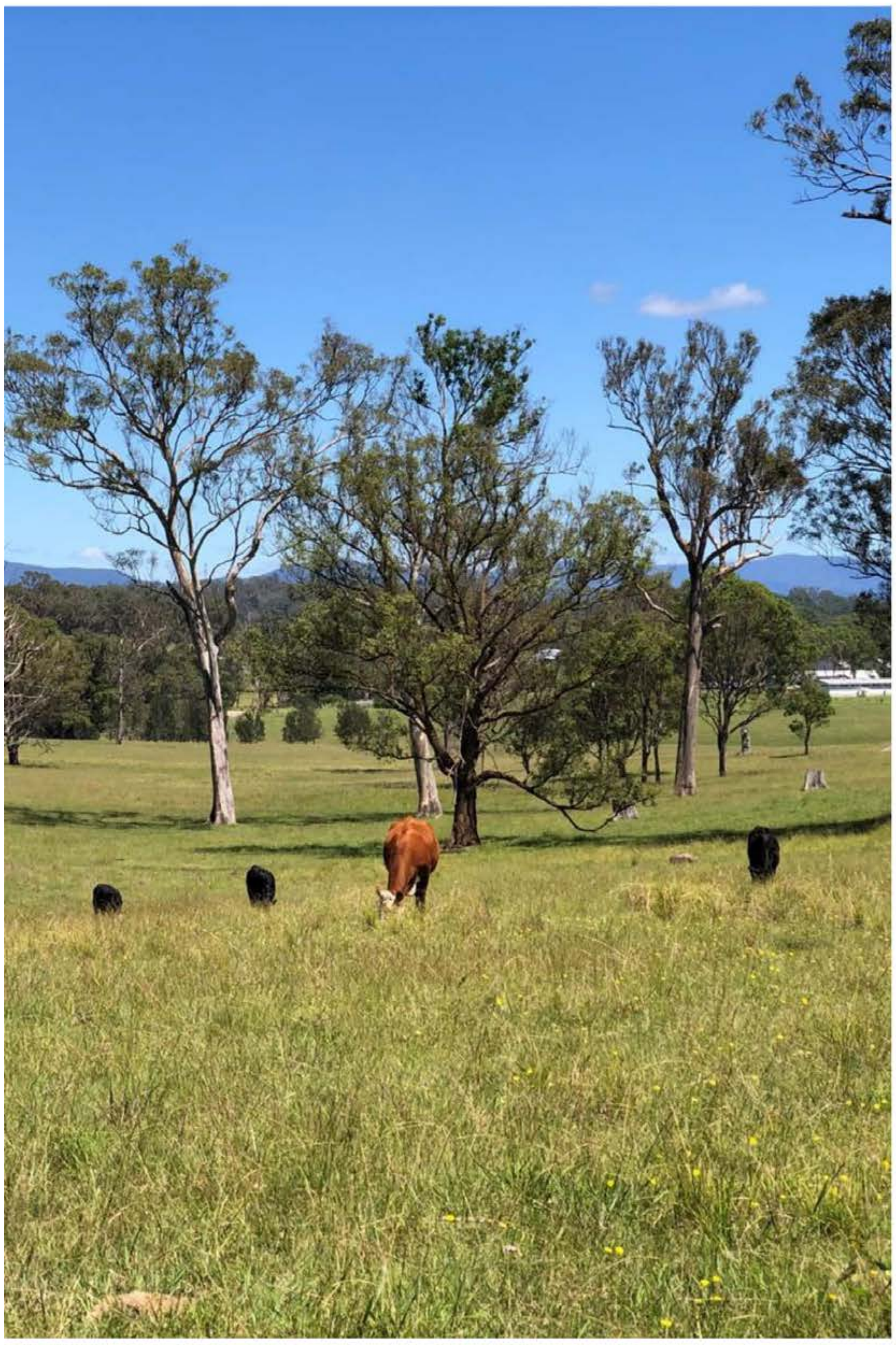
DIMENSIONS IN MILLIMETERS U.N.O. DO NOT SCALE - IF IN DOUBT ASK

PROJECT: STANDARD INSTALLATION DETAILS

TITLE: CUSTOMER SITE TANK COMPOUND
4No. 7.5kL LPG VESSEL PLAN

SHEET 1 OF 1 | SHEET SIZE A3 | ORIGIN DRAWING No. Ogn-1018-22 | REV B

A3



ROOT PARTNERSHIPS
Advisory+
Project Management

Eurobodalla Health Service

Proposed Cold Water & Sewer Infrastructure Strategy

Agenda

01 Welcome & Project Update

02 Proposed Infrastructure: Cold Water Supply

03 Proposed Infrastructure: Sewer Connection Strategy

04 Sewer Pump Station Details

05 Next Steps & Questions

EHS Project Update

Program & Progress

EHS

Project Update

- Project is in final stages of concept design, schematic design will commence in August 2021.
- Site acquisition in final stages and anticipated to be completed in Q3 2021.

Proposed Infrastructure

Cold Water Supply

EHS

Existing Council Infrastructure: Cold Water Supply

Albert Street:

- 200mm asbestos-cement (AC) main, TWL
- 119.9m.
- 200mm polyvinyl chloride (PVC) main,
- TWL 60m.

Lo Crown:

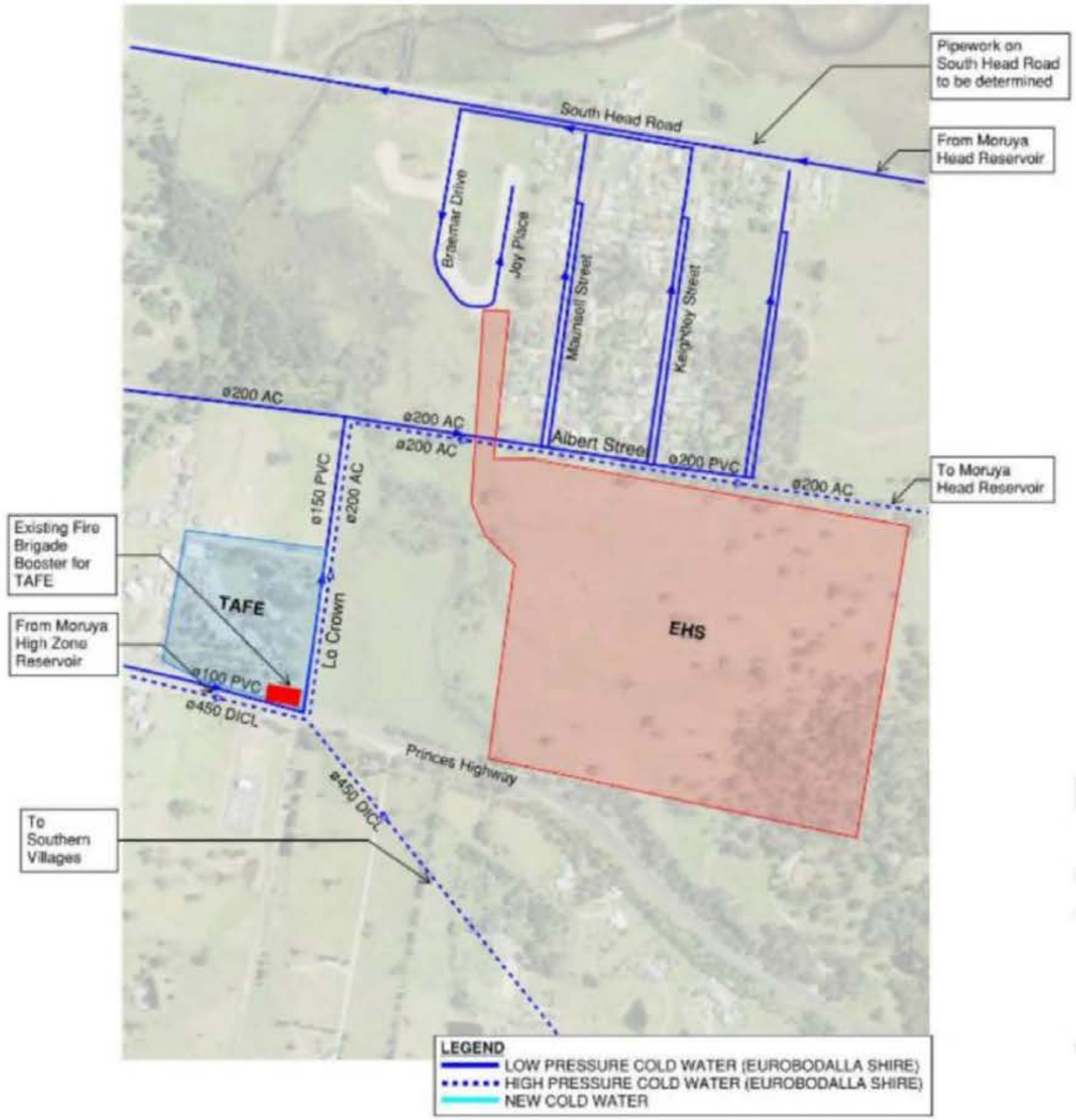
- 200mm asbestos-cement (AC) main, TWL
- 119.9m.
- 150mm polyvinyl chloride (PVC) main,
- TWL 60m.

Princes Highway:

- 450mm ductile iron cement mortar lined
- (DICL) main, TWL 119.9m.
- 100mm polyvinyl chloride (PVC) main,
- TWL 60m.

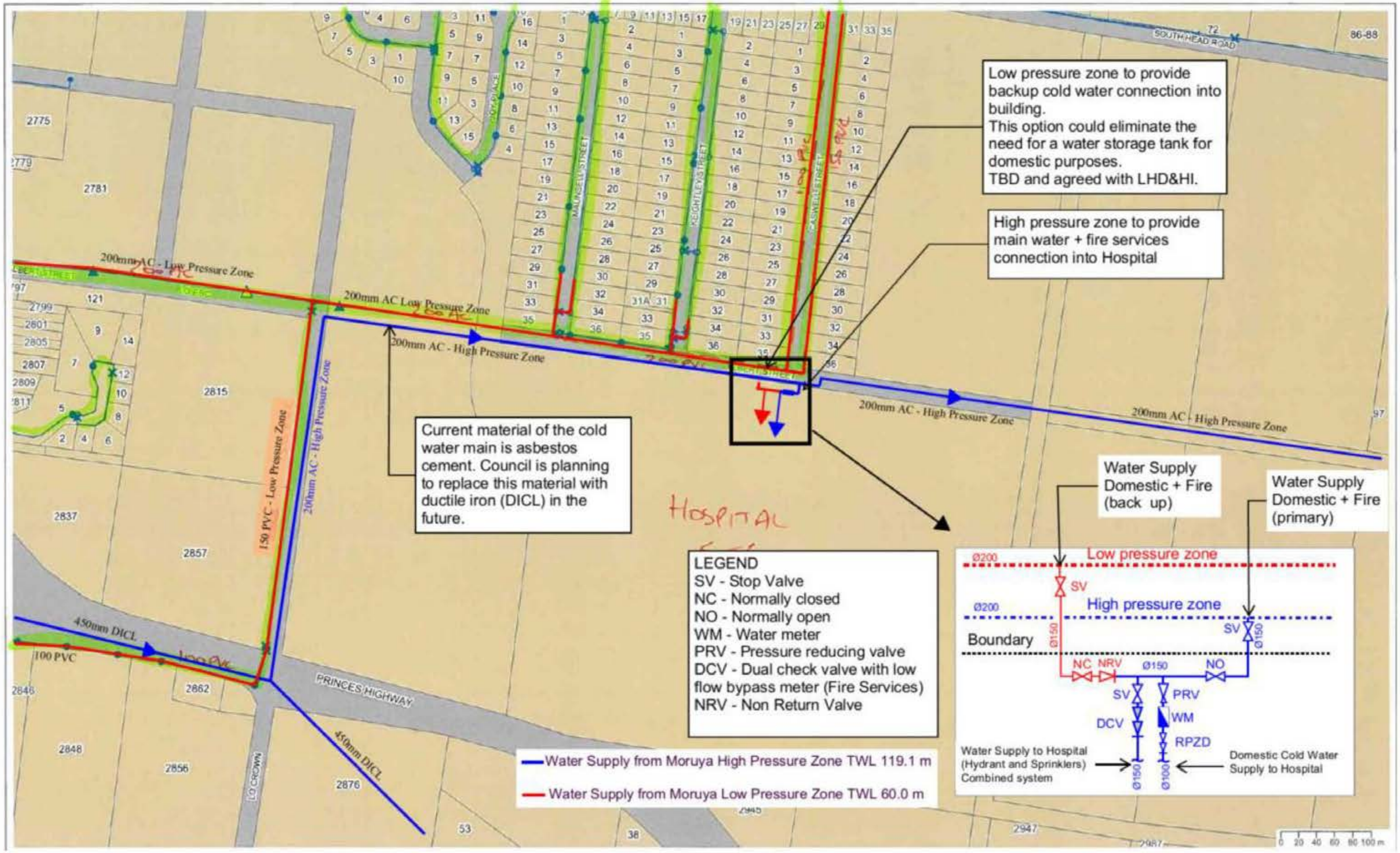
South Head Road:

- Pipework to be determined, TWL 77.5m.



EHS

Proposed Infrastructure: Cold Water Supply



Proposed Infrastructure

Sewer Connection Strategy

EHS

Proposed Sewer Design: Connection Strategy

- Multiple sewer infrastructure options considered.
- Preferred option:
  - Install Hospital Sewer Pump Station to Council Specification near Albert St.
  - Continue connection along site boundary into existing Council infrastructure (Sewer Pumping Station MO05) to minimise impact on neighbouring properties.

EHS

Existing Council Infrastructure: Sewer

EHS

Existing Council Infrastructure: Sewer

Bergalia Street, John Street and Princes Highway:

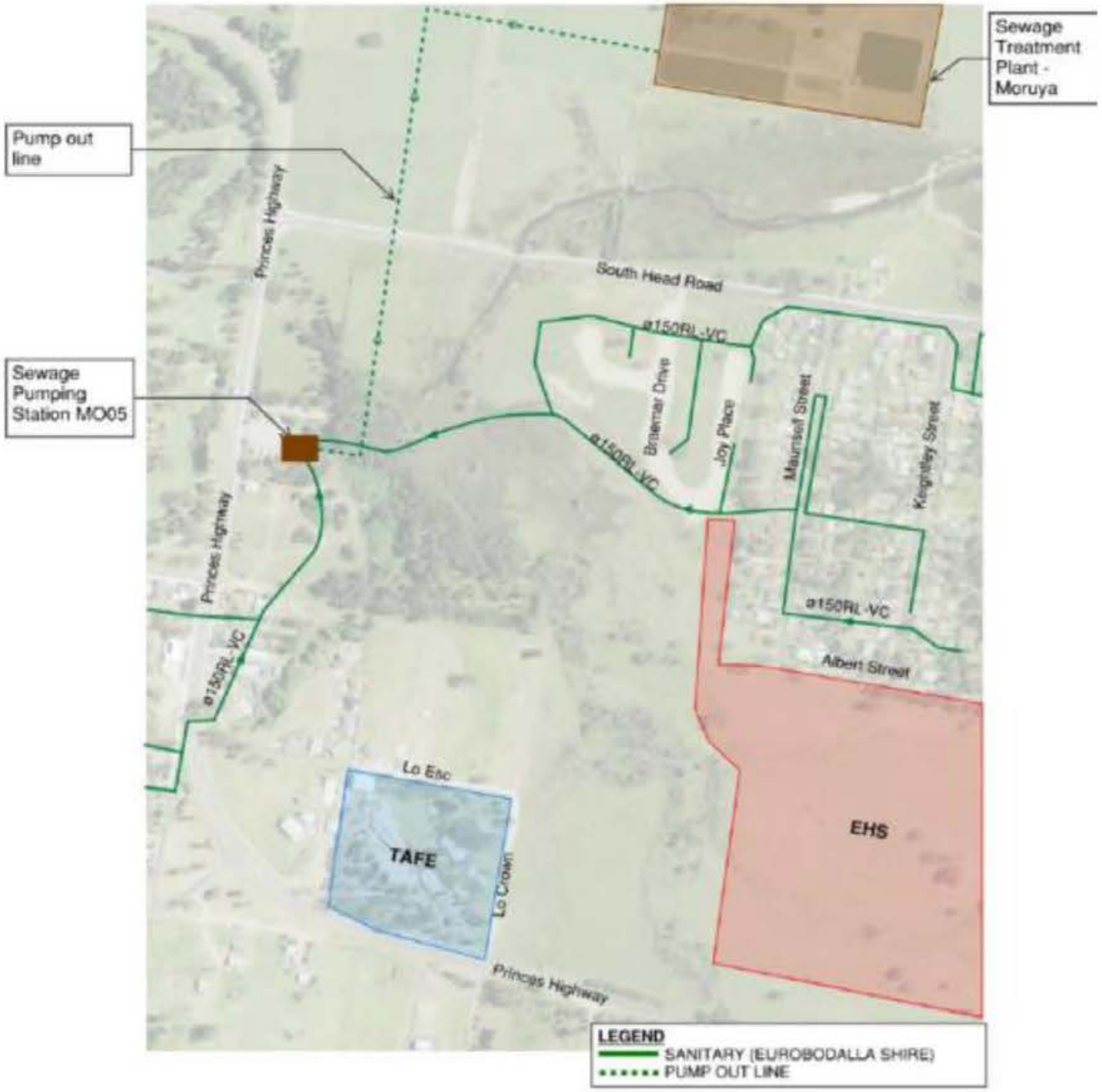
- 150mm vitrified clay (RL-VC) main

Keightley Street, Maunsell Street, Joy Place and Braemar Drive:

- 150mm vitrified clay (RL-VC) main

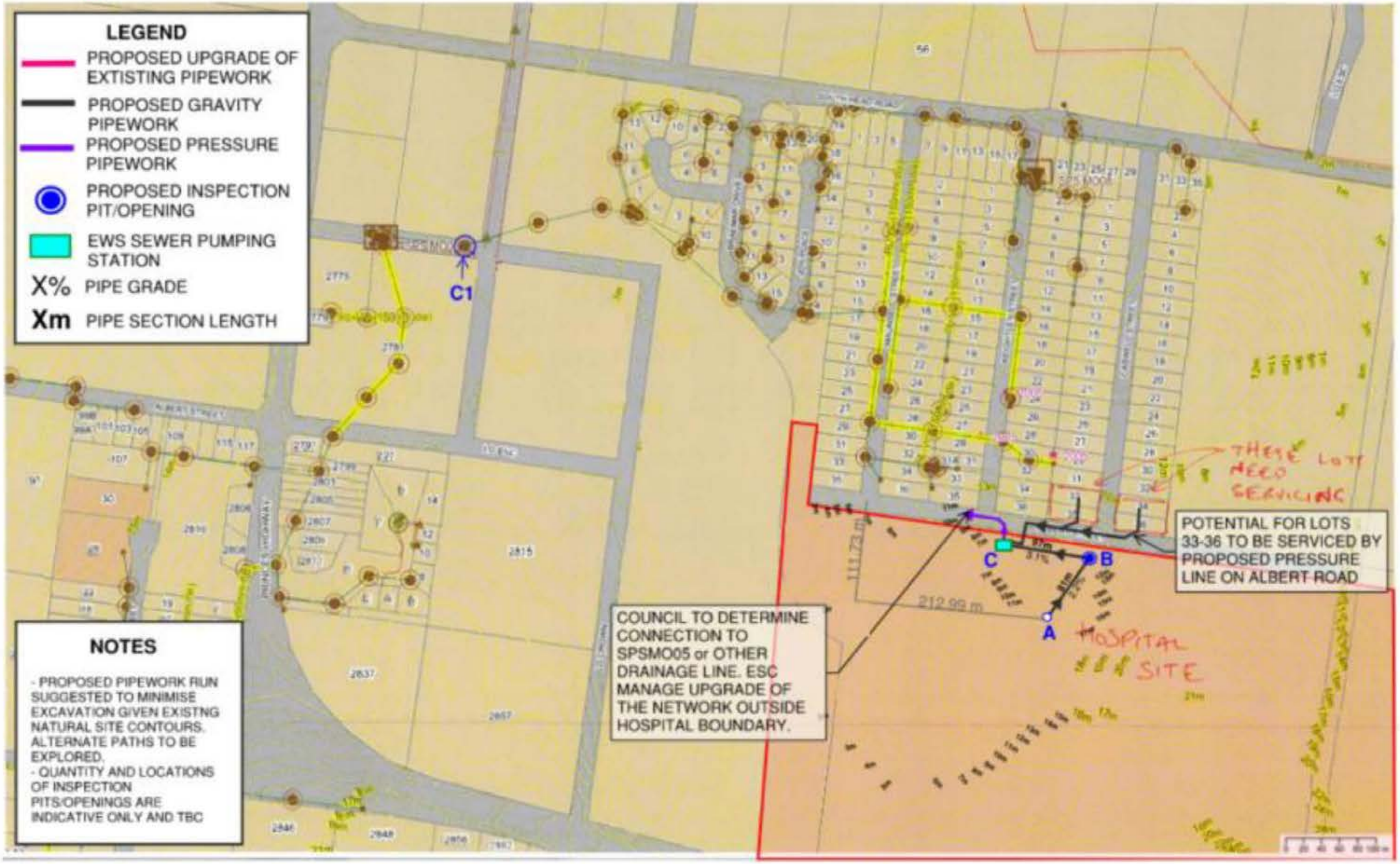
Lo Esc

- Sewage pumping station SPSMO05



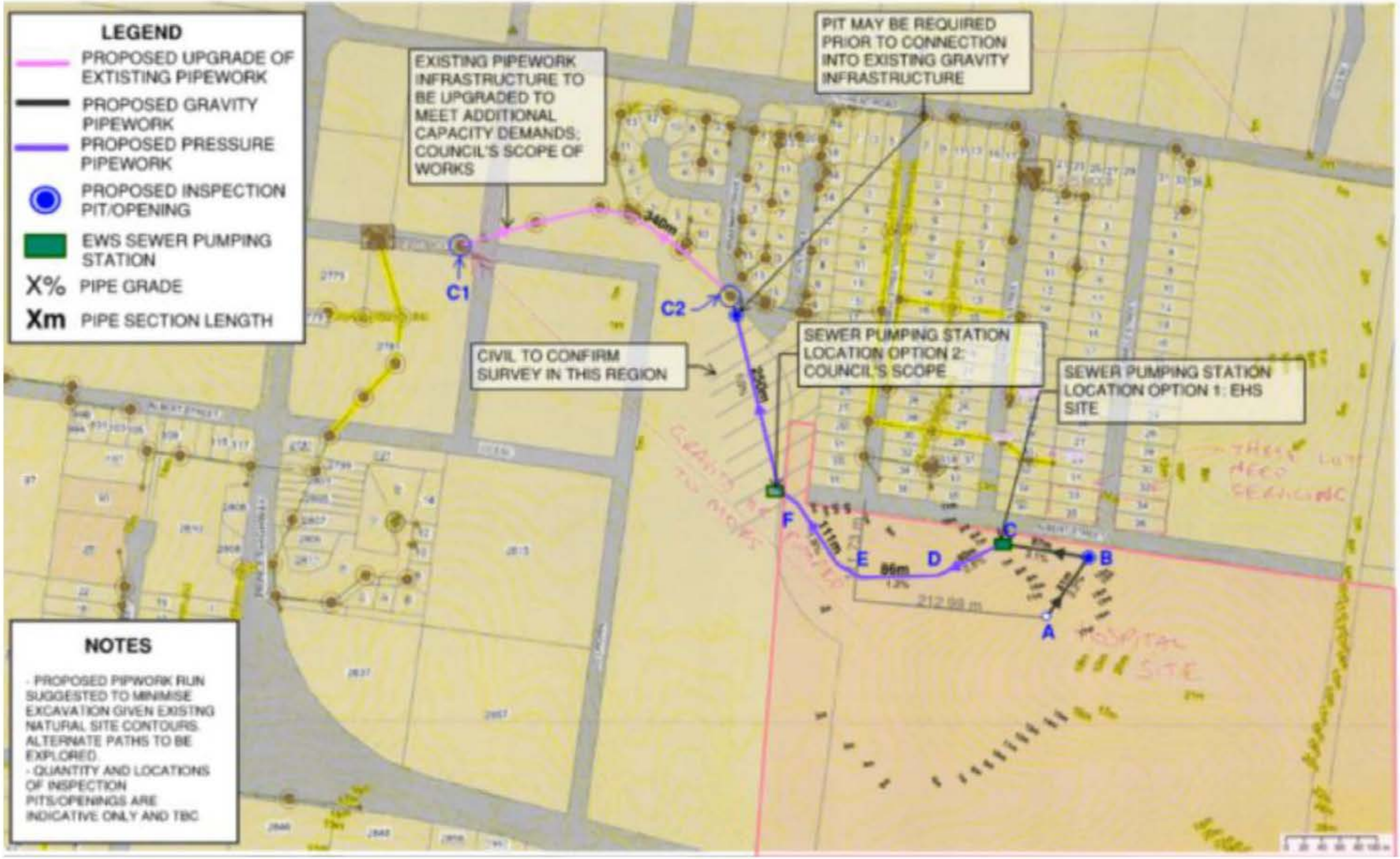
EHS

Proposed Sewer Connection: Preferred Option



EHS

Proposed Sewer Connection: Preferred Option



Sewer Pump Station Details

Proposed Strategy

EHS

Sewer Pump Station Design: Proposed Strategy

- Proposed infrastructure solution:
  - Design and construction of EHS sewer pump station by Project Team to Council's standards/specification.
  - Management and operation of Hospital sewer pump station by Council.

Other Business

Next Steps

EHS

Next Steps

- Council consideration of opportunities.
- Next meeting to be scheduled.

Applied Thinking

11.9 Traffic and Carparking CD Report

MOH.9999.1108.0423

Eurobodalla Health Services

Concept Report

Health Infrastructure NSW

26 July 2021

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Document Issue History

Report File Name	Prepared	Reviewed	Issued	Date	Issued to
P5059.001R Eurobodalla Health Services Traffic Concept Review Report	[redacted]			21/06/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.001R Eurobodalla Health Services Traffic Concept Review Report				23/06/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.003R Eurobodalla Health Services Traffic Concept Review Report				25/06/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.004R Eurobodalla Health Services Traffic Concept Review Report				28/06/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.005R Eurobodalla Health Services Traffic Concept Review Report				28/06/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.006R Eurobodalla Health Services Traffic Concept Review Report				8/07/2021	[redacted] – Conrad Garratt/ [redacted] – Root Partnerships, Via AConex
P5059.007R Eurobodalla Health Services Traffic Concept Review Report				26/07/2021	[redacted] – Conrad Garratt Via AConex

CONTENTS

Tables

Figures

1. INTRODUCTION

1.1 Background

The NSW government has committed to developing the Eurobodalla Health Service (EHS) which will deliver new contemporary medical, surgical, and allied health infrastructure. The development offers new clinical and non-clinical support services with a total of 137 overnight and day only beds. Upon completion, the EHS will replace the existing Moruya and Batemans Bay district hospitals. The 137-bed provision is based on planning prioritisation (P&P) which is the subject of the masterplan development application. The EHS will commence operations in January 2025. The Clinical Services Plan (CSP) specifies 167 beds will be required in the five (5) to 10-year design horizon and while not part of this application, this has been considered as part of the masterplan assessment.

The EHS is located on Lot 6/DP1212271 and is shown in Figure 1.1

SOURCE: Nearmap

Figure 1.1: Project Site

Additional supporting health services have been considered as part of master planning; however these will be subject to separate applications. Additional health services could include:

- Accommodation: 10-bedrooms with communal living areas
- NSW Ambulance: Medium size station as per the Rural Ambulance Station Facilities Design Guidelines
- Education: similar facility to Bega Clinical Training Facility (Approx. 270m^2)
- Private Provider: Zone to accommodate a day surgery service, 2 procedure rooms and support space.

1.2 Study Process

This report presents a traffic and transport assessment to guide the concept planning and options development phase of the project. This assessment details the operational transport and traffic impacts and mitigation measures recommended to be incorporated as part of the Concept Design. Key guidelines referenced for use during the assessment include:

- Guide to Traffic Generating Developments (Roads and Maritime Services)
- EIS Guidelines – Road and Related Facilities (DoPI)
- Cycling Aspects of Austroads Guides
- NSW Planning Guidelines for Walking and Cycling
- *Austroads Guide to Road Design (Part 3, 4 and 4a)*
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development
- Standards Australia AS2890.3 (Bicycle Parking Facilities).

Traffic and Parking surveys of the Batemans Bay and Moruya Hospitals are to be undertaken to inform traffic and parking generation rates to be used for the new health service. Previous traffic and parking data analysis undertaken for the Tweed Valley Hospital project, which is a new greenfield hospital recently approved and under construction in regional NSW, will also be used as a benchmark for estimating traffic and parking generation for the Moruya site.

1.3 Scope and Limitations

The scope of this study included the following:

- Reviewing the project site
- Collecting traffic survey data for the surrounding road network
- Reviewing the existing road network and traffic conditions and the future Moruya bypass
- Reviewing the crash history surrounding the subject site
- Assessing the public transport, pedestrian and cycling networks and connectivity surrounding the project site, including a summary of infrastructure proposed to support the project
- Assessing the proposed project's traffic generation and distribution onto the external network
- Assessing the proposed access location and requirements.

As the project is still in the concept phase, not all details have been confirmed by TfNSW and NSW Health. Limitations of the study include:

- Internal geometric layout was still being refined at the time of writing (e.g. internal road alignment, parking, turnaround area)
- Access arrangement design assumptions are preliminary (subject to future consultation with TfNSW)
- Staffing numbers and operational requirements for service vehicles are yet to be confirmed by the Local Health District (LHD)

2. Proposal and Road Environment

2.1 Proposed Development

The proposed EHS will consist of two main wards located at the centre of the subject site consisting of the following:

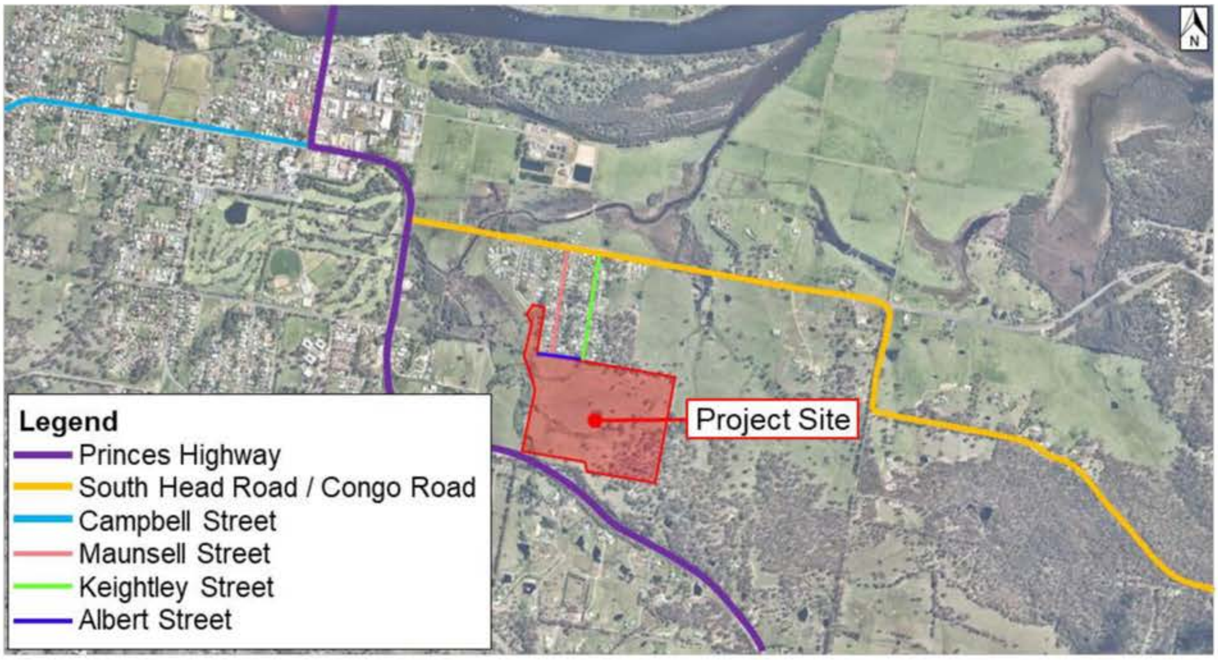
- 137 hospital beds
  - Additional 30 beds proposed as part of the CSP
- 10-bedrooms with communal living areas
- A day of surgery service with 2 theatres and a procedure room
- Emergency loading bay for up to 4 emergency vehicles
- Servicing bays able to cater up to Articulated vehicles (AVs)
- A refuelling bay
- An on-site bus stop.

The development may also provide future educational facilities, similar to Bega Clinical Training Facilities (approx. 270m²).

Figure 2.1: Development Layout

2.2 Existing Road Conditions

The surrounding road network is shown in Figure 2.2.



SOURCE: Nearmap

Figure 2.2: Surrounding Road Network

2.2.1 Princes Highway

The Princes Highway is a Transport for New South Wales (TfNSW) controlled highway connecting Sydney and Melbourne. In the vicinity of the project site, the Princes Highway is a two-lane undivided road with a posted speed limit of 100km/hr. To the west of the project site, the posted speed is reduced to 80km/hr and further to 50km/hr before entering Moruya. Figure 2.3 shows the typical cross section of the Princes Highway in proximity to the project site.

SOURCE: Google Maps

Figure 2.3: Typical Princes Highway Cross Section

2.2.2 Albert Street

Albert Street is a local road that runs along the northern boundary of the project site. It is a two-lane undivided road with a speed limit of 50km/h and runs parallel to the northern site frontage. The typical cross section of Albert Street is shown in Figure 2.4.

SOURCE: Google Maps

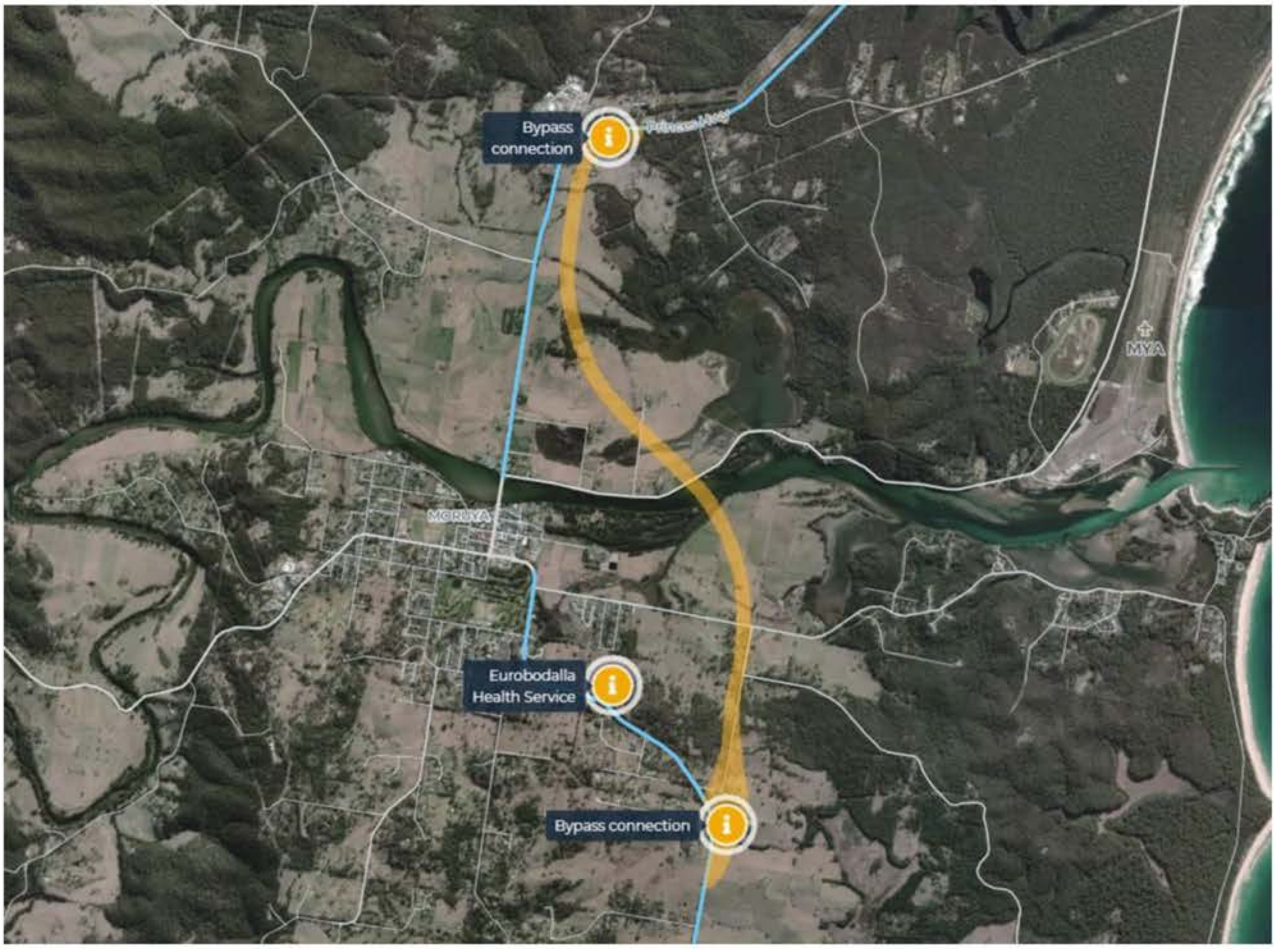
Figure 2.4: Typical Albert Street Cross Section

2.2.3 Maunsell Street / Keightley Street

Both Maunsell and Keightley Street are local roads that give access to Albert Street. Both streets are two lane, undivided with a 50km/h posted speed and are lined with residential properties. If a secondary access was proposed via Albert Street, it likely to result in an increase in traffic volumes through these local streets.

2.3 Future Planning and Transport Network Considerations

TfNSW has committed $1.5 billion to upgrade the Princes Highway between Jervis Bay Road at Falls Creek and the Victorian border. The Moruya bypass is a priority project as part of the Princes Highway upgrade program which is an 8km project that will divert Princes Highway to the east of Moruya before re-joining the existing highway as shown in Figure 2.5.



SOURCE: NSW Princes Highway Upgrade

Figure 2.5: Proposed Moruya Bypass Upgrade

The bypass is expected to drastically decrease the frontage road traffic volumes but increase the number of trips approaching from the east, when compared to the existing travel patterns past the site. The exact alignment and timing of the bypass project are yet to be confirmed and are subject to further investigation.

3. Concept Design Review

3.1 Overview

3.2 Access and Internal Circulation Assessment

The EHS main site access will be via Princes Highway (see Section 4.2 for further details), with a potential future secondary access via Albert Street. The secondary access is planned to be access control in business-as-usual conditions but also provide redundancy in the event access via Princes Highway is restricted.

The internal road network connects the access to key locations within the site including parking areas, pick-up / drop-off facilities, loading areas and emergency vehicle areas. Key considerations for the design development of internal roadways included:

- Specific design vehicles using the various roadway sections
- Location of parking, pick-up / set-down areas, loading areas etc.
- Maintaining compliance with Australian Standards (AS2890) for roadway widths, curvature, and gradients
- Traffic volumes
- Site topography

As part of the concept design review phase the following aspects were reviewed and subject to design advice.

3.2.1 Main Entrance Pick up/drop off area

A single pick up/drop-off facility has been proposed at the hospital main entrance to service patients and visitors. Capacity for three (3) public pick-up/drop-off bays (southern side) and three (3) emergency drop-off-bays (northern side is being incorporated into the design, see Figure 3.1.

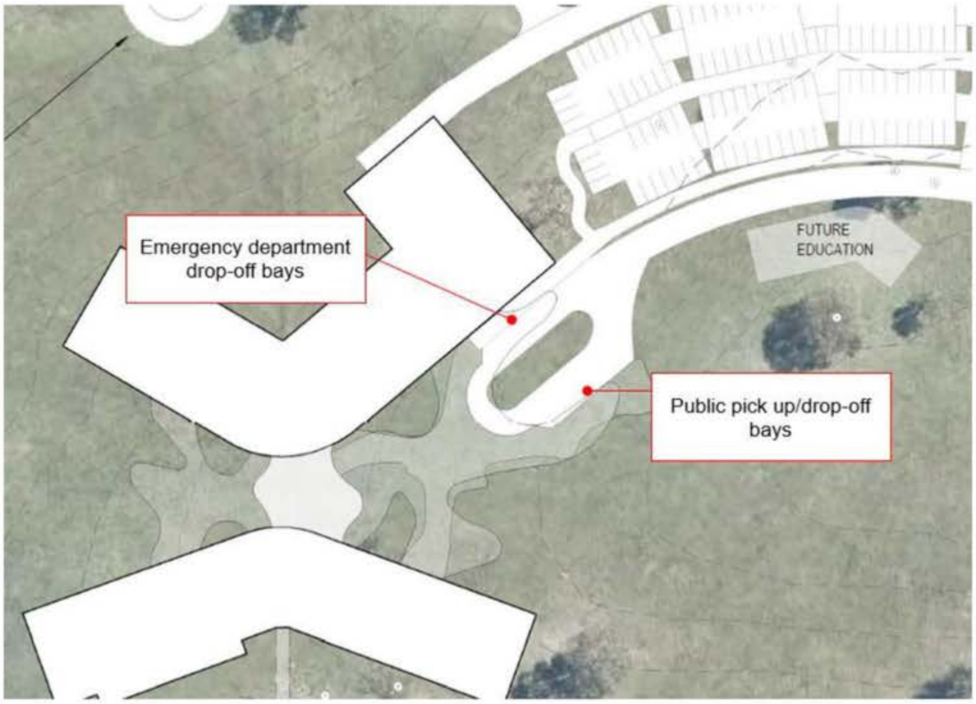


Figure 3.1: Main Entrance Pick-up/Drop-off area

Bitzios Consulting has conducted swept path analysis and design review of this area to accommodate for B99 car, small rigid vehicle, and buses. In its current form, the turnaround however does not cater for bus movements and requires alterations to the road alignment and pavement area.

Consideration of having a separate emergency department drop-off area had been suggested, based on previous project experience with other recent NSW Health facilities. It is understood the project is satisfied a single area should be suffice for this EHS facility.

This turnaround area is also understood as being planned for public and community transport services drop off and vehicle turnaround.

Figure 3.2 shows the required turnaround geometry required a bus or Heavy Rigid Vehicle (HRV). The proposed turnaround would require substantial modifications from the current design to cater for HRV and bus swept paths.

The design criteria for the EHS turnaround to cater for both a bus and HRV is as follows:

- Minimum inner turnaround radius of 10m
- Minimum outer turnaround radius of 14m

Figure 3.2: EHS Turnaround

The addition of an indented bus stop has also been considered; however the location and form are yet to be confirmed. Based on liaison with the project architects (Conrad Garrett) The preferred location is on the southern side of the internal access road and buses utilising the main entrance turnaround area.

An alternate option for accommodating buses would be to have these vehicles circulate around the northern access road, past the parking area and have an indented bus bay/stop on the egress side of the internal road, see Figure 3.3

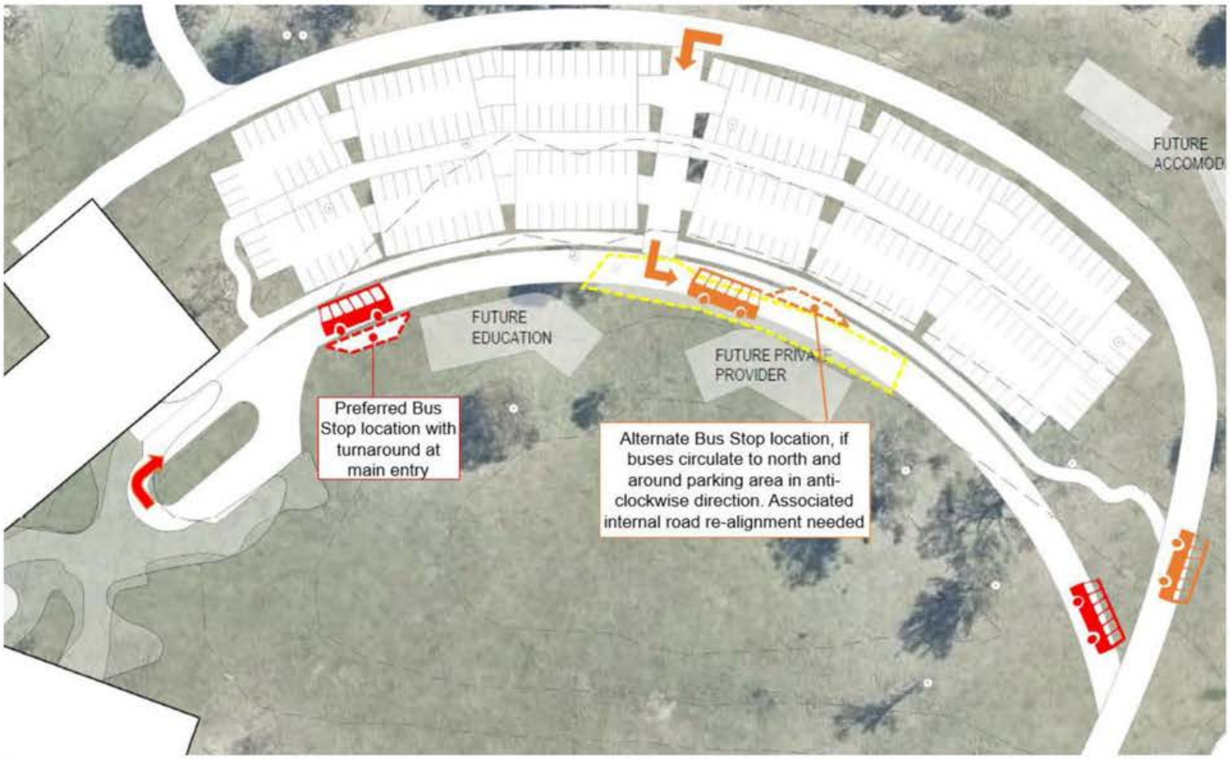


Figure 3.3: Alternate Bus Circulation and Stop Location

The stop for the alternate location would be located further away from the building entry. This would require longer walking distances between the stop and the building entrance; however the stop could be incorporated into potential kerbside parking as well as the proposed major walkway facility located along the northern side of the access road. This option would and limit the need for additional pathway connections on the southern side of the circulation roadway and internal road crossing facilities in the immediate term until such time that future Education or Private Provider facilities are constructed.

Resolution of the bus arrangements and layout will be subject to the schematic design process and through consultation with the LHD and TfNSW.

3.2.2 Service Road

A rear service road allows for separation of service vehicles, and emergency vehicles from the main access areas and facilitates access to various locations across the site (LPG and gas storage, ambulance servicing area, servicing area). It will also need to allow for full circulation of the site by fire appliances.

The design of the rear service road will need to be undertaken in accordance with AS2890.2, with a minimum two-way width of 6.5m catering for AVs on straights and curves with an inside radius of more than 800m. Widening through sections where the curve radius is 800m or less is required.

The location of LPG and oxygen storage is yet to be confirmed but swept paths were prepared assuming this area may be on the far eastern side of the site, to provide appropriate safety clearances from the building and for this type of service vehicle to exit the area in a forward gear in the event of an emergency.

Initial swept path analysis for these larger service vehicles were conducted and provided to the project architects to inform further design refinement.

Internal road and ramp grades as well as 'changes of grade' for the service road will need to comply with AS2890.2, including an absolute maximum permitted grade of 15.4% and a maximum rate of change of 6.25% in 10m of travel.

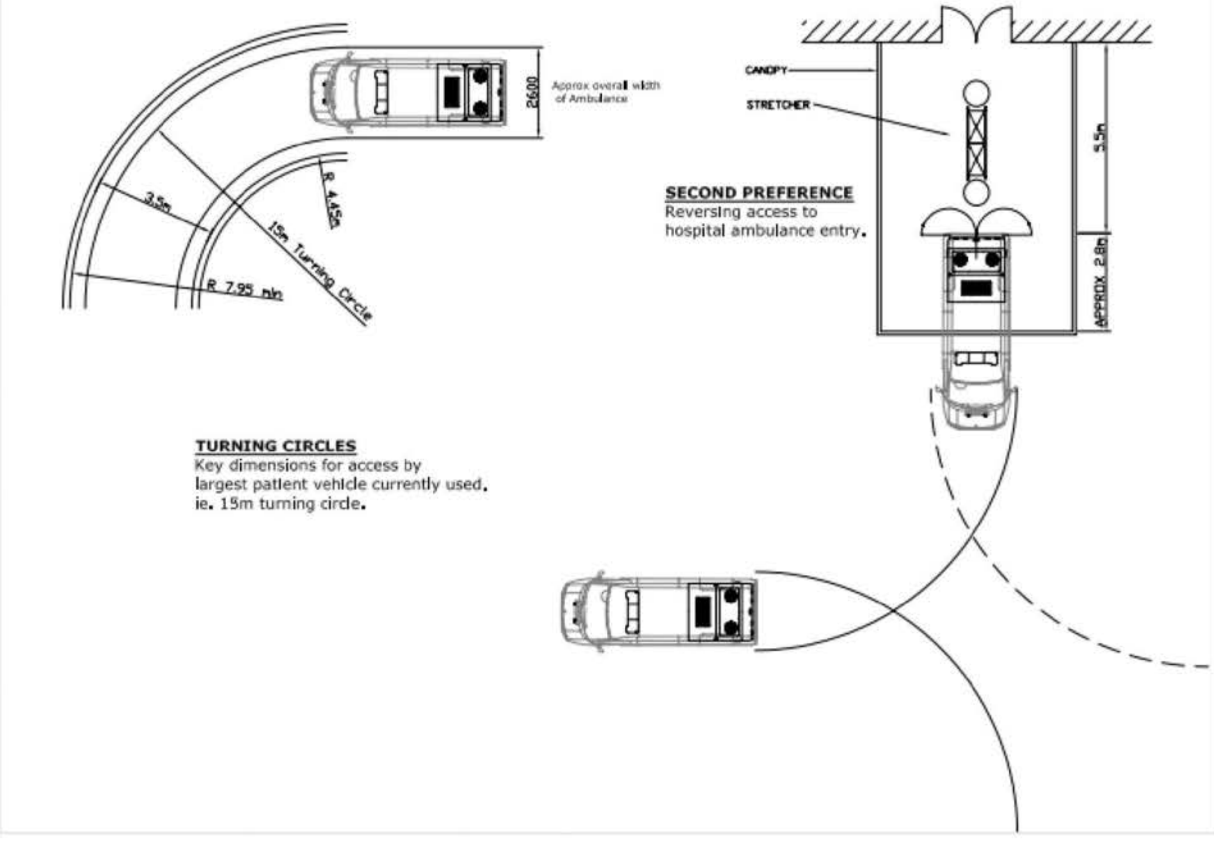
3.2.3 Ambulance/Emergency Vehicle Dock

Ambulance and other emergency vehicles will access the hospital via the rear of the site. The emergency vehicle dock is located above the servicing vehicle dock and is expected to cater for up to three (3) ambulances, with ability to accommodate for demands for other emergency vehicles (i.e. police, paramedics).

Swept paths of an ambulance (a 6.4m Small Rigid Vehicle, SRV) have been prepared and demonstrated vehicle movements for the emergency / service vehicle access roads as well as ingress and egress movements for the emergency vehicle dock. The proposed design of the emergency vehicle dock was found to be functional and provide suitable capacity for expected demands.

It is noted some refinement will be needed for the access road connection to this area and its intersection point/ alignment with access to the loading dock area (see section 3.2.3).

The *ASNSW Ambulance Access Guideline* specifies requirements for providing covered areas and dimensional requirements for stretcher areas and parking. The "Second Preference" (reverse access) was adopted due to the number of ambulance bays proposed and manoeuvring / spatial efficiencies. Figure 3.4 shows the second preference ambulance manoeuvres and clearances.



SOURCE: Ambulance NSW

Figure 3.4: Vehicle Access Specification for Ambulances NSW

Figure 3.5 illustrates vehicle manoeuvring and the minimum dimensions to cater for three ambulances.

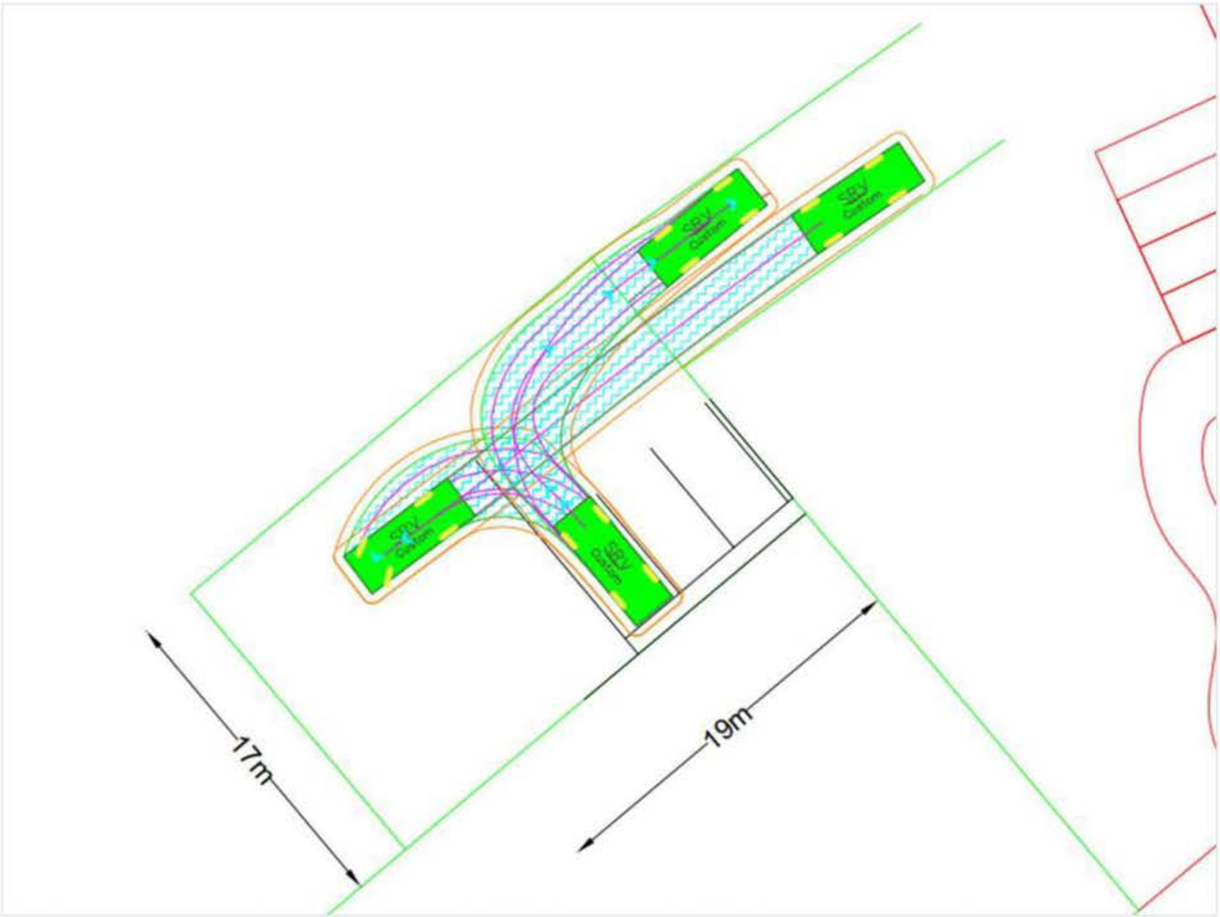


Figure 3.5: EHS Emergency Vehicle Dock

3.2.4 Loading Dock and Large Service Vehicle Manoeuvring

Similar to the emergency vehicles, service vehicles such as the Articulated Vehicle (AV) and Heavy Rigid Vehicle (HRV) will use the rear service road to access the loading dock, which is located below the emergency vehicle dock based on level changes. Minimum height clearance for a HRV and AV is 4.5m.

Additional height clearance will be required to cater for refuse collection vehicle operations. Subject to the refuse service provider and collection type, the following general servicing heights should be considered:

- Front-lift loading collection vehicle: 6.0m to 6.5m
- Rear loading collection vehicle: 3.6m
- Side Loading collection vehicle: 4.5m

It is understood that is it unlikely that more than two AVs and two HRVs will be on-site at any one time, and manoeuvring space has been designed to cater for this. Confirmation of loading area requirements in the next stage of design will need to be determined in consultation with HI and the LHD.

As part of further stages of design, a series of loading and service demand scenarios will need to be developed and tested. This is to ensure the size of the loading dock can sufficiently cater for the likely quantum of service vehicles that may need to be accommodated in this area at any one time (i.e. 1 x HRV, 3 x MRV, 2 x SRV; 1 x AV, 4 x MRV).

Swept paths of an AV manoeuvring in and out of loading bays with adjacent bays occupied have been used to identify the required hardstand and loading dock dimensions to cater for the 'worst-case' scenario.

the current concept design is considered undersized to accommodate for the expected largest design vehicles (HRV and AV). The layout and hardstand area for this loading dock are still to be refined in consultation with the project team.

Figure 3.6 shows the critical swept paths that determine the overall minimum servicing dock requirements. Current layouts will require some minor extension to hardstand areas and adjustment to the circulation roadway.

The design of the service dock area is still under development, along with internal road configurations. Further swept path analysis will be performed and design further refined with Conrad Garrett Architects and the project team.

Figure 3.6: EHS Servicing Dock

3.2.5 Parking Area Layout

The parking area's layout and design was still being refined through concept design stage, as such a full detailed review had not yet been conducted. Based on a review of the current concept plans, the following is noted:

- The geometric design of the car parking elements appear generally is in accordance with AS290.1, specifically:
  - Car parking bays – 2.6m wide by 5.4m in accordance with the requirements for User 3
  - Car Parking aisles – minimum 5.8m wide.
- Parking modules are being designed to be inter-connected (where possible) to reduce the number of intersections and entry/exit points of the internal circulation road.

As part of further parking layout and design development, designated person with disability (PWD) parking should be provided. 90-degree PWD parking should be located at the western of the parking area, with ease of access to the pedestrian footpath connection. Parallel PWD drop-off facilities are expected to be provided for visitor at the Main Entrance pick-up / drop-off. PWD parking is to be provided in accordance with AS2890.6:

- 2.4m by 5.4m plus an adjacent shared space of the same dimensions (for 90-degree parking)
- 7.8m by 3.2m plus a 7.8m by 1.6m by 7.8m shared space at the same level as parking (for parallel parking).

3.3 Traffic Generation and Access Arrangement

Traffic generation for the EHS has been based on TfNSW (previously Roads and Maritime Services) *Guide to Traffic Generating Developments* (2002), the *Technical Direction* (2013) and first principles assessment based on likely staff and student numbers benchmarked against recent hospital developments in regional NSW.

Access arrangement and forms have been chosen based on the existing road alignment, operations and anticipated daily volumes for the hospital. During consultation with TfNSW, it was generally agreed that the primary access intersection would consist of a roundabout configuration.

Section 4 further details the traffic generation and access arrangements.

3.4 Parking Requirements

The previous masterplan Traffic and Transport Study benchmarked parking demand based on rates that were determined based on a recent car park demand study for the recently approved Tweed Valley Hospital (TVH) located on the north coast of NSW with a parking rate of 3.1 car parking spaces per bed.

Based on concept plans and previous cost planning discussions it is understood hardstand parking areas could fall short of potential peak parking demands. Current concept plans indicate in the order of 367 hardstand parking spaces with further areas for future parking.

An assessment of parking demands at the existing Batemans Bay and Moruya Hospital sites has been conducted to apply sensitivity testing on these previous parking demand assumptions.

Section 5 further details parking demand and supply considerations.

4. TRAFFIC ASSESSMENT AND ACCESS ARRANGEMENTS

4.1 Preliminary Masterplan Traffic Generation

The Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments* was used to calculate the project's peak hour traffic generation. The RMS guide specifies three peak period traffic generation rates for hospitals as follows:

- Vehicle trip generation in the morning commuter peak hour (MVT) – This provides an indication of development traffic generation during the typical morning hear hour which typically occurs around 8:00am-9:00am
- Vehicle trip generation in the evening commuter peak hour (EVT) – This provides an indication of development traffic generation during the typical evening peak hour which typically occurs around 5:00pm-6:00pm
- Peak vehicle trips (PVT) – This provides an indication of peak development traffic generation, While the time was found to vary, the most common time for the PVT to occur was 3:00pm-4:00pm. The PVT incorporates a staff shift change.

While not part of the EHS application, a number of supporting health services are proposed on the subject site. These will be subject to separate approvals. Despite this, the supporting health services have been considered in the 2035 traffic analysis to ensure sufficient capacity exists within the site access intersection, internal roads and that suitable space is allowed for to allow provision of off-street parking to support the ultimate site yield.

Supporting health services include:

- Accommodation (up to 10 bedrooms)
- Ambulance station. Ambulance trips are accounted for in hospital trip rate, the ambulance station will however result in additional staff trips)
- Educational classes (two 8-student tutorials)
- Private provider (2 x day surgery rooms).

The MVT, EVT and PVT traffic volumes for the EHS are presented in Table 4.1 with the daily traffic generation traffic volumes for the project are presented in Table 4.2.

Table 4.1: EHS Traffic Generation (Peak Hour)

Year	Yield	Peak	Peak Hour Trip Rate	Peak Hour Trips
2023	137 beds 358 staff	MVT	-10.21+0.47B+0.06ASDS	76
		EVT	-2.84+0.25B+0.40ASDS	175
		PVT	-14.69+0.69B+0.31ASDS	191
2023	167 beds 436 staff	MVT	-10.21+0.47B+0.06ASDS	95
		EVT	-2.84+0.25B+0.40ASDS	214
		PVT	-14.69+0.69B+0.31ASDS	236

**B = hospital beds*
***ASDS = average number of staff per weekday day shift*

Table 4.2: EHS Traffic Generation (Daily)

Year	Yield	Daily Trip Rate	Daily Trips
2025	137 beds	11.81 trips/bed/day	1618
2035	167 beds	11.81 trips/bed/day	1973

The daily traffic generation aligns with typical profiles where peak hour traffic is approximately 10% of daily volumes.

Peak period traffic generation was calculated by combining the peak period trips for the EHS with traffic generated by the future supporting health services. Traffic generation for the supporting health services was calculated as follows:

- Accommodation: the RMS Guide to Traffic Generating Developments Technical Direction 2013 rate for high density residential flat buildings was adopted
- Ambulance station: a first principles assessment of traffic generation was used on the based on the number of staff spaces and the conservative assumption of a complete staff change during the peak hour. The Rural Ambulance Station Facilities Design Guidelines specifies six staff car parking spaces for a medium size station
- Educational facility: a first principles assessment of traffic generation on the basis of one trip per student in each peak hour
- Private provider: a first principles assessment of traffic generation on the on the basis of the number of staff and patient trips per operating room per hour.

The ancillary peak traffic generation is detailed in Table 4.3 with the total peak period trip generation detailed in Table 4.4.

Table 4.3: EHS Supporting Services Traffic Generation

Component	Quantity	AM Rate	PM Rate	AM Peak Hour Trips	PM Peak Hour Trips
Accommodation	10	0.53	0.32	6	4
Ambulance NSW (Staff)	6	2	2	12	12
Education	16	1	1	16	16
Private Provider	2	8	8	16	16
				50	**48**

Table 4.4: Total Peak Period Traffic Generation

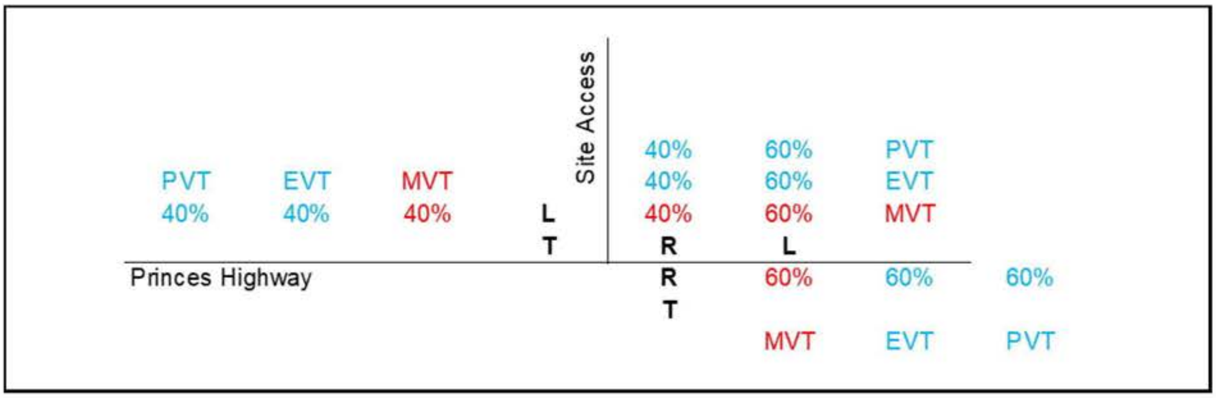
Peak Hour	EHS Trips	Ancillary Trips	Total Trips
MVT (AM)	76	50	126
EVT (PM)	175	48	223
PVT (PM)	191	48	239

Both the development's EVT and PVT generation were assessed against the same period (i.e. commuter peak). This allowed for a conservative assessment and allowed for a sensitivity comparison by assessing different traffic splits.

4.1.1 Development Traffic Distribution and Assignment

Traffic distribution assumptions on the surrounding network was based on distributions from the Moruya Bypass Model (with the EHS on the Project Site) and using a first principle's assessment which considered population centres and densities across Eurobodalla.

Figure 4.1 shows the development traffic distributions. Figure 4.2 shows the design traffic volumes.



SOURCE: Moruya Aimsun Model

Figure 4.1: Development Distributions

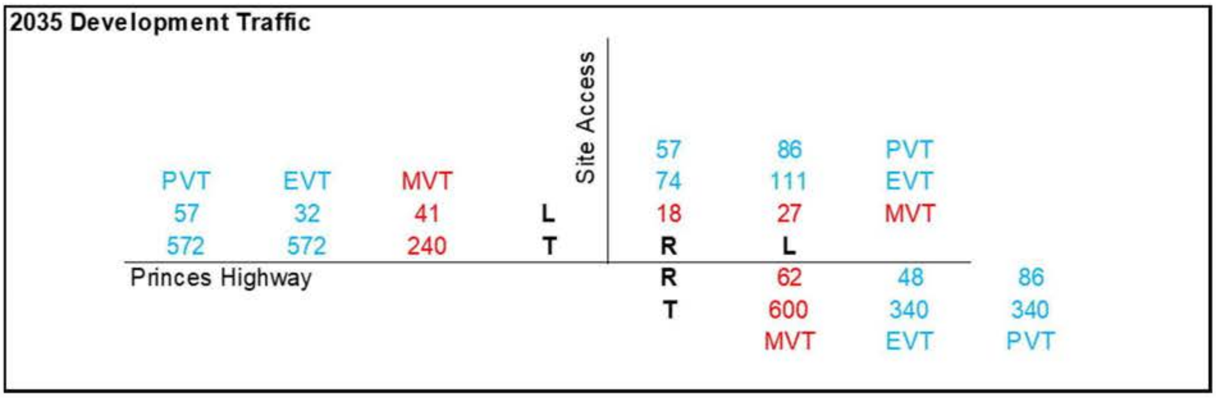


Figure 4.2: Design Traffic

The traffic analysis approach and these distributions assumptions will be subject to further discussion with TfNSW and the Moruya Bypass project team.

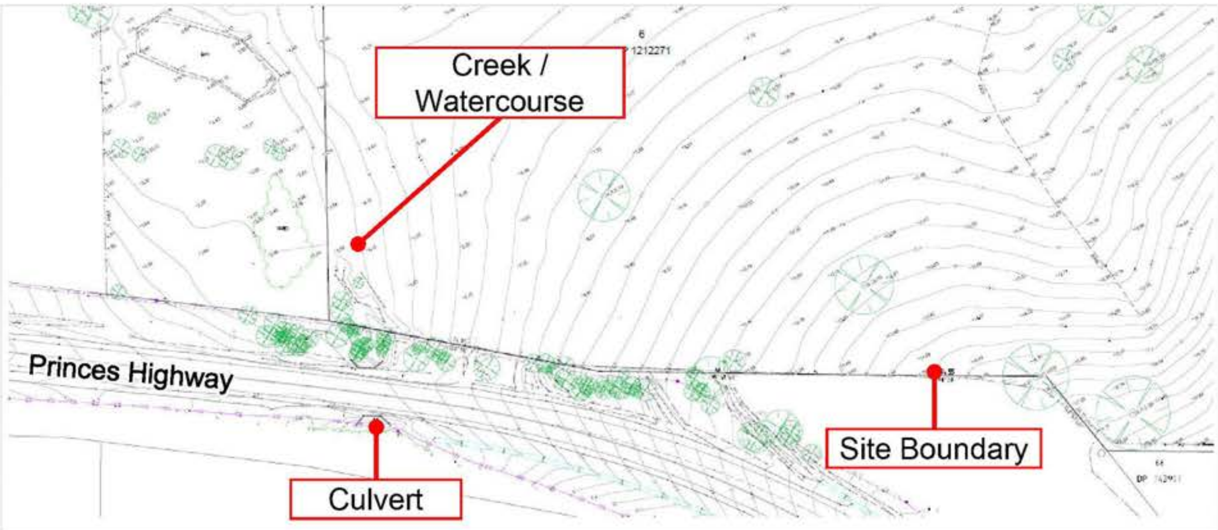
4.2 Access Arrangement

4.2.1 Site Constraints

The subject site frontages have significant constraints in the context of providing site access. This includes:

- The road geometry:
  - To the north the roads are local residential streets and are not suitable to provide the primary point of access to a hospital. Primary access will be required from the Princes Highway. Secondary access has been proposed via Albert Street adjacent to Keightley Street intersection. This is considered appropriate, given the minimal use of the access and the existing turn pockets into Keightley Street from South Head Road.
  - To the south, the Princes Highway has both horizontal and vertical curves which impact sightlines and potential access forms
- The speed environment:
  - The Princes Highway has a 100km/h posted speed at the site frontage. This is an important factor in the access design and form.
  - Changing the speed requires a change to the road environment from preliminary discussions with TfNSW they are open to reducing the speed limit for the Highway (80km/h with possibility of a 60km/h roundabout intersection). This matter however will be subject to further discussions as part of a Transport Working Group for the project.
- The available site frontage:
  - The existing creek which is located on the western side of the subject site. This runs under Princes Highway via a culvert
  - Limited site frontage west of the culvert and an access here would require an additional bridge structure within the site
- Grades within the site
- Flooding with the western side of the site being affected by the probable maximum flood (PMF) level.

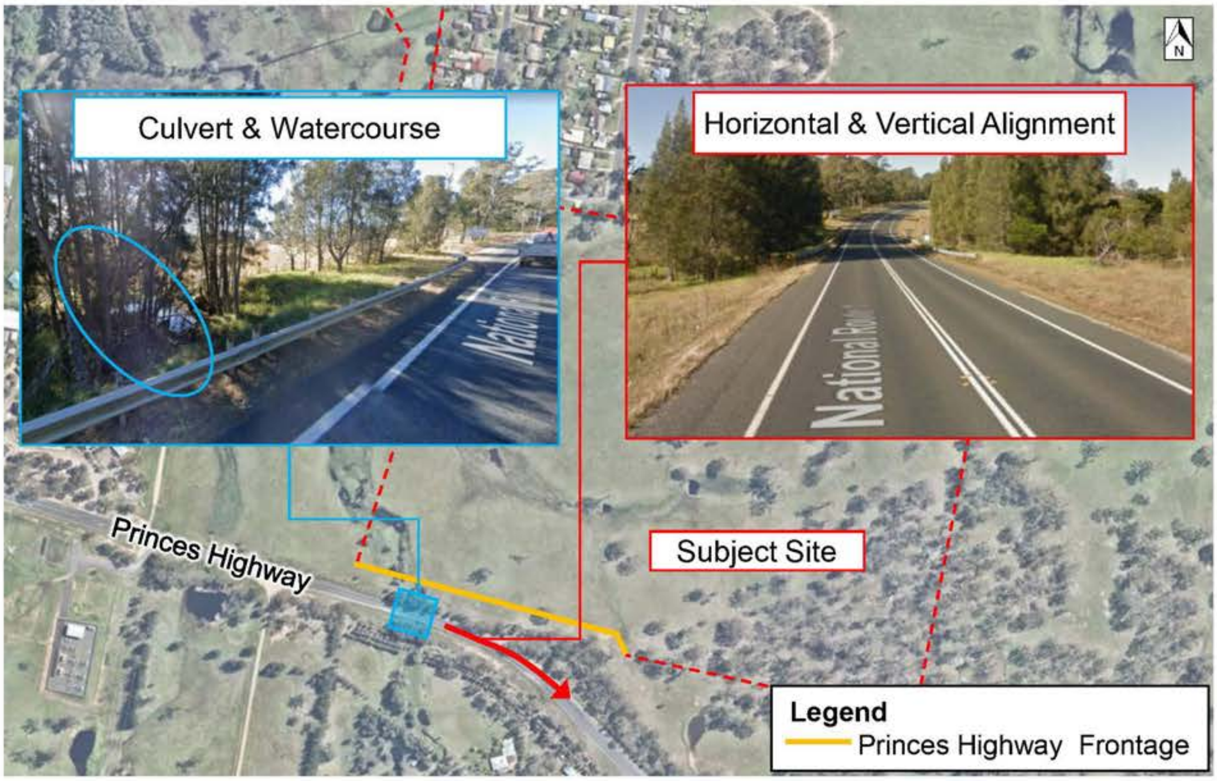
The excerpt of the site survey is shown in Figure 4.3. This shows the boundary, culvert, and creek.



Source: LTS survey (edited by Bitzios)

Figure 4.3: Site Survey

Figure 4.4 shows the southern site frontage on Princes Highway and shows a key road alignment and sight line constraints.



SOURCE: NearMap

Figure 4.4: Princes Highway Access Review

Primary access to the south is proposed to be through a new intersection with the Princes Highway through a roundabout as shown in Figure 4.5 and Figure 4.6. The specific design and location of this will be subject to civil design and consultation with TfNSW.

Figure 4.5: Proposed Roundabout access Configuration

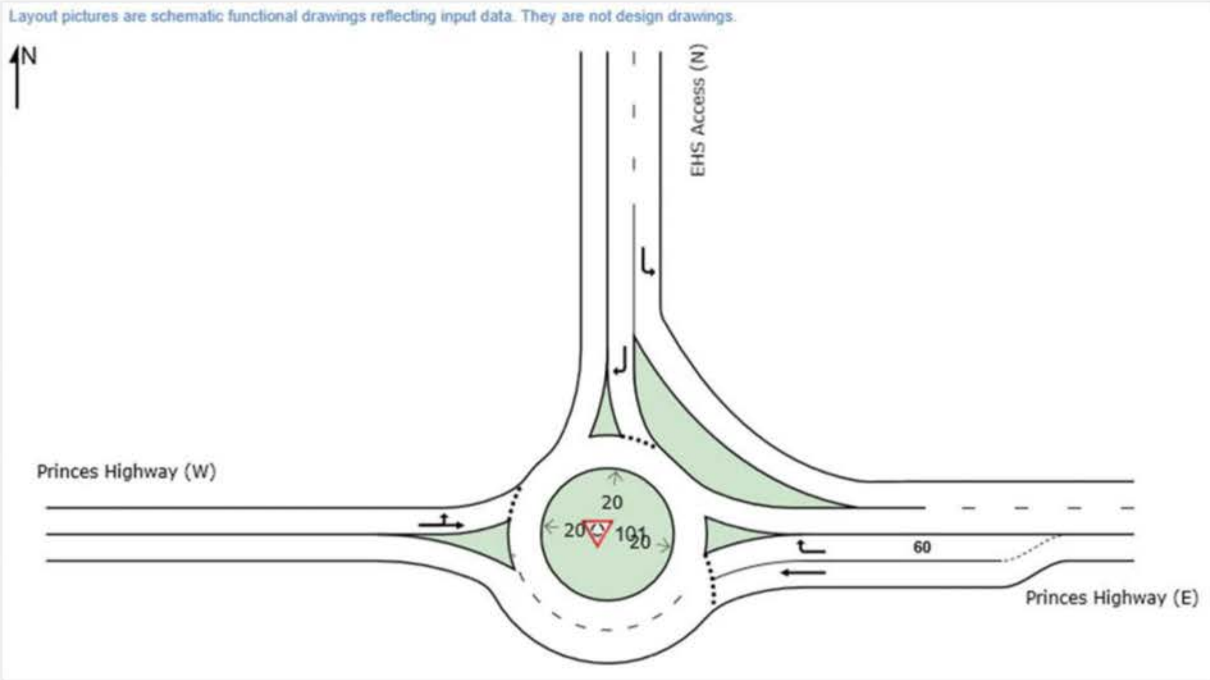


Figure 4.6: Princes Highway / EHS Access SIDRA Layout

Consultation with TfNSW and Council is required to further determine the suitability of this design as an access intersection. If the roundabout is to be designed for 80km/h the inter radius of the roundabout is required to be 20m. This could be reduced down to a 14m radius is a 60kmh speed environment is supported.

The suitability of this access also requires further investigation from a civil engineering perspective given the various constraints at the access location, particularly regarding vertical and horizontal alignment of the Princes Highway.

The secondary access to the north of the project site via Albert Street is proposed to be as a driveway crossover and managed with a boom gate to restrict use.

5. Parking Assessment

5.1 Preliminary Masterplan Parking Requirements

The preliminary masterplan Traffic and Transport Study benchmarked parking demand based on rates that were determined based on a recent car park demand study for the recently approved Tweed Valley Hospital (TVH). Based on this study a parking demand rate of 3.1 car parking spaces per bed was determined. A detailed project-specific car parking demand study was undertaken by PTC for TVH project. Their demand study considered the existing Tweed Hospital as well as projected staff numbers, bed numbers and service events.

The TVH had been used to provide a realistic car parking supply comparison based on expected demand. Based on the equivalent parking rate provided for TVH, it was expected that the parking demands for the EHS are in the order of **425 car parking spaces** for the 137 beds proposed as part of the P&P. This increases to **518 car parking spaces** for the 167 beds proposal.

In addition to allowing for expansion associated with the CSP yield, it was recommended that the masterplan allows for additional car parking to be provided in the future to cater for demands associated with the supporting health services. With this proposed used anticipated demand was found to be in the order of up to 560 car parking spaces.

5.2 Benchmarking of Parking for Other Regional Facilities

For comparison and benchmarking purposes a quick desktop assessment of parking provision ratios has been conducted of a selection of other regional NSW Health facilities.

Griffith Base Hospital is a similar size to EHS as a 119-bed facility. This site however is noted to be closer to its nearest town centre and has access to extensive on-street parking opportunities to manage any peak parking overflow (while EHS has limited overflow on-street parking opportunities). Based on aerial imagery the Griffith site is estimated to have 174 formalised car parking spaces, and a further 65 informal spaces in a gravel parking area. In addition to on-site parking there an estimated 162 on-street parking spaces along the site frontages and in directly adjacent streets. Based in this the facility has on-site parking provisions of **2 car parking spaces per bed** and in the order of **>3.36 parking spaces per bed** available when accounting for immediate on-street parking.

Macksville District Hospital is recently constructed but smaller facility currently with 42 inpatient beds and up to 76 beds (when accounting for potential full other wards and associated sites). The Macksville site, however, has similar road network constraints being adjacent the Princes Highway and with limited overflow parking opportunities. This site has an estimated 150 formalised car parking spaces based on site aerials and the facilities Traffic Assessment report. This would equate to **3.5 car parking spaces per bed** based on 42 beds and **1.97 spaces per bed** based on 76 beds. Based on some media, it appears this site however may already have some parking challenges.

Byron Central Hospital is a regional 54-bed facility that also has little to no opportunities for on-street and overflow parking. Based on aerial imagery this site has in the order of 254 car park spaces which would equate to **4.7 car parking spaces per bed.**

Port Macquarie Base Hospital is a 228-bed facility with an estimated 450 formalised car parking spaces (based on aerial imagery). This would equate to **1.97 car park spaces per bed**; however it would appear this parking supply is at capacity with some overflow parking observed from historical aerial imagery (on-street and within informal/unformed area on-site).

Based on this desktop assessment on average parking at regional NSW Health facilities appears to be provided at a ratio of **2.66 to 3 car parking spaces per bed.**

5.3 Parking Requirements Based on Demand Surveys

As part of the EHS project recent parking and traffic surveys were conducted in April 2021 for the existing Batemans Bay and Moruya Hospital sites.

Table 5.1 shows the average and peak parking demands based on the surveys.

Table 5.1: Findings of Existing Health Campus Parking Surveys

Health Precinct	Precinct Parking Capacity*	Off-street parking		On-street parking		Peak Parking Demand
		Average Parking Demand	Peak Parking Demand	Average Parking Demand	Peak Parking Demand	
Batemans Bay	169	58	68	51	58	126
Moruya	299	87	113	100	134	247
						373

* *Precinct parking capacity include both site parking and on-street parking in proximity to each hospital*

It is understood these existing health precincts have in the order of a combined 111 beds, but current staff numbers are not confirmed. Based on the findings of this parking demand surveys, this would equate to:

- Average parking demand rate of 2.67 car parking spaces per bed
- Peak parking demand rate of 3.36 car parking spaces per bed.

It is noted the Batemans Bay Hospital does have some other surrounding land uses which may contribute to this on-street parking demand found during the parking surveys. The percentage contribution this would have to parking demand and therefore a parking demand rate would however be considered negligible.

Table 5.2 summarises potential parking demand scenarios for the EHS site.

Table 5.2 Parking Demand Scenarios Comparison

Land Use	Masterplan Stage Estimated Parking Demand	Estimated Average Parking Demand	Potential Peak Parking Demand
Hospital, 137 beds	425	366	460
Hospital, 167 beds	518	446	560
Hospital, 167 plus full supporting services	560	488	602

An important consideration when planning for the car parking provision is to achieve a balance between parking demand and providing an oversupply. A key risk however with the EHS site with is there are limited opportunities to accommodate for overflow parking demand (see section 5.4).

At EHS the key demand time will be around afternoon staff shift change when there will be overlap being departure/handover from day-shift staff and the arrival/briefing of night-shift staff. As part of future stages of the project there will be the need to determine whether specific parking areas need to be allocated, with internal separators/access restrictions to ensure safe and convenient parking is available for night-shift staff.

As a minimum the site should seek to provide formalised parking spaces to meet estimated average parking demand. Peak parking demand risks and impacts should in-turn be managed through a combination of informal (gravel) parking areas, and other management strategies (i.e. night shift and car-pooling allocated parking).

5.4 Concept Layout and Overflow Parking Implications

As noted in Section 3.4, formalised parking hard stand area may only incorporate up to 367 spaces.

If a 367-car parking space hardstand area is achieved based on parking demand scenarios there could be overflow parking demands in the order of 59 to 94 vehicles. Overflow parking would therefore likely occur across the following locations, each which have their own challenges and risks:

- At the side of the internal circulation road
- On open and gravel/grassed areas within the site that are relatively flat
- Nearby on-street parking in residential streets to the north.

With widening of the pavement width of the circulation road, or a semi sealed shoulder, there could be opportunity to provide parallel parking opportunities. It is noted some of these areas have been added to the concept design.

As part of the schematic design stage of the project the formalised and overflow parking arrangements can be further refined.

There is also the possibility that overflow parking may result in cluttering of nearby residential streets such as Keightley Street and Maunsell Street to the north, and the adjacent NSW TAFE campus to the west.

11.10 Heritage Report

COMBER CONSULTANTS

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

Eurobodalla Health Service Redevelopment

Aboriginal Archaeological Assessment

16 August **2021**

Report to: Root Partnership on behalf of Health Infrastructure NSW

LGA: Eurobodalla Shire

Version: C.2021

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DOCUMENT CONTROL

PROJECT NO: NH407 **STATUS:** DRAFT

REV	DATE	PREPARED	EDITED	APPROVED
A	09/07/2021	[redacted]	[redacted]	[redacted]
B	19/07/2021	[redacted]	[redacted]	[redacted]
C	16/08/2021	[redacted]	[redacted]	[redacted]

ACKNOWLEDGEMENTS

Comber Consultants would like to thank:

- [redacted] from the Cobowra Local Aboriginal Land Council for their assistance and generosity in sharing information about the site and the Moruya area.
- Also, [redacted], Project Manager, Root Partnership for her assistance in providing maps, explaining the project and general support.

INTEGRATED MANAGEMENT SYSTEM

Comber Consultants has a certified integrated management system to the requirements of ISO 9001 (quality), ISO 14001 (environmental) and ISO 45001 (health and safety). This is your assurance that Comber Consultants is committed to excellence, quality, and best practice and that we are regularly subjected to rigorous, independent assessments to ensure that we comply with stringent Management System Standards.

ECAAS ECAAS ECAAS
ISO 9001 ISO 45001 ISO 14001
CERTIFIED CERTIFIED CERTIFIED

EXECUTIVE SUMMARY

The NSW Government has announced a total of $200m towards the development of the new Eurobodalla Health Service. The project will provide a new hospital facility on a greenfield site that services Moruya, Batemans Bay, and surrounding towns. The Eurobodalla Health Service Redevelopment Project is being assessed as a State Significant Development (SSD) under part 5 of the *Environmental Planning and Assessment Act* 1979.

To ensure that the Aboriginal archaeological significance of the project area is not adversely impacted upon by this proposal, Comber Consultants were engaged to undertake this Aboriginal Archaeological Assessment in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DPIE 2010).

An AHIMS search undertaken on 17 May 2021 revealed six Aboriginal sites within the study area. Previous archaeological testing had been undertaken within the study area which revealed a high density of Aboriginal artefacts. In addition, an archaeological site inspection undertaken for this assessment identified three Aboriginal scarred trees in the south-eastern part of the study area.

The Aboriginal archaeological sites, as identified in the AHIMS search and archaeological inspection, are Aboriginal objects as defined under the *National Parks and Wildlife Act* 1979. Aboriginal objects are protected under the *National Parks and Wildlife Act* 1979, and it is an offence to harm such objects. This report therefore makes the following recommendations:

Recommendation 1: Consultation
Aboriginal consultation should be undertaken in accordance with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* 2010 and an Aboriginal cultural heritage assessment report (ACHAR) prepared for this proposal. This ACHAR will inform the EIS required for the SSDA and support an application for an AHIP for any early works to be assessed under Part 5 of the EPA Act.

Recommendation 2: Salvage
Archaeological salvage must be undertaken in consultation with the Cobowra Local Aboriginal Land Council and other Registered Aboriginal Parties. The archaeological salvage can be undertaken without an AHIP once the SSDA has been issued.

Recommendation 3: Early works
If project early works, such as installation of services, the driveway, a parking lot etc., which may be assessed under Part 5 or as a complying development under the EPA Act, are to be undertaken, an Aboriginal Heritage Impact Permit will be required. Aboriginal consultation must be undertaken first as detailed in recommendation 1 above and An AHIP application for harm, with salvage, submitted to Heritage NSW accompanied by the ACHAR and a Research Design outlining the salvage methodology.

Recommendation 4: Scarred Trees
The three scarred trees should avoided and protected from harm or damage through early works or development of the new hospital. They should be actively managed and protected to ensure their health and longevity.

Recommendation 5: Interpretation Strategy and Plan
An interpretation strategy and plan should be developed and implemented to showcase the Aboriginal history of Moruya and the site.

Recommendation 6: Report review
Once the final plans have been developed they should be reviewed and this report updated

CONTENTS

FIGURES

PHOTOGRAPHS

TABLES

1.0 INTRODUCTION

1.1. Background

Health Infrastructure NSW propose to build a new hospital at Moruya, Eurobodalla Shire, as part of the Eurobodalla Health Service Redevelopment Project.

The Eurobodalla Health Service Redevelopment Project as being assessed as a State Significant Development (SSD) under part 5 of the *Environmental Planning and Assessment Act 1979*. The purpose of this Assessment is to inform an Environmental Impact Statement (EIS) for the project.

In addition, early works may be undertaken, prior to the hospital construction, as Complying Development under the *Environmental Planning and Assessment Act 1979.* As Aboriginal objects will be harmed by the proposed early works, it will be necessary to apply for an Aboriginal Heritage Impact Permit (AHIP) to undertake the early works. This report will support such an application.

To ensure that the Aboriginal archaeological significance of the project area is not adversely impacted upon by this proposal and to meet planning requirements, Comber Consultants have been commissioned to undertake this Aboriginal Archaeological Assessment in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2010).

1.2. Location and description

The study area is located at Lot 6, Princes Highway, Moruya and is known as Lot 6 DP 1212271. It is within the Eurobodalla Shire, on the NSW South Coast, c. 260 km south of Sydney (Figure 1). The study area is a vacant allotment with a land area of c. 25 ha and is located east of the township of Moruya.

Figure 1: Location map

Figure 2: Study area edged in red (Google Satellite).

Photograph 1: Entrance to the study area, view to north

1.3. Proposal

The NSW Government has announced a total of $200m towards the development of the new Eurobodalla Health Service. The project will provide a new hospital facility on a greenfield site that services Moruya, Batemans Bay, and surrounding towns. The Eurobodalla Health Service will deliver new contemporary Medical, Surgical, Allied Health and Outpatient infrastructure along with new clinical and non-clinical support services. The project includes the decommissioning of the existing Moruya and Batemans Bay Hospitals when the new health service has become operational. As a pilot project for the NSW Government Architect's "Connecting with Country" framework, consultation has been undertaken with members of the Indigenous community both as part of identification of a preferred site as well as development of the Master Plan. This consultation is planned to continue through the life of the project to ensure the facility, its staff and visitors connect with, and respond to, Country.

The proposal is currently in the planning stages. It involves the full redevelopment of the study area which is currently a vacant lot. The proposal will impact the entire land area of the study area. The proposed works will involve extensive ground disturbance including, but not limited to:

- Land clearing
- Cut and fill
- Construction of buildings
- Construction of service infrastructure, including parking
- Construction of road access infrastructure

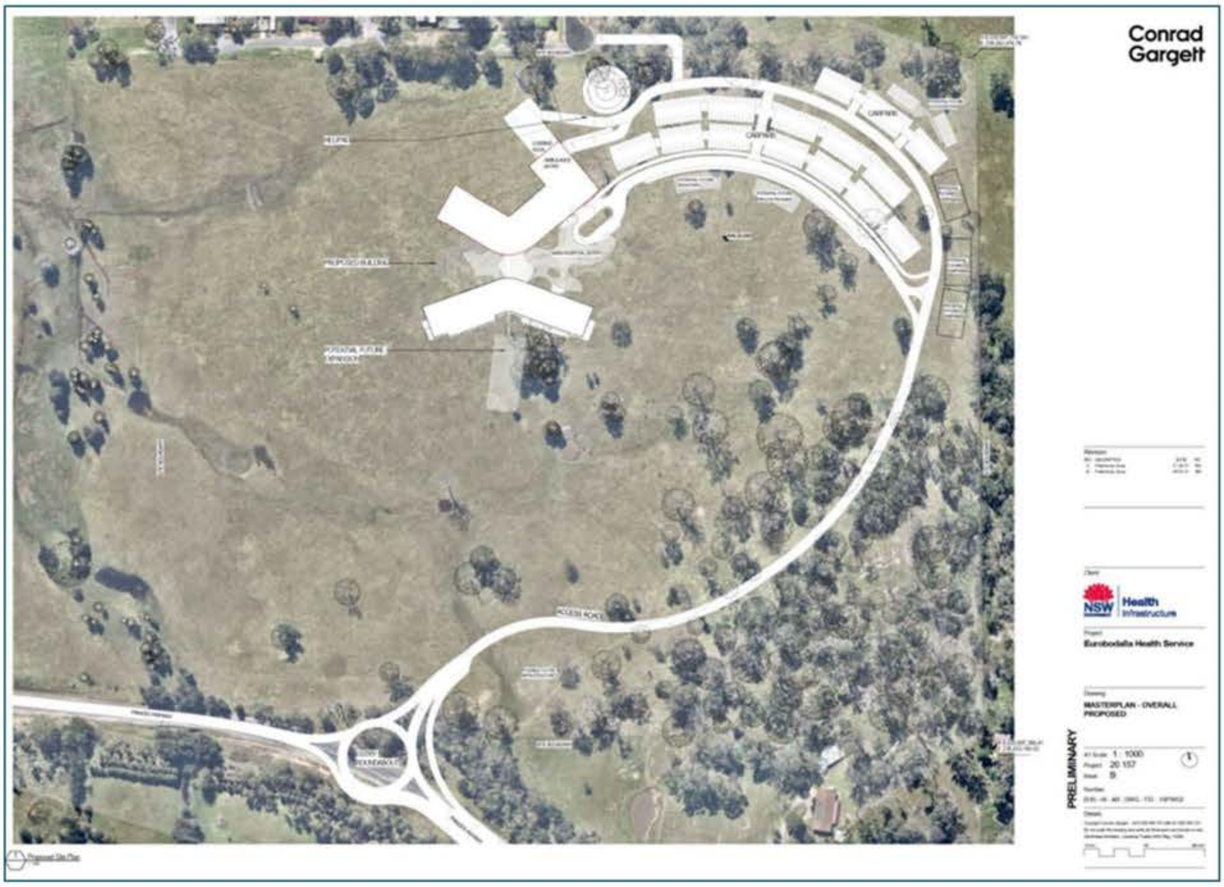

Figure 3: Project design masterplan (courtesy of Root Partnerships).

2.0 METHODOLOGY

This project was conducted in three stages, being background research, field survey and report preparation, as detailed below.

Stage 1: Background Research

Prior to the field component of this project, the Aboriginal Heritage Information Management System (AHIMS) of the Department of Planning Industry and Environment (Heritage NSW) was searched on 17/05/2021. A copy is attached at Appendix A. Site data, associated documents and archaeological reports held by AHIMS were reviewed. Environmental information relating to Aboriginal land use was also researched. Such research facilitated an understanding of the potential nature of sites and site patterning in the region, which enabled a predictive statement to be made. It also provided an archaeological and environmental context within which a significance assessment could be made, if any Aboriginal sites were located during the field survey.

Stage 2: Site Inspection

The archaeological site inspection was undertaken on 3-4 June 2021. The site inspection was undertaken by the following:

Comber Consultants:

- [redacted]

Cobowra Local Aboriginal Land Council

- [redacted]

The inspection was undertaken in transects by foot and covered the full extent of the site including all exposed areas. Less than 0.2% of the site was exposed and this was limited to the base of some trees, and tractor tyre marks in areas of soakage.

Stage 3: Report Preparation

Further archaeological research was conducted, where necessary, to clarify the results of the survey. This draft report was then prepared and provided to Root Partnership, Health Infrastructure NSW and the Cobowra Local Aboriginal Land Council for comment. Once their comments have been received, this report will be finalised.

3.0 LEGISLATION

3.1. National Parks & Wildlife Act 1974

The National Parks & Wildlife Act 1974 (NPW Act) provides statutory protection to all Aboriginal sites within New South Wales. Heritage NSW is the State Government agency responsible for the implementation and management of this Act.

Part 6 of the National Parks & Wildlife Act states that it is an offence to harm or desecrate an Aboriginal object or Aboriginal place, without an Aboriginal Heritage Impact Permit (AHIP). An Aboriginal object is defined as:

> *Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.*

An Aboriginal Place is defined as:

> *A place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture, to be an Aboriginal place for the purposes of this Act.*

As this project is being assessed as a State Significant Development approval under Part 6 of the National Parks & Wildlife Act 1974 will not be required. Please see below.

3.2. Environmental Planning & Assessment Act 1979

This project is being undertaken as a State Significant Development under Part 4, Division 4.7 of the Environmental Planning & Assessment Act 1979 (EPA Act). Section 4.41 of the EPA Act (see below) does not require that a State Significant Development seek approval under the NPW Act as follows:

4.41 **Approvals etc legislation that does not apply**
(cf previous s 89J)

(1) The following authorisations are not required for State significant development that is authorised by a development consent granted after the commencement of this Division (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply)—
   - (a) (Repealed)
   - (b) a permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*,
   - (c) an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*,
   - (d) an Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*,
   - (e) (Repealed)
   - (f) a bush fire safety authority under section 100B of the *Rural Fires Act 1997*,
   - (g) a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

(2) Division 8 of Part 6 of the *Heritage Act 1977* does not apply to prevent or interfere with the carrying out of State significant development that is authorised by a development consent granted after the commencement of this Division.

(3) A reference in this section to State significant development that is authorised by a development consent granted after the commencement of this Division includes a reference to any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with a development application for any such development.

The EPA Act is administered by the Department of Planning and Environment who will provide the consent for this project and for any impact on Aboriginal objects. Section 4.41(d) does not require the consent of Heritage NSW.

4.0 ABORIGINAL CONSULTATION

Aboriginal culture is dynamic and continuous. It includes the tangible and intangible and links people over time to their community and land. It is important to recognise that Aboriginal people have the right to protect, preserve and promote their cultural heritage. In recognition of that right, relevant Aboriginal community organisations were invited to participate fully in the assessment.

The study area falls within Walbunga country and is within the boundaries of the Cobowra Local Aboriginal Land Council (CLALC). Prior to the site inspection Jillian Comber discussed the project with Lee-Anne Parsons of the CLALC and plans and maps were sent to the CLALC. The following representatives of the CLALC attended the site inspection and provide invaluable advice and information:

- [redacted]
- [redacted]
- [redacted]

5.0 ENVIRONMENTAL CONTEXT

5.1. Topography

The study area is located 1.6 km east of Moruya's town centre and 1.3 km south of the Moruya River. It constitutes a low-lying landscape composed of three low river terraces (c. 15 m AHD) with a south westerly aspect. The terraces are part of the first terrace order, (the highest vertical tier of river terraces) and are delimited by three small seasonal channels, which converge into a larger channel developing along the study area's western boundary. This seasonal channel leads into a swamp along the right bank of Racecourse Creek, a major tributary of the Moruya River.

5.2. Geology and soils

The local lithology is characterised by Devonian granite, exposed in valleys incised through Permian siltstone and silty sandstone, elevation about 170m (Mitchell 2002: 116). The study area is located within a coastal lowlands system developing along the right bank of the Moruya River. This system is characterised by rolling to undulating terrain described as the Moruya Channels and Floodplains Landscape (MCF) (Mitchell 2002:126). According to Mitchell (2002:126), the MCF landscape is defined by:

Channel, floodplain, and terraces of the deep, narrow valley of Quaternary alluvium of the Moruya and Deua Rivers from the coast to the base of the Great Escarpment. ... Uniform sands and loamy sands on the active floodplain, gradational loams, and sandy loams on the first terrace and brown texture-contrast soils on higher terraces. Limited areas of abandoned channel and swamp.

5.3. Vegetation and wildlife

According to the Mitchell landscape descriptions endemic vegetation throughout the study area would have comprised:

Gallery forest of river oak (Casuarina cunninghamiana) along the main channel, tall forest of river peppermint (Eucalyptus elata) on the floodplains with rough-barked apple (Angophora floribunda) and Acacia sp., understorey. ... Small patches of temperate rainforest with sassafras (Doryphora sassafras) and lilly pilly (Acmena smithii) in gully heads and as a gallery forest along major streams in sheltered locations.

Such vegetation communities would have provided a variety of edible plant species and plants suitable for artefact manufacture. They would have also sustained a diverse fauna including a variety of marsupials, which would have provided a sustainable food resource. The proximity to fresh water also determines the availability of further food resources such as fish and possibly eels.

5.4. Land use and disturbance

The study area is currently partially deforested. It was previously part of an historic farm called "Braemar" and the name Braemar remains on the gate which provides access to the property. The homestead has since been demolished and the northern section of Braemar Farm was developed into a residential subdivision. The current study area is located on the southern portion of the former Braemar Farm and is still vacant land. The study area has been used as for grazing and possibly agriculture since the late 1860s. The historical archaeological report for the site (Garbov & Nutley 2021) also indicates that military exercises may have been undertaken within the study area during the 1970s. There is evidence of possible foxhole trenches on the property.

6.0 ARCHAEOLOGICAL BACKGROUND

6.1. Moruya

Archaeological survey, assessment and testing as part of development consulting projects have been undertaken in the Moruya area since the late 1970s with the quantity of works notably increasing in the 1990s and 2000s (for an exhaustive summary of works prior to 2004 see Dibden 2005). The vast majority of Aboriginal sites recorded and studied in the local area reveal broadly similar parameters. The sites are usually represented by artefact scatters and subsurface archaeological deposits of Aboriginal stone tools. Artefact concentrations are of various density determined by microregional specifics such as landform, land use and disturbance. Midden sites are usually located on coastal headlands.

More recently, Williams (2005) undertook subsurface probing at Bangalay Estate, Moruya Heads. This site is located c. 2.5 km east of the study area. It was surveyed in 2003 and test-excavated in 2005. It is located on a similar landform to the general locality of the current study area. Williams excavated 88, 250x250 mm test pits (c. 5.5 m^2) which yielded 590 Aboriginal stone artefacts, indicating concentrations exceeding 93 artefacts per m^2. The highest densities were identified on flat to gently sloping ridge saddles.

In 2006 Dibden undertook an archaeological assessment for a proposed residential subdivision at Lot 69, DP 752151, South Head Road, Moruya. This property is located immediately to the north-east of the current study area. The initial site survey of this property was undertaken by Dr Julie Dibden in October 2006 and revealed a vegetated agricultural land with minimal ground surface visibility. While no Aboriginal artefacts were identified on the ground surface, four of the seven survey units, in which the project area was divided, were identified as archaeologically sensitive for the likely presence of subsurface archaeological deposits. A program for subsurface archaeological testing was recommended as a result of this assessment.

In 2007 the Lot 69 which had been assessed by Dibden (2006) was test-excavated by AHMS (2007). This was a machine excavation using a mechanical excavator with a 1 m flat bucket. Test pits were laid out in transects across the project area and excavated in 100 mm mechanical layers.

Eighteen test pits were excavated down to basal clay which revealed a heavily disturbed soil profile with evident traces of ploughing down to the basal clay. 293 definite and probable Aboriginal artefacts were recovered comprising items of quartz (34.8%), silcrete (26.3%), tuff (14.3%) and chert (5.8%), plus a mixture of other materials such as volcanic rocks, FGS, qartzite and agate (6.8%). The assemblage was dominated by broken flakes as residue of the stone tool production process (aka 'knapping', or 'debitage'). Nevertheless, some complete flakes and cores were also recovered. Usewear analysis found micro chipping on several of the artefacts. No further archaeological and mitigation works were recommended after the completion of the test excavation.

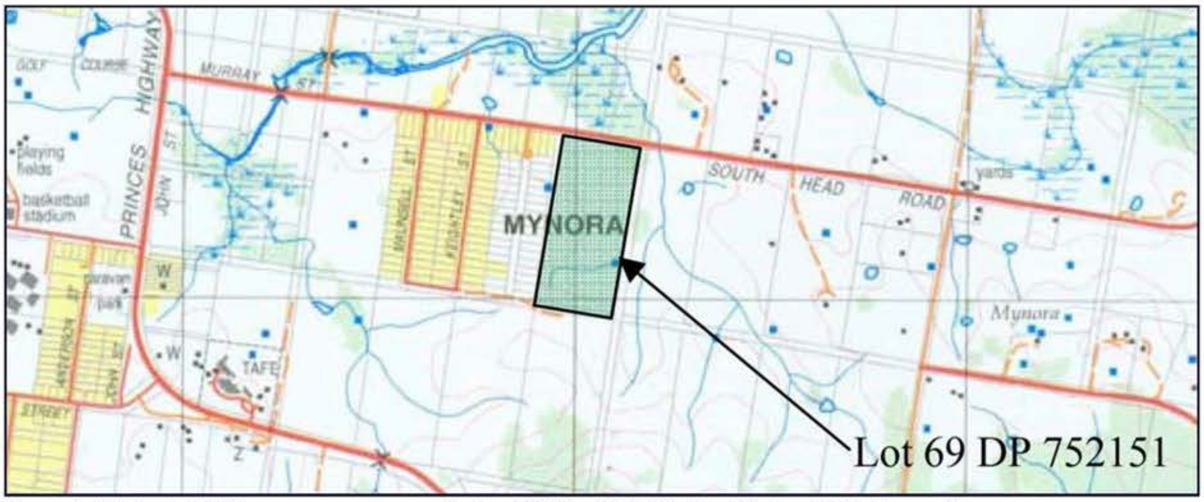

Figure 5: Dibden's 2006 survey area, excavated in 2007 by AHMS (after Dibden 2006, Figure 4)

6.2. AHIMS

An AHIMS search was undertaken on 17 May 2021. This search revealed 18 Aboriginal sites in a 1 km radius around the study area (Figure 4). Six AHIMS sites were identified within the study area (see next section). The majority of sites (93.75%) represent surface artefact sites (artefact scatters and isolated finds), one site is a shell midden (**Table 1**). Aboriginal sites are generally only recorded as part of archaeological surveys undertaken prior to redevelopment. Therefore, the number of sites and site patterning is not reflective of the number of sites within the region. They are only the sites which have been identified to date.

Site Type	Occurrence	Percent
Artefact Scatter	13	81.25%
Isolated Find	2	12.5%
Midden	1	6.25%
Total	16	100%

Table 1: AHIMS search results site statistics

6.3. Study Area

There are six previously identified Aboriginal archaeological sites within the study area (Figure 4; **Table 2**). The relevant AHIMS site cards are provided as Appendix C to this report. The study area is not a declared Aboriginal place.

The AHIMS sites within the study area represent exclusively surface artefact finds – one Isolated Find and five surface artefact scatters (**Table 2**:). While an *Isolated find* represents a single stone artefact, found on the surface of the land not in association with any other artefact, an *Artefact scatter* (also known as a *surface scatter*) represents an area where precontact material such as artefacts and stone tool production waste debris are lying exposed on the surface of the ground and most likely exist subsurface.

Site ID	Site name	Site Type
58-4-1104	Moruya Site 2	Open site / Isolated Find
58-4-1317	BF-SU7	Open site / Isolated Find
58-4-1318	BF-SU9	Open site / Artefact scatter (2 artefacts)
58-4-1319	BF-SU10	Open site / Artefact scatter (58 artefacts)
58-4-1320	BF-SU11	Open site / Artefact scatter (59 artefacts)
58-4-1321	BF-SU12	Open site / Artefact scatter (67 artefacts)

Table 2: AHIMS sites within the study area.

The AHIMS sites within the study area were identified by [redacted] in relation to the Braemar Farm redevelopment, and were subsequently excavated. Further details are below.

Due to low ground surface visibility conditions, and due to the prior testing, none of these sites could be identified in the site inspection undertaken for this report.

Figure 4: Map of the study area showing the location of entries in the AHIMS register.

In 2004 [redacted] excavated the site of Braemar Farm prior to a proposed subdivision. The site comprised Lots 1, 2, 3, 4 in DP 758710, Lot 50, 51, 54, 65, 68 in DP 752151, and Lot 2 in DP 553273. The subdivision site included the current study area (Figure 5).

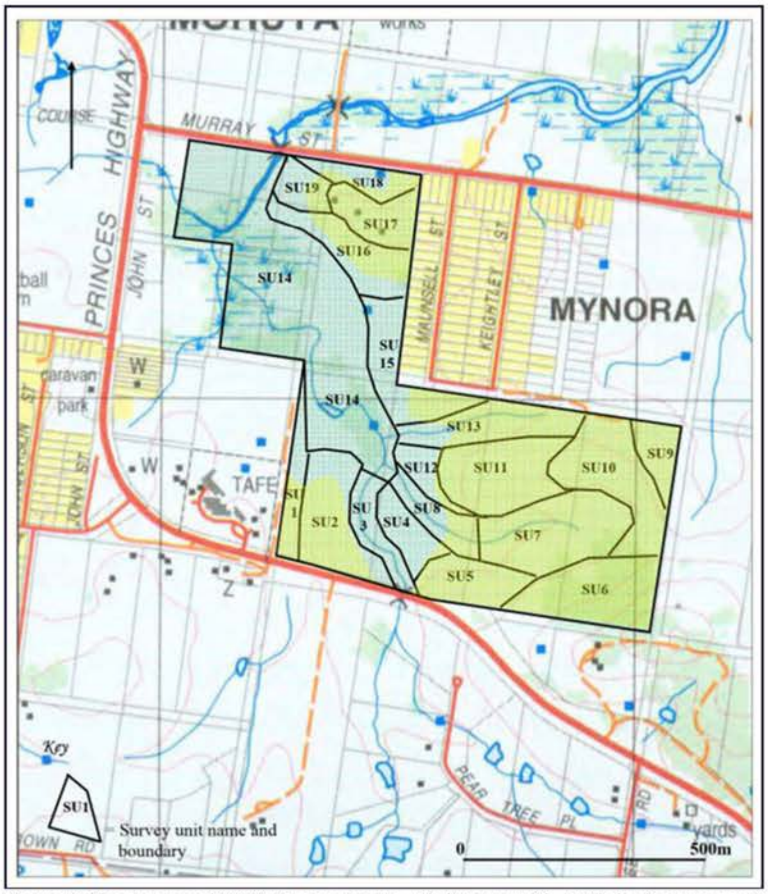

Figure 5: The proposed 2004 Braemar Farm subdivision with J. Dibden's survey units (after Dibden 2005 Figure 3). The current study area forms the southern portion of the above subdivision.

Dibden (2005) excavated 222 test pits in 21 transects across the property and 307 Aboriginal stone artefacts were recovered. The highest densities were found in basal simple slopes and medium densities were found on spur crests. The average density recorded was 5.5 artefact per m^2. The following artefact raw materials were identified: silcrete (37%), quartz (35.9%) and volcanic rock (22%). Both terrestrial as well as alluvial cortex was identified which suggested that raw materials were sourced both from quarries and from riverine context. Significantly, artefact scatters are not necessarily close to fresh water sources and were found at a considerable distance from fresh water.

Dibden's 2005 test excavation report (provided as Appendix E to this report) recommended ongoing consultation with the Cobowra LALC, consideration of an active conservation management strategy for the site and archaeological salvage, should the latter prove to be unfeasible.

6.4. Site prediction

On the basis of the environmental and archaeological information the following predictions can be made for the study area:

- The study area is located within an accessible and diverse open landscape with ample resources, therefore it would have been suitable for human occupation and daily activities;
- The study area may contain exposed granite rock outcrops, so it is possible that Aboriginal axe grinding grooves or rock art could be found;

- The study area has been mainly cleared of endemic vegetation and natural resources, however some native trees are to be found, therefore there is the potential for scarred or carved trees to remain within the study area.
- As the predominant Aboriginal settlement pattern in the micro-region was based on open camp sites, and not necessarily close to a water source, the study area may contain open artefact scatters and subsurface archaeological deposits.
- The study area has been modified by modern farming, therefore any artefact scatters and subsurface archaeological deposits within the study area are expected to have sustained previous impact and would be disturbed;
- Archaeological testing in the study area has revealed extensive material evidence of Aboriginal occupation in the form of subsurface archaeological deposits containing Aboriginal stone artefacts;
- Six Aboriginal sites have already been identified within the study area.
- Test excavations within the study area have revealed a high density of artefacts;
- The study area therefore has a very high potential to have retained archaeological evidence for past Aboriginal occupation represented by surface artefact scatters and subsurface archaeological deposits.

7.0 SITE INSPECTION RESULTS

7.1. Results

The site survey was undertaken on 3-4 June 2021 by [redacted], [redacted], [redacted] and [redacted] of Comber Consultants together with [redacted] from the Cobowra Local Aboriginal Land Council. The inspection was undertaken in transects by foot and covered the full extent of the study area including all exposed areas. Less than 0.2% of the site was exposed and this was limited to the base of some trees, and tractor tyre marks in areas of soakage. Due to low ground surface visibility conditions, none of the AHIMS sites within the study area could be identified.

The study area is largely cleared and covered with thick pasture (Photograph 2). The high ground in the south-east portion of the property has numerous granite outcrops and is lightly covered with open forest (Photograph 3). Four shallow swales drain moisture from the high ground into that wetland (Photographs 4-5) which, in turn, runs to the north-west outside of the property to join Racecourse Creek. Evidence of the damming of one of these swales was also present (Photograph 6).

Photograph 2: View of open pasture and trees on upper slopes. View to the south-east.

Photograph 3: Granite outcrops and open forest on the high ground in the south-east sector of the study area.

Photograph 4: Soakage swale running south-east to north-west across the property. View to the north-west.

Photograph 5: Wetland near western border

Photograph 6: Small dam on the swale running east to west across the property. View to north-east

The ridgelines, natural soakage and the creek running along the western boundary of the study area indicate an area that had potential to be a source of aquatic animals and plant foods and the dry ridge lines had potential to be used as occupation sites. Aboriginal lithic material on the ridgelines, and slopes, and on the shallow valleys, and creek bed on the property have the potential to have been distributed through natural processes (rain, bioturbation etc), and from colonial, and post-colonial agricultural activities, including tree-felling, grazing and ploughing.

While the extant AHIMS sites were not identified due to the high ground cover, the site inspection identified three Aboriginal scarred trees near the south-eastern extent of the site. These have been registered on the Aboriginal Heritage Information Management System (Site ID : 58-4-1466; 58-4-1467; 58-4-1468 AHIMS Site Cards Appendix B).

The details of the scarred trees are as follows:

Scarred Tree 1: E.tereticornis, being colonised by fig (Site ID 58-4-1466)

Grid Ref (Zone 56S): 237778E; 6020543N

Aspect (i.e., direction that scar faces):
- 322^0 Magnetic
- 335^0 True North

Dimensions:

Girth of tree: 5000mm
- Scar dimensions:
  - Length: 1200mm
  - Width: 530mm
- Regrowth Dimensions:
  - Left side regrowth:
  - Width: 450mm
  - Depth: 222mm
- Right side regrowth:
  - Width:210mm
  - Depth: 180mm

Distance of base of scar above ground: 600mm

Scarred Tree 2: E.tereticornis (Site ID 58-4-1467)

Grid Ref (Zone 56S): 237921E; 6020574N

Aspect (i.e., direction that scar faces):

160^0 Magnetic

172^0 True North

Dimensions:

Girth of tree: 4400mm

Scar dimensions:

Length 2100mm;

Width 340mm

Regrowth Dimensions:

Left side regrowth:

Width: 950mm

Depth: 260mm

Right side regrowth:

Width: 980mm

Depth: 270mm

Distance of base of scar above ground: 1220mm

Scarred Tree # 3: E.tereticornis (Site ID 58-4-1468)

Grid Ref (Zone 56S): 237912E; 6020619N

Aspect (i.e., direction that scar faces):
271^0 Magnetic
284^0 True North

Dimensions:
Girth of tree: 4400mm
Scar dimensions:
Length 1600mm;
Width 110mm
Regrowth Dimensions:
Left side regrowth:
Width: 510mm

Depth: 140mm

Right side regrowth:

Width: 540mm

Depth: 150mm

Distance of base of scar above ground: 580mm

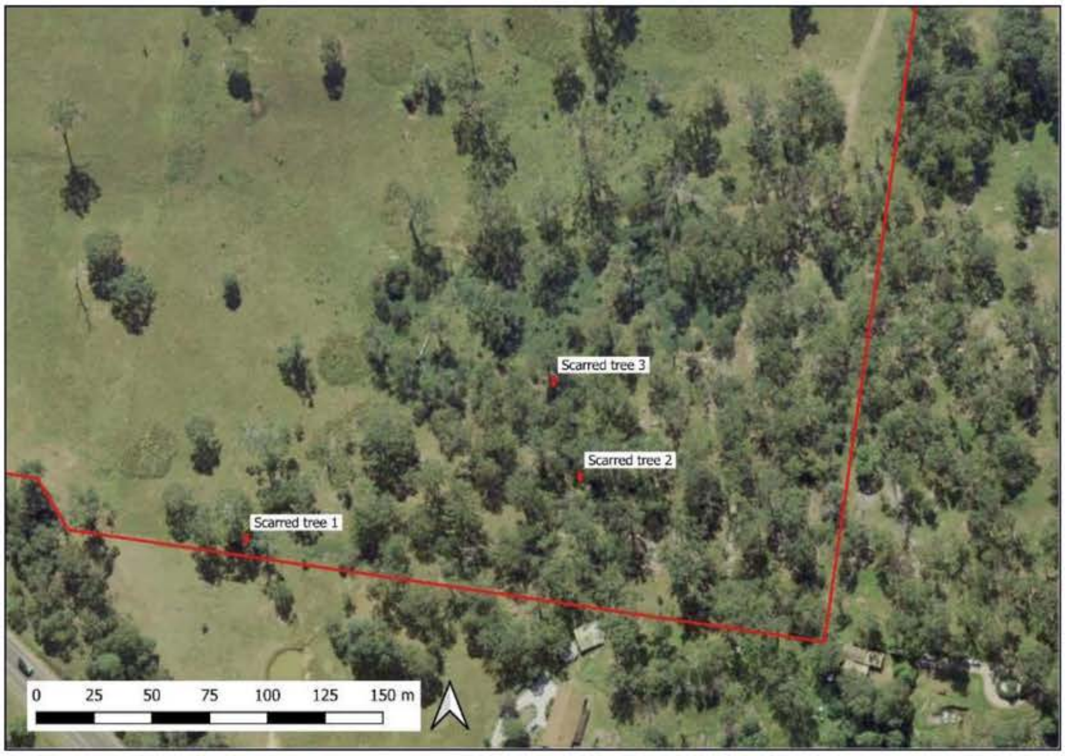

Figure 6: Aerial image of study area showing location of scarred trees (source: Nearmap)

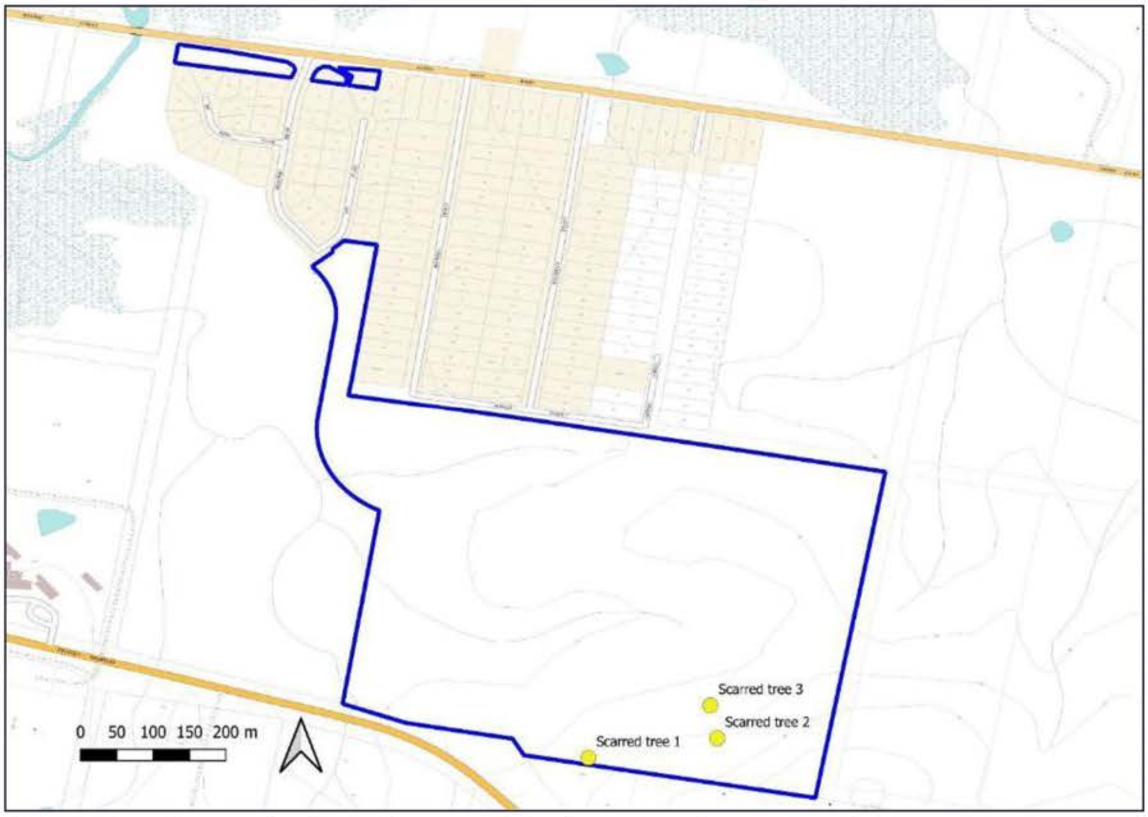

Figure 7: Topographic map of study area showing locations of scarred trees (source: SixMaps)

8.0 SIGNIFICANCE ASSESSMENT

8.1. Preamble

Significance assessment is the process whereby sites or landscapes are assessed to determine their value or importance to the community. A range of criteria have been developed for assessing the significance which embody the values contained in the Burra Charter. The Burra Charter provides principles and guidelines for the conservation and management of cultural heritage places within Australia.

Following are the criteria which will be used to assess the study area:

Social Value (sometimes termed "Aboriginal" value) which refers to the spiritual, traditional, historical or contemporary associations and attachments which the place or area has for the present-day Aboriginal community.

Historic Value refers to the associations of a place with a person, event, phase, or activity of importance to the history of an Aboriginal community.

Scientific Value refers to the importance of a landscape, area, place, or object because of its archaeological and/or other technical aspects.

Aesthetic Value refers to the sensory, scenic, architectural, and creative aspects of the place.

Representativeness refers to whether the site demonstrates the principal characteristics of that site and is a good representative example of that site type.

Rarity refers to the degree to which such a site is known elsewhere and whether the site is uncommon, rare or endangered.

8.2. Assessment

Social Value
Consultation with representatives of the Cobowra Local Aboriginal Land Council indicates that the study area is of importance to the local and broader Aboriginal community. The precinct contains evidence of Aboriginal occupation which provides a continuing cultural link to their past. The study area provides evidence of tangible and intangible links of Aboriginal occupation with the lifestyle and values of their ancestors.

Historic Value
The study area contains evidence of Aboriginal occupation which contributes to an understanding of the history of the pre and post contact history of the local Aboriginal community.

Scientific Value
The study area has the potential to yield further information through further detailed scientific and archaeological research into the nature of Aboriginal occupation and techniques utilised in subsistence activities. It has the potential to contain sub-surface archaeological deposits.

Aesthetic Value
The current site is an attractive and significant cultural landscape.

Representative Value
Until the excavation has been completed it is not known if the site contains representative values.

Rarity Value
Until further research has been completed it is not known if the study area contains rarity values, although due to natural attrition scarred trees are increasingly becoming unusual within the landscape.

8.3. Statement of significance

Consultation with representatives of the Aboriginal community indicates that the study area is important to the local and broader Aboriginal community. The precinct contains evidence of Aboriginal occupation which provides a continuing cultural link to their past. The study area provides evidence of tangible and intangible links of Aboriginal occupation with the lifestyle and values of their ancestors; it contains evidence of Aboriginal occupation which contributes to an understanding of the history of the pre and post contact history of the local Aboriginal community, it has the potential to yield further information through detailed scientific and archaeological research into the nature of Aboriginal occupation and techniques utilised in subsistence activities. The current site is an attractive and significant cultural landscape. The Aboriginal archaeological and cultural heritage potential of the study area therefore fulfils the criteria for social, historic, scientific and aesthetic value. Until further research has been completed it is not known if the area contains representative or rarity values.

9.0 IMPACTS AND MITIGATION

9.1. The Proposal

The proposed works will involve extensive ground disturbance including, but not limited to:

- Land clearing
- Cut and fill
- Construction of buildings
- Construction of service infrastructure
- Construction of road access infrastructure

The preliminary plans do not necessarily show all impacts. In particular the location of services, carparking etc., are not shown.

9.2. Impacts

An overlay of the preliminary project designs with the archaeological map of the study area provides an indication of the extent of potential impacts to Aboriginal sites (Figure 8). It should be noted that the plans shown at Figure 8 do not show areas for carparking, access, services installation etc. Under the current project plans, five of the six registered Aboriginal sites located within the study will be impacted by the proposed construction works

- 58-4-1104 – located near the north eastern site boundary
- 58-4-1318 – located near the proposed accommodation block
- 58-4-1319 – located near the eastern end of the proposed car park
- 58-4-1320 – located near the proposed hospital's southern wing
- 58-4-1317 – located near the proposed access road

In addition, one of the newly identified scarred trees (Scarred Tree # 1) is located near the southern site boundary and is therefore under direct threat from the construction activities (Figure 8).

As the project is still in the planning phase and all designs are preliminary, it is difficult to assess what potential impacts may be incurred to the remaining scarred trees (#2 and #3), as well as AHIMS site 58-4-1321.

9.3. Mitigation

As surface Aboriginal objects have been identified within the study area (AHIMS sites 58-4-1104; 58-4-1317, 58-4-1318, 58-4-1319, 58-4-1320, 58-4-1321), and it is an offence to harm such objects, and as avoidance cannot be achieved, archaeological salvage must be undertaken in consultation with the local Aboriginal community.

The information gained from archaeological excavation contributes to our knowledge and understanding of Aboriginal occupation. This knowledge can then be passed down to future generations through educational programs and interpretation. Such strategies will contribute to building and maintaining social cohesion within the Aboriginal and broader community and protecting cultural values for future generations. Archaeological sites are valued by the Aboriginal community for more than their archaeological/scientific values. Such sites reflect both the physical and spiritual presence of ancestors on country. It is therefore important that as much information as possible is obtained to ensure recognition of Aboriginal heritage and to pass this information on to future generations.

The three Aboriginal scarred trees identified within the study area must be avoided. The final plans should be designed in such a manner so as to avoid these trees. Due to their age Aboriginal scarred trees are suffering loss and damage, so it is important that all scarred trees be protected and actively managed to ensure their health and longevity.

Figure 8: Overlay of the Aboriginal archaeological sites within the study area with the project masterplan.

10.0 RECOMMENDATIONS

The following recommendations are made based on:

- Legal requirements under the terms of the *National Parks & Wildlife Act* 1974 (as amended), which states that it is an offence to harm or desecrate an Aboriginal object without first gaining a permit under Part 6 of the National Parks & Wildlife Act 1974.

- Research into the archaeological record for the region, and the study area.

- Results of the assessment as outlined in this report.

Recommendation 1: Consultation
Aboriginal consultation should be undertaken in accordance with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* 2010 and an Aboriginal cultural heritage assessment report (ACHAR) prepared for this proposal. This ACHAR will inform the EIS required for the SSDA and support an application for an AHIP for any early works to be assessed under Part 5 of the EPA Act.

Recommendation 2: Salvage
Archaeological salvage must be undertaken in consultation with the Cobowra Local Aboriginal Land Council and other Registered Aboriginal Parties. The archaeological salvage can be undertaken without an AHIP once the SSDA has been issued.

Recommendation 3: Early works
If project early works, such as installation of services, the driveway, a parking lot etc., which may be assessed under Part 5 or as a complying development under the EPA Act, are to be undertaken, an Aboriginal Heritage Impact Permit will be required. Aboriginal consultation must be undertaken first as detailed in recommendation 1 above and An AHIP application for harm, with salvage, submitted to Heritage NSW accompanied by the ACHAR and a Research Design outlining the salvage methodology.

Recommendation 4: Scarred Trees
The three scarred trees should avoided and protected from harm or damage through early works or development of the new hospital. They should be actively managed and protected to ensure their health and longevity.

Recommendation 5: Interpretation Strategy and Plan
An interpretation strategy and plan should be developed and implemented to showcase the Aboriginal history of Moruya and the site.

Recommendation 6: Report review
Once the final plans have been developed they should be reviewed and this report updated.

REFERENCES

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DECCW, 2010. *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW.* Department of Environment, Climate Change and Water.

Garbov, D. and D. Nutley. 2021. Eurobodalla Hospital. Historical Archaeological Assessment. Report by Comber Consultants to Health Infrastructure NSW.

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NSW Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Eurobodalla

Client Service ID : 591283

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
58-4-1104	Moruya Site 2	GDA	56	238050	6020945	Open site	Valid	Artefact : -		
	Contact Searle	Recorders	Doctor.Julie Dibden					Permits	2249,2250	
58-4-1105	Moruya Site 3	GDA	56	237487	6021409	Closed site	Valid	Shell : -		
	Contact Searle	Recorders	Doctor.Julie Dibden					Permits	2249,2250,3438	
58-4-1261	Lot 69 South Head Road 1	GDA	56	237922	6020998	Open site	Valid	Artefact : -		103039
	Contact	Recorders	Jim Wheeler					Permits		
58-4-1326	BF - SU 17	GDA	56	237410	6021374	Open site	Valid	Artefact : 4		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1320	BF- SU11	GDA	56	237725	6020841	Open site	Valid	Artefact : 59		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1321	BF- SU12	GDA	56	237554	6020868	Open site	Valid	Artefact : 67		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1322	BF- SU14	GDA	56	237295	6021175	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Julie Dibden					Permits	3438	
58-4-1323	BF- SU16	GDA	56	237386	6021302	Open site	Valid	Artefact : 3		
	Contact	Recorders	Doctor.Julie Dibden					Permits	3438	
58-4-1324	BF- SU18	GDA	56	237419	6021453	Open site	Valid	Artefact : 3		
	Contact	Recorders	Doctor.Julie Dibden					Permits	3438	
58-4-1315	BF- SU2	GDA	56	237358	6020793	Open site	Valid	Artefact : 28		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1316	BF- SU4	GDA	56	237504	6020744	Open site	Valid	Artefact : 43		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1317	BF- SU7	GDA	56	237797	6020702	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1318	BF- SU9	GDA	56	238052	6020911	Open site	Valid	Artefact : 2		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1319	BF- SU10	GDA	56	237992	6020828	Open site	Valid	Artefact : 58		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1325	BF- SU19	GDA	56	237279	6021453	Open site	Valid	Artefact : 22		
	Contact	Recorders	Doctor.Julie Dibden					Permits		
58-4-1331	BF-SU4	GDA	56	237504	6020744	Open site	Valid	Artefact : 43		
	Contact	Recorders	Doctor.Julie Dibden					Permits		

Report generated by AHIMS Web Service on 17/05/2021 for Dragomir Garbov for the following area at Lat, Long From : -35.9234, 150.0804 - Lat, Long To : -35.9121, 150.0986 with a Buffer of 0 meters. Additional Info : Assessment. Number of Aboriginal sites and Aboriginal objects found is 16

APPENDIX B: AHIMS SITE CARDS

Office of Environment & Heritage

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID: 58-4-1466 **Date recorded:** 25-06-2021

Site Location Information

Site name:	Moruya - Scarred Tree 1
Easting:	237778
Northing:	6020543
Coordinates must be in GDA (MGA)	
Horizontal Accuracy (m):	10
Zone:	56
Location method:	Phone GPS

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Mr	[redacted]	[redacted]

Organisation:	Comber Consultants
Address:	76 Edwin St Nth, Croydon, NSW
Phone:	[redacted]
E-mail:	[redacted]

Site Context Information

Land Form Pattern:	Rolling Hills
Land Use:	Pastoral/Grazing
Land Form Unit:	Slope
Vegetation:	Open Woodland
Distance to Water (m):	360
Primary Report:	
How to get to the site:	Travelling south, 420m past the entrance to Moruya TAFE College. Turn left immediately past the crash barrier on culvert over a small creek. Enter through the gate, turn right and follow fence for 300m. Tree is adjacent to fence.
Other site information:	The tree species is identified as E.tereticornis. it also has numerous, small natural scars around the perimeter of the base of the trunk. The western side of the tree is also partially obscured by a juvenile tree.

1

Site location map

Site contents information

open/closed site: Open

Site condition: Rot

Features:

No.	Features	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
1.	Modified Tree	1	120	53	22.2	22.2	Elongated	Other Eucalypt

Description:

The scar is on the western side of the tree and faces 322 degree (Mag), 335 degrees (True North). The exposed surface is dead wood with numerous vertical splitting. The tree itself is dying and is being colonised by a species of fig. Only a few upper branches of tree are still supporting leafage.

Features:

No.	Features	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
2.								

Description:

2

Features:	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
3.							

Description:

Features:	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
4.							

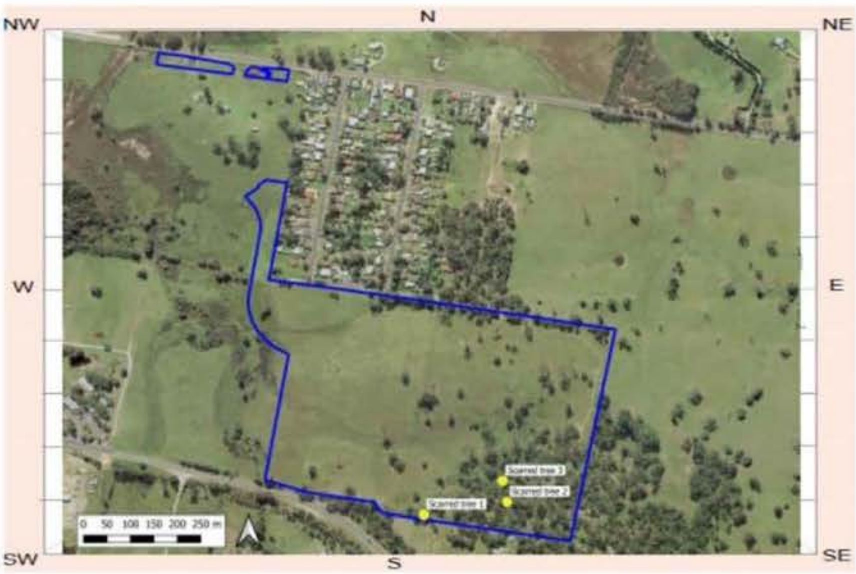
Description:

Features:	features	extent (m)	extent (m)	Scarred Trees: Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
5.							

Descriptic

Other Site Info: The tree species is identified as E tereticornis. it also has numerous, small natural scars around the perimeter of the base of the trunk. The western side of the tree is also partially obscured by a juvenile tree.

Site plan



3

Site photographs

Description: Scar - view to east-south-east.

Description: Scarred tree (left) bearing with colonising fig and adjacent juvenile regrowth. View to south.

Description: Natural scarring around base of three. View to west.

Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

Title	Surname	First name

Organisation:

Address:

Phone: E-mail:

4

NSW GOVERNMENT Office of Environment & Heritage

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID: 58-4-1467 **Date recorded:** 25-06-2021

Site Location Information

Site name:	Moruya scarred tree 2
Easting:	237921
Northing:	6020574
	Coordinates must be in GDA (MGA)
Horizontal Accuracy (m):	10
Zone:	56
Location method:	Phone GPS

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Mr	[redacted]	

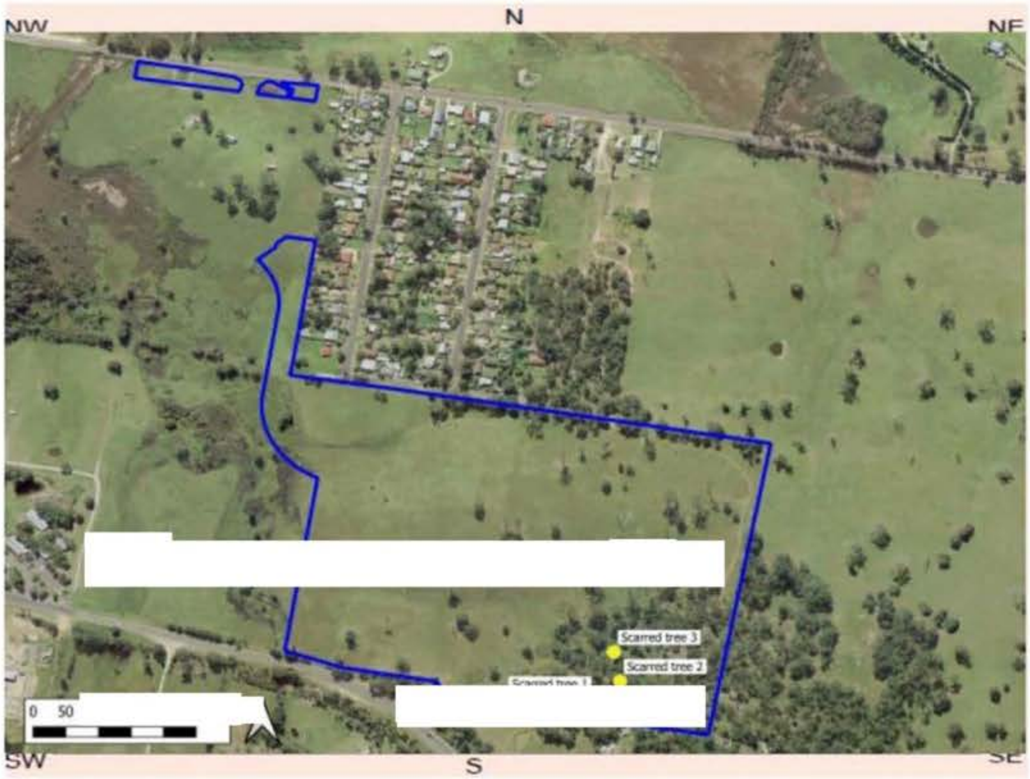
Organisation:	Comber Consultants
Address:	76 Edwin St Nth, Croydon, NSW
Phone:	[redacted]
E-mail:	[redacted]

Site Context Information

Land Form Pattern:	Rolling Hills
Land Use:	Pastoral/Grazing
Land Form Unit:	Slope
Vegetation:	Open Woodland
Distance to Water (m):	400
Primary Report:	Eurobodalla Hospital: Aboriginal Archaeological Assessment. 2021
How to get to the site:	Drive south from Moruya township. 400m past entrance to TAFE College turn left immediately after crash barrier over small creek. Through gate, walk 385m east up slope towards granite outcrops. Tree is 60 north of fence line.
Other site information:	The tree is on the southern side of a small, natural drainage line and just below the commencement of exposed granite outcropping.

1

Site location map



Site contents information

open/closed site: Open **Site condition:** Good

Features:

	Feature	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
1.	Modified Tree	1	210	34	26	95	Oval	Other Eucalypt

Description:

Feature is on eastern side of E.tereticornis. Scar faces 160 degrees (Mag), 172 degrees (Tue North). Base of scar is 122cm above ground.

Features:

	Feature	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
2.								

Description:

2

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
3.							

Description:

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
4.							

Description:

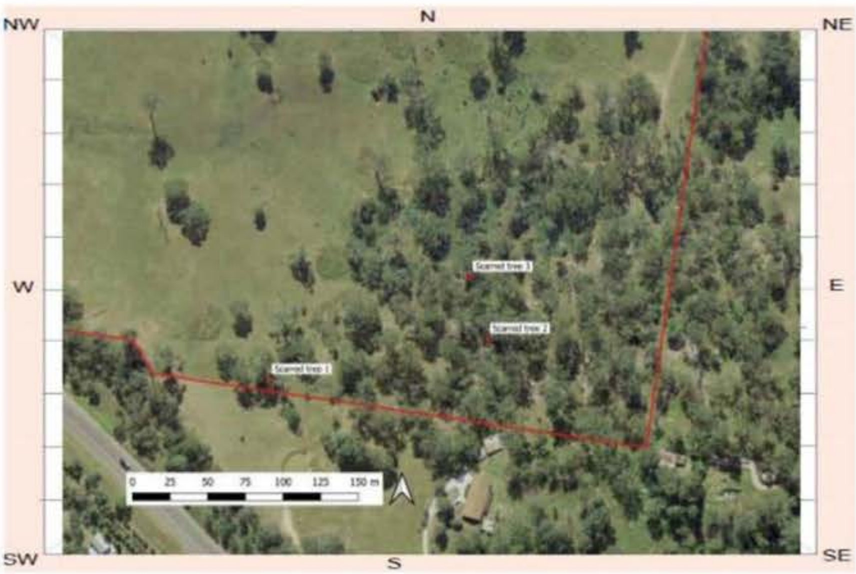
Features:

	features	extent (m)	extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
5.							

Descriptic

Other Site Info: The tree is on the southern side of a small, natural drainage line and just below the commencement of exposed granite outcropping.

Site plan

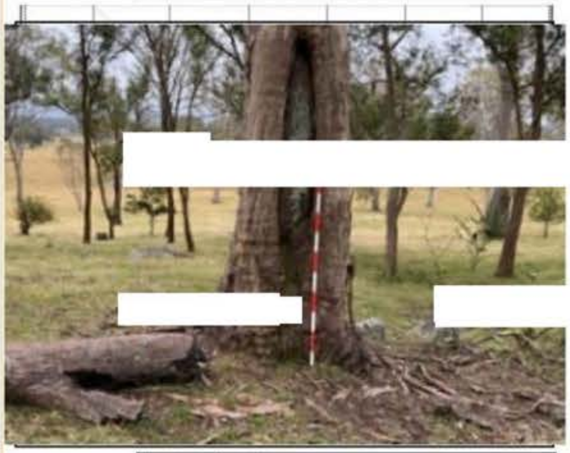


3

Site photographs

Description: Scarred Tree 2 (centre). Shallow gully and granite outcrops to right. View to north-west.

Description: VCiew to north-west.



Description: View to north-west.

Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

Title	Surname	First name

Organisation:

Address:

Phone: E-mail:

4

Office of Environment & Heritage
NSW GOVERNMENT

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID: 58-4-1468

Date recorded: 25-06-2021

Site Location Information

Site name: Moruya scarred tree 3

Easting: 237912

Northing: 6060619

Coordinates must be in GDA (MGA)

Horizontal Accuracy (m): 10

Zone: 56

Location method: Phone GPS

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Mr	[redacted]	[redacted]

Organisation: Comber Consultants

Address: 76 Edwin St Nth, Croydon, NSW

Phone: [redacted]

E-mail: [redacted]

Site Context Information

Land Form Pattern: Rolling Hills

Land Use: Pastoral/Grazing

Land Form Unit: Slope

Vegetation: Open Woodland

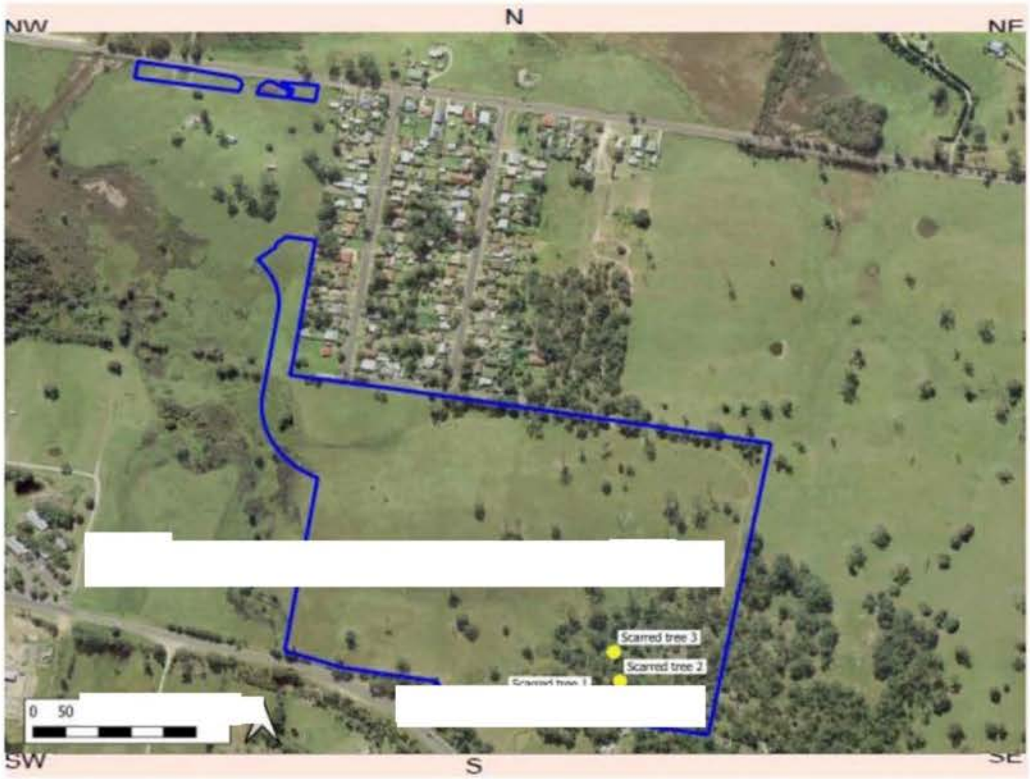
Distance to Water (m): 400

Primary Report: Eurobodalla Hospital: Aboriginal Archaeological Assessment. 2021

How to get to the site: Drive south from Moruya township. 400m past entrance to TAFE College turn left immediately after crash barrier over small creek. Through gate, walk 370m east up slope towards granite outcrops. Tree is 100 north of fence line.

Other site information: Distance of the base of the scar above ground is 58cm.

Site location map



Site contents information

open/closed site: Open

Site condition: Good

Features:

	Features	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
1.	Modified Tree	1	160	11	14	51	Elongated	Other Eucalypt

Description:

The scar faces west (271 degrees Mag; 284 degrees True North). The regrowth has almost closed over the original scar.

Features:

	Features	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
2.								

Description:

2

Features:	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
3.							

Description:

Features:	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
4.							

Description:

Features:	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
5.							

Description:

Other Site Info: Distance of the base of the scar above ground is 58cm.

Site plan

3

Site photographs

Description: Scarred Tree 3. View to east.

Description: Scarred Tree 3. View to east.

Description:

Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

Title	Surname	First name

Organisation:

Address:

Phone: E-mail:

4

APPENDIX C: GLOSSARY

Adze: an axe like bifacial tool with a bevelled bit or blade edge usually used to work wood, or sometimes to dig for root crops.

Alluvium: material which is transported by a river and deposited at points along the flood plain of the river.

Artefact: any object made by human agency. All lithic tools and lithic debitage are considered artefacts.

Artefact scatter: also known as a surface scatter or open site, where prehistoric material such as artefacts and waste debris are lying exposed on the surface of the ground.

Assemblage: a collection of artefacts from an archaeological site.

Australian small tool tradition: a mid Holocene tool industry of the Australian Aborigines that appeared about 5,000 years ago when a new ensemble of small, flaked stone tools began to come into use. The types consisted of backed blades and flakes, Unifacial and bifacial points, and small adze flakes. There are some regional distributions of tools, including Bondi points, geometric microliths, Pirri points and Tula adzes.

Axe: a stone artefact that has been ground on one or more sides to produce a sharp edge.

Backed blade: a blade flake that has been abruptly retouched along one or more margins opposite an acute (sharp) edge. Backed pieces include backed blades and geometric microliths. They are thought to have been hafted onto wooden handles to produce composite cutting tools or spears. Backed blades are a feature of the "Australian small tool tradition", dating from between 5,000 and 1,000 years ago in south eastern Australia (Mulvaney 1975).

Bifacial flaking or retouch: when flakes have been removed from two opposing faces.

Biomantle: the upper part of soil produced by biodynamical agents and processes of which bioturbation is normally hierarchically dominant. By definition, it contains at least 50% biofabric, a condition met in essentially all topsoils.

Bioturbation: the alteration of a site by non-human agency, eg. burrowing animals, tree and grass roots, insects

Blade: a flake that is at least twice as long as it is wide.

Bondi point: a small, asymmetric backed point, named after Bondi Beach where it was first found, which is a component of the Australian small tool tradition. It is usually less than 5cm long and is sometimes described as a backed blade.

Broad platform flake: a flake which has a platform which is as wide as, or wider than, the body of the flake.

Bulb of percussion: a rounded bulge where the force from the hammerstone has radiated through the stone and split it from the core.

Burin: a flake tool that was produced by the removal of two flakes at right angles to one another to produce a very fine sharp and durable edge.

Carved trees: trees which have had designs carved into the bark or heartwood and in some areas may have been used to mark burial or initiation sites.

Chert: a very fine crystalline aggregate of silica.

Context: the time and space setting of an artefact, feature or culture. The context of a find is its position on a site, its relationship through association with other artefacts, and its chronological position as revealed through stratigraphy. An artefact's context usually consists of its immediate matrix (the material surrounding it, eg. clay, gravel or sand), its provenience (horizontal and vertical position within the matrix), and its association with other artefacts (occurrence together with other archaeological remains, usually in the same matrix). The assessment of context includes study of what has happened to the find since it was deposited.

Core: a piece of stone bearing one or more negative (concave) flake scars. A stone which has obviously had flakes and flaked pieces struck from it.

Cortex: refers to the original weathered outer surface of the rock used to manufacture an artefact.

Debitage (debris): detached pieces that are discarded during the reduction process.

Distal end: the end opposite to the platform or the point end of a blade.

Dorsal surface: the 'back' of the artefact or the side that was once part of the outside of the core or shows evidence of previous flake removals.

Edge-ground artefact: an artefact (generally an axe or adze) whose cutting edges have been ground, rather than flaked, to form a sharp edge.

Eraillure scar: the small flake scar on the dorsal side of a flake next to the platform. It is the result of rebounding force during percussion flaking.

Erosion: the wearing away or loosening and transportation of soil or rock by water, wind and ice.

Fabricator: a stone or bone artefact used in the manufacture of other tools. Often rod shaped and worn heavily on one end, it is used to chip flakes from a core, or to retouch a flake.

Flake: any piece of stone removed from a larger mass (core) by application of force (percussion), and having a striking platform and bulb of percussion.

Flaked piece: any stone struck from a larger mass by percussion but not containing all or any of the characteristics of a flake.

Focal platform flake: a flake which has a platform narrower than the body of the flake.

Grinding groove: a depression resulting from the sharpening of stone tools such as axes and adzes, usually located on surfaces of fine homogenous sandstone and near water.

Grinding stone: a thick stone used as a mortar for grinding seeds, roots, tubers, or ochre.

Hammerstone: the stone that is used to remove flakes from the core.

Holocene: that portion of geologic time that postdates the latest episode of continental glaciation. The Holocene Epoch is synonymous with the recent or postglacial interval of Earth's geologic history and extends from 10,000 years ago to the present day. It was preceded by the Pleistocene Epoch and is part of the Quaternary Period, a time characterised by dramatic climatic oscillations from warm (interglacial) to cold (glacial) conditions that began about 1.6 million years ago. The term Holocene is also applied to the sediments, processes, events, and environments of the epoch.

Horizon (or soil horizon): the layers of the upper crust of the earth. The top, or O, horizon is the layer of undecomposed litter; the A horizon is topsoil, where most roots grow; B is the subsoil; and C is the parent rock material, broken into chunks. Although some roots can penetrate into the C horizon, few microorganisms live there.

Isolated find: a single stone artefact found on the surface of the land not in association with any other artefact.

Knapping: the process of hitting one stone (core) with another (hammerstone) to produce a flaked artefact.

Lamellate flaked piece: thin and wedge shaped, similar to a flake, but without the diagnostic features of a flake. A lamellate may by the distal end of a flake which has had its platform broken off.

Lithic: anything made of stone. Derived from the Greek word meaning stone or anything pertaining to stone.

Manuport: piece of stone intended to be, or used as, a core that has been carried to the area from somewhere else.

Microlith: a small (1 – 3cm long) flake with evidence of retouch. Bondi points, scrapers and backed blades are all types of microliths.

Midden: a prehistoric refuse site chiefly composed of shell fragments.

Multidirectional core: a lithic mass (core) with evidence of flaking originating from more than one direction and with more than a single striking platform.

Negative flake scar: the scar left by the removal of a flake. The scar may also show a rounded depression which is the negative of the bulb of percussion.

Open site: also known as a surface or artefact scatter, where prehistoric material such as artefacts and waste debris are lying exposed on the surface of the ground.

Pirri point: a symmetrical leaf-shaped point, up to 7cm long, unifacially flaked all over its dorsal surface. The striking platform and bulb of percussion are sometimes removed to produce a rounded, thinned butt. Pirri points are a component of the Australian small tool tradition, found generally in inland Australia. The term pirri is an Aboriginal word for 'wood engraving tool'.

Platform: the flat surface which receives percussion or pressure in the removal of a flake or flaked piece.

Pleistocene: a geochronological division of geological time, an epoch of the Quaternary period following the Pliocene. During the Pleistocene, large areas of the northern hemisphere were covered with ice and there were successive glacial advances and retreats. The lower Pleistocene began about 1.8 million years ago; the Middle Pleistocene about 730,000 years ago; and the Upper Pleistocene about 127,000 years ago; it ended about 10,000 years ago. The Pleistocene was succeeded by the Holocene.

Potential archaeological deposit (PAD): any location considered to have a moderate to high potential for subsurface archaeological material

Potlid: small circular piece of stone that has literally "popped off" the surface of the artefact due to exposure to extreme heat.

Proximal end: the 'top' of the artefact, or the part that the knapper hit to remove it from the core, where the platform is expected to be.

Quarry: a location from which stone has been extracted in order to make stone artefacts.

Retouch: refers to the secondary working of an artefact after it has been struck from the core. Retouch is used to sharpen the edges. It is the intentional modification of a stone tool edge by either pressure or percussion flaking techniques.

Scarred trees: trees from which bark has been removed for the manufacture of everyday items such as containers, canoes or shields.

Scraper: a generalised term used to describe a flake tool that has a retouched edge angle of approximately 60 to 90 degrees.

Silcrete: silica-rich duricrust identified by the presence of complete granules or even pebbles within the matrix.

Stratigraphy: the study and interpretation of the stratification of rocks, sediments, soils, or cultural debris, based on the principle that the lowest layer is the oldest and the uppermost layer is the youngest. The sequence of deposition can be assessed by a study of the relationships of different layers.

Taphonomy: Literally, 'the laws of burial'. In archaeology, it is the study of the processes by which archaeological remains are transformed by human and natural processes during their incorporation into archaeological deposits, their subsequent long-term preservation within those deposits, and their recovery by archaeologists. The aim is to understand the processes resulting in the archaeological record.

Thumbnail scraper: a small flake with a convex scraper edge, shaped like a thumbnail and located opposite the flake's platform. They exhibit unifacial retouch (usually on the ventral surface) and are usually less than 30mm in length.

Transect: an arbitrary sample unit which is a linear corridor of uniform specified width. A straight line or narrow sections through an archaeological site, along which a series of observations or measurements is made.

Tuff: a rock formed of volcanic fragments (generally ash).

Typology: a scheme to order multiple types in a relational manner. A common typology orders types in a hierarchical manner.

Unidirectional core: a core with only one striking platform surface and with flake scars extending in only one direction.

Unifacial flaking or retouch: where flakes have been removed from one face only.

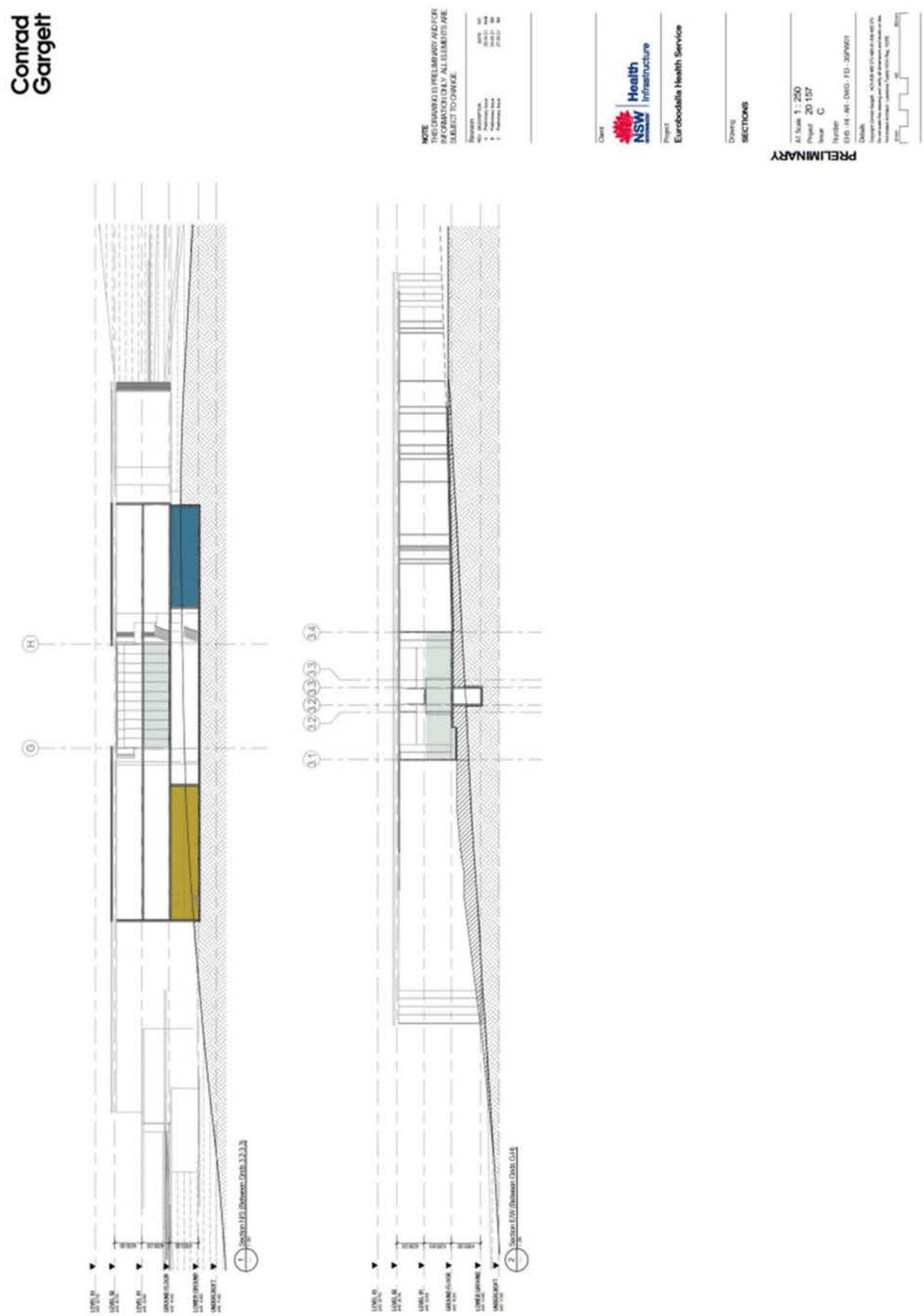
Use-wear: the physical changes to the edges of an artefact as a result of its use. Modification of a tool resulting from its use.

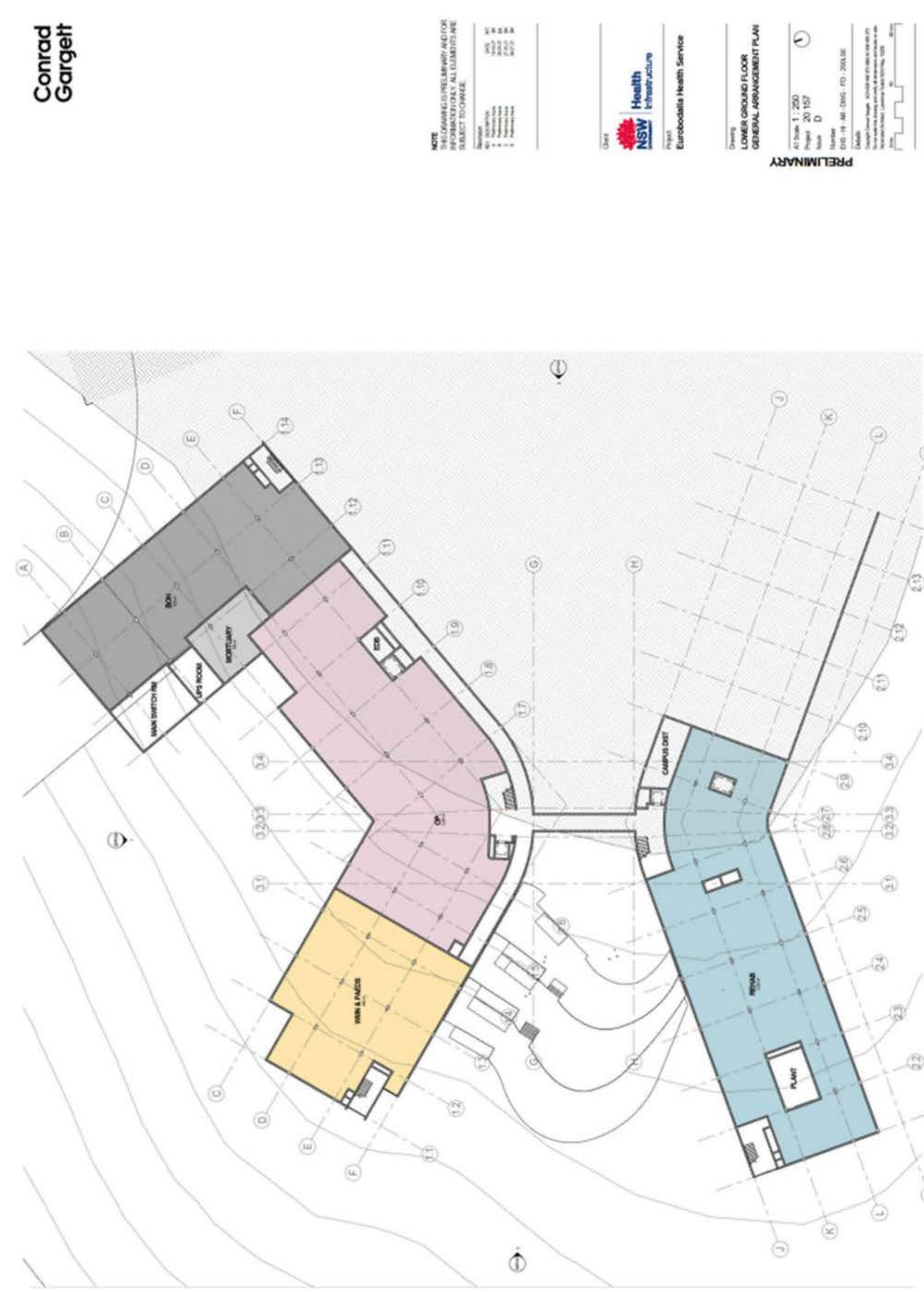
Ventral surface: the 'front' of the artefact, or the side that was once part of the interior of the core.

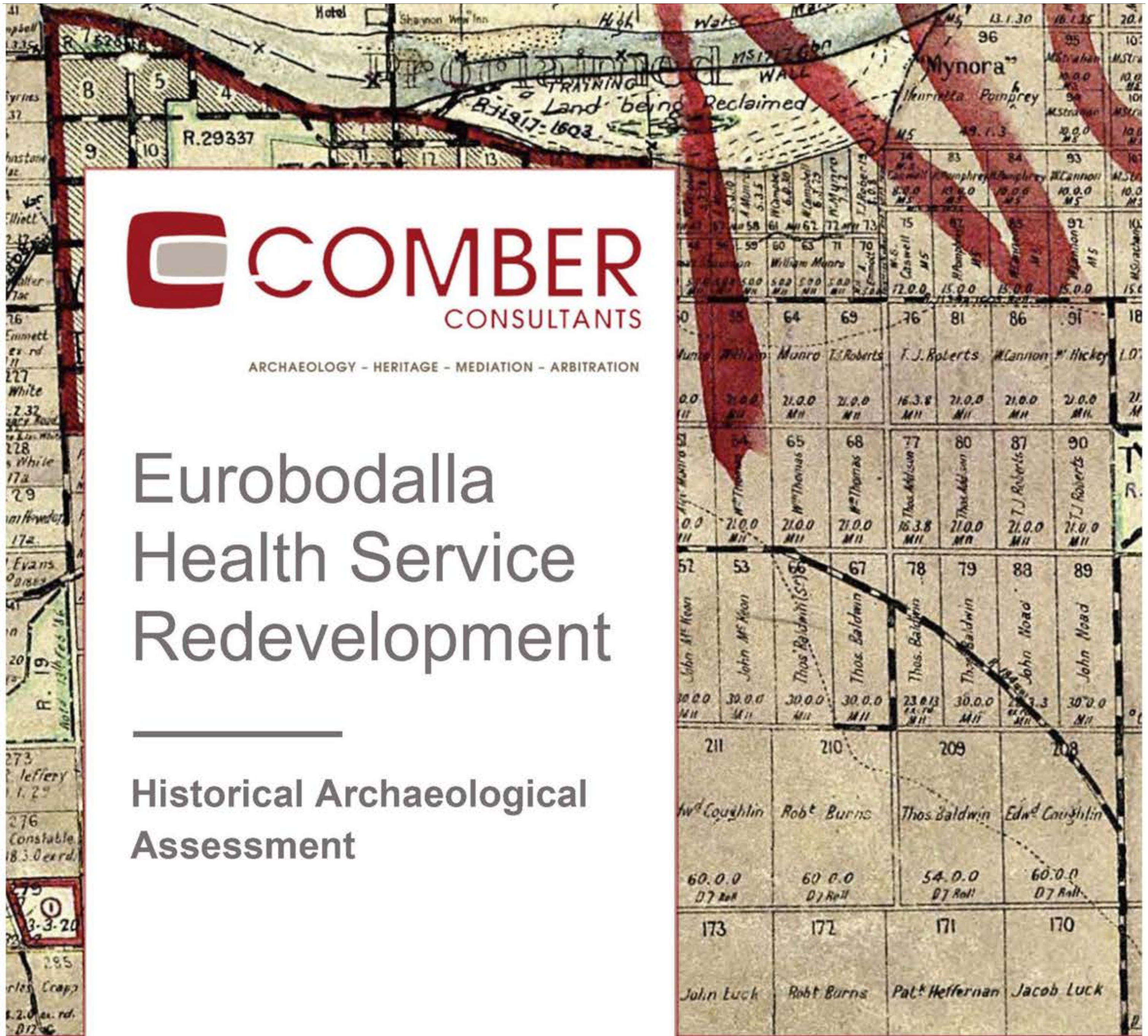
APPENDIX D: PLANS


Conrad Gargett
PRELIMINARY
NSW Health Infrastructure
Eurobodalla Health Service
MASTERPLAN - OVERALL PROPOSED
1 : 1000
20 157
B
CARPARK
CARPARK
ACCESS ROAD
PROPOSED BUILDING
POTENTIAL FUTURE EXPANSION
HELIPAD
ENTRY ROUNDABOUT


Conrad
Gargett
NSW Health Infrastructure
Eurobodalla Health Service
SITE SECTIONS
1 : 1000
20 157
A
PRELIMINARY


Conrad Gargett
Health Infrastructure
Eurobodalla Health Service
SECTIONS
PRELIMINARY
1 : 250
20 157


Conrad Gargett
NSW Health Infrastructure
Eurobodalla Health Service
LOWER GROUND FLOOR
GENERAL ARRANGEMENT PLAN
PRELIMINARY
MAIN SWITCH RM
UPS ROOM
MORTUARY
REHAB
PLANT
CAMPUS DIST



COMBER CONSULTANTS

ARCHAEOLOGY - HERITAGE - MEDIATION - ARBITRATION

Eurobodalla Health Service Redevelopment

Historical Archaeological Assessment

16 August **2021**

Report to: Root Partnership on behalf of Health Infrastructure NSW

LGA: Eurobodalla Shire

Version: C.2021

ABN 96 109 670 573 | 76 EDWIN STREET NORTH | CROYDON, NSW, 2132 | T 02 9799 6000 | F 02 9799 6011 www.comber.net.au

DOCUMENT CONTROL

PROJECT NO.: NH407 **STATUS**: DRAFT

REV	DATE	PREPARED BY	EDITED BY	APPROVED BY
A	09/07/2021	[redacted]	[redacted]	[redacted]
B	19/07/2021	[redacted]	[redacted]	[redacted]
C	16/08/2021	[redacted]	[redacted]	[redacted]

ACKNOWLEDGEMENTS

The historical research for this report (Section 4) has been prepared by [redacted] (History & Archaeology), Associate Diploma Local & Applied History, and Graduate Member PHA NSW & ACT.

INTEGRATED MANAGEMENT SYSTEM

Comber Consultants has a certified integrated management system to the requirements of ISO 9001 (quality), ISO 14001 (environmental), ISO 45001 (health and safety) and AS/NZS 4801 (health and safety). This is your assurance that Comber Consultants is committed to excellence, quality, and best practice and that we are regularly subjected to rigorous, independent assessments to ensure that we comply with stringent Management System Standards.

EXECUTIVE SUMMARY

Health Infrastructure NSW propose the construction of a hospital at Moruya, Eurobodalla Shire, as part of the Eurobodalla Health Service Redevelopment Project. The NSW Government has announced a total of $200m towards the development of the new Eurobodalla Health Service. The project will provide a new hospital facility on a greenfield site that services Moruya, Batemans Bay, and surrounding towns. The project includes the decommissioning of the existing Moruya and Batemans Bay Hospitals when the new health service has become operational. The Eurobodalla Health Service Redevelopment Project will be assessed as a State Significant Development (SSD) under part 5 of the *Environmental Planning and Assessment Act 1979*.

To ensure that the historical archaeological significance of the project area is not adversely impacted upon by this proposal and to inform an Environmental Impact Statement (EIS), Comber Consultants have been commissioned to undertake this historical archaeological assessment in accordance with the NSW Heritage Manual, *Assessing Heritage Significance* (Heritage Office 2001) and the *Historical Archaeology Code of Practice* (Heritage Office 2006).

This report determined that the study area, which has previously been used for grazing and agricultural purposes, does not contain archaeological potential and it is not expected that relics will be located within the property. Therefore, there are no constraints to the proposed development in respect of historical archaeology.

This report makes the following recommendations:

1. The front entrance gate contains a faded sign containing the name "Braemar Farm". This sign should be carefully removed and donated to the The Moruya and District Historical Society for display in the Moruya Museum. The Museum contains other artefacts removed from the Braemar Farm Homestead before and during its demolition.

2. An interpretation plan and strategy should be developed and implemented which documents the history of Braemar Farm and its occupants.

3. All employees, contractors and subcontractors working on the hospital development should be provided with an induction into their responsibilities under the NSW *Heritage Act 1977* and that it is an offence to move, damage or destroy a relic.

4. If any previously unidentified relics are unexpectedly uncovered, all work must cease in the vicinity of that relic whilst advice is being sought from the consultant.

CONTENTS

FIGURES

PHOTOGRAPHS

TABLES

1.0 INTRODUCTION

1.01 Background

Health Infrastructure NSW propose to construct a new hospital at Moruya, Eurobodalla Shire, as part of the Eurobodalla Health Service Redevelopment Project. The Eurobodalla Health Service Redevelopment Project will be assessed as a State Significant Development (SSD) under part 5 of the *Environmental Planning and Assessment Act 1979*.

To ensure that the historical archaeological significance of the project area is not adversely impacted upon by this proposal and to inform an Environmental Impact Statement (EIS), Comber Consultants have been commissioned to undertake this historical archaeological assessment in accordance with the NSW Heritage Manual, *Assessing Heritage Significance* (Heritage Office 2001) and the *Historical Archaeology Code of Practice* (Heritage Office 2006).

1.02 Site location and description

The study area is located at Lot 6, Princes Highway, Moruya and is known as Lot 6 DP 1212271. It is within the Eurobodalla Shire, on the NSW South Coast, c. 260 km south of Sydney (Figure 1). The study area is a vacant allotment with a land area of c. 25 ha located east of the township of Moruya (Figure **2**2). Photograph 1 shows the entrance to the study area.

Figure 1: Location of study area within NSW (reference for this map)

Figure 2: Study area location map (Moruya NSW; image reference)

Photograph 1: Entrance to the study area, view to north

1.03 Proposal

The NSW Government has announced a total of $200m towards the development of the new Eurobodalla Health Service. The project will provide a new hospital facility on a greenfield site that services Moruya, Batemans Bay, and surrounding towns. The Eurobodalla Health Service will deliver new contemporary Medical, Surgical, Allied Health and Outpatient infrastructure along with new clinical and non-clinical support services. The project includes the decommissioning of the existing Moruya and Batemans Bay Hospitals when the new health service has become operational.

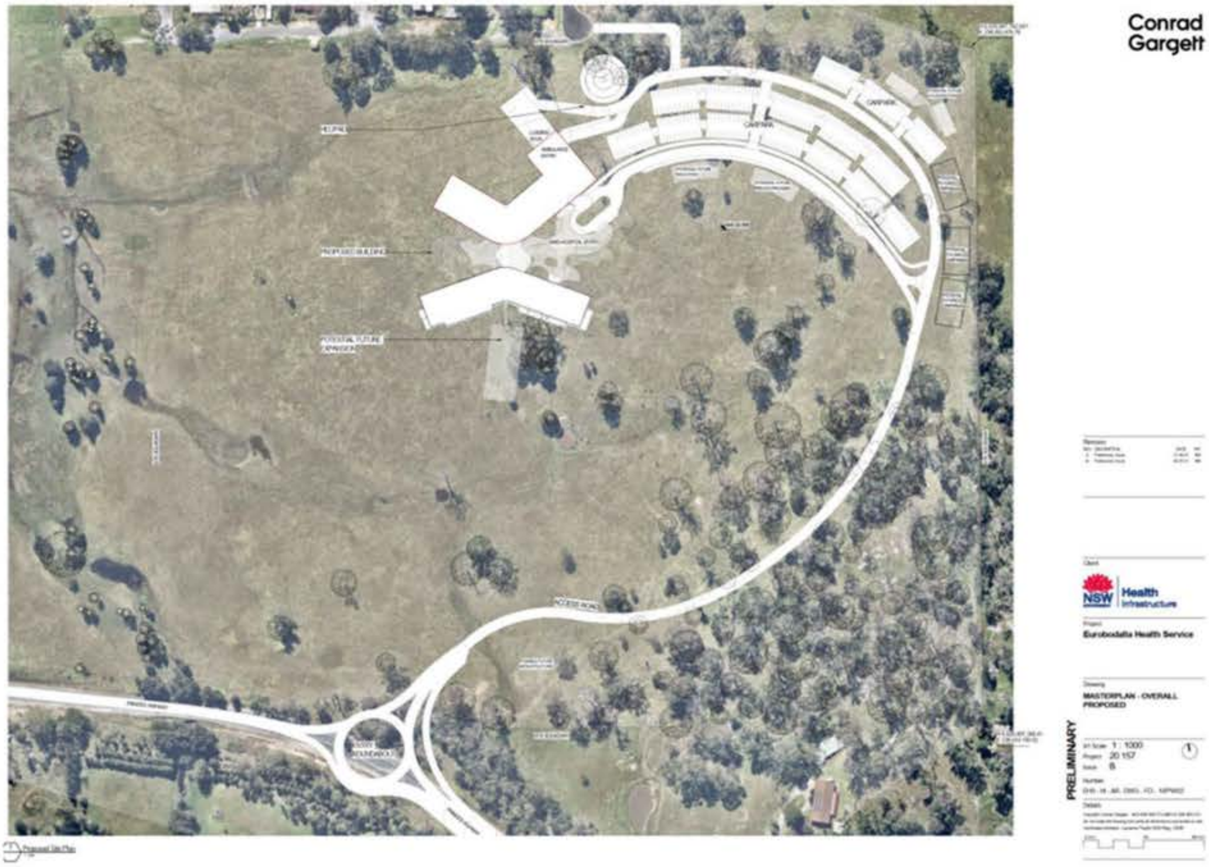


Figure 3: Project design masterplan (courtesy of ROOT Partnerships).

2.0 LEGISLATION

2.01 Heritage Act 1977 (as amended)

State Heritage Register

s31 of the NSW *Heritage Act 1977* provides for the establishment and maintenance of the State Heritage Register by the Heritage Council. s32 allows the Minister to direct the listing of an item which is of State heritage significance and sets out the procedure for listing an item.

Under s57 of the Heritage Act a person must not "demolish, despoil, excavate, alter, move, damage or destroy" an item listed on the State Heritage Register without a permit under s60 of the Act. The study area is not listed on the State Heritage Register an approval under s60 will not be required.

Protection of relics

As defined in the NSW Heritage Act 1977 a "relic"*:*

> *means any deposit, artefact, object or material evidence that:*
> *(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
> *(b) is of State or local significance"*

Under section 139 of the *Heritage Act 1977:*

> *A person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.*

This assessment has identified that it is highly unlikely that relics will exist on the property.

2.02 State Significant Development

This project is being undertaken as a State Significant Development under Part 4, Division 4.7 of the *Environmental Planning & Assessment Act 1979* (EPA Act). Section 4.38 of the EPA Act (see below) does not require that a State significant development seek approval under the Heritage Act as follows:

4.38 Consent for State significant development

(cf previous s 89E)

(1) The consent authority is to determine a development application in respect of State significant development by—
- (a) granting consent to the application with such modifications of the proposed development or on such conditions as the consent authority may determine, or
- (b) refusing consent to the application.

Note—

Section 380AA of the *Mining Act 1992* provides that an application in respect of State significant development for the mining of coal can only be determined if it is made by or with the consent of the holder of an authority under that Act in respect of coal and the land concerned.

(2) Development consent may not be granted if the development is wholly prohibited by an environmental planning instrument.

(3) Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.

(4) If part of a single proposed development that is State significant development requires development consent to be carried out and the other part may be carried out without development consent—
- (a) Division 5.1 does not apply to that other part of the proposed development, and
- (b) that other part of the proposed development is taken to be development that may not be carried out except with development consent.

(5) A development application in respect of State significant development that is wholly or partly prohibited may be considered in accordance with Division 3.5 in conjunction with a proposed environmental planning instrument to permit the carrying out of the development. The Planning Secretary may (despite anything to the contrary in section

3.32) undertake the functions of the planning proposal authority under Part 3 for a proposed instrument if it is initiated for the purpose of permitting the carrying out of the development (whether or not it contains other provisions).

(6) If the determination under section 3.34 (Gateway determination) for a planning proposal declares that the proposed instrument is principally concerned with permitting the carrying out of State significant development that would otherwise be wholly prohibited—

(a) the proposed instrument may be made only by the Independent Planning Commission under a delegation from the Minister, and

(b) the development application for the carrying out of that development may be determined only by the Independent Planning Commission under a delegation from the Minister.

3.0 HERITAGE LISTINGS

3.01 The study area

Searches of the following statutory registers were undertaken on 16 May and 7 June 2021. The study area is not listed on any of the statutory registers:

- National List
- State Heritage Register
- Local Environmental Plan

3.02 Listed items in proximity to the study area

The review of the relevant statutory registers has revealed one historical heritage item listed for historical archaeological values on the Eurobodalla LEP 2012, known as *Site of Braemar Farm, formerly comprising Farmhouse remains and Outbuildings, and Bunya Pine* (LEP Item A11; Lot 50, DP 752151). This item's boundary is adjacent to the study area however it does not extend into the study area (**Figure 4**). The buildings that were within this LEP boundary have since been demolished and residential housing constructed on the site of the former Braemar Farm.

Figure 4: Braemar Farm boundaries shown hatched and edged in yellow. The study area edged in red.

4.0 HISTORY

4.01 Historical Development of Moruya

The earliest European investigation of land in the vicinity of the study area was a survey of the Deua River (part of the Moruya River catchment to the west of the town of Moruya) led by Surveyor Robert Hoddle in 1827. In 1828 Thomas Florance was directed to investigate the coastline from Port Jackson to the Moruya River (Gibbney 1980:19). News of the results of the surveys led to an application for a grant on the north side of the Moruya River however there is no evidence that the land was settled at that time. Francis Flanagan occupied and farmed the first land grant or lease at a place known as Mullenderree (sometimes recorded as Mogendoura) north east of the later site of the town of Moruya and named Shannon View. Subsequently several grants north of the Moruya River were taken up and actively farmed or grazed. The exact date of the first land grants or leases south of the river is not known. Baker's 1841 map of the grazing districts of New South Wales records the Maneroo District bounded by the Moruya River in the north and Port Phillip District in the south included 133 stations by this time (Gibbney 1980:21-26; Baker 1841, Map F 479 NLA).

Prompted by requests for grazing and agricultural land around Moruya in the newly designated County of Dampier, William Parkinson was directed to conduct a survey of the locality. The survey dated November 1850 shows landholdings of various sizes to be offered for purchase. At the centre of the prospective farms was land reserved for a village and to its south an area set aside for 'grazing town cattle.' Parkinson's 1851 survey provides evidence of Moruya's natural landscape including the topography and watercourses (CP M.1424 & M.1-1424 NSW LRS). Initially the name Gundary, the name of a nearby cattle run, was suggested for the village but was later changed to Moruya, a name derived from an Aboriginal word. The site of the settlement was chosen at a point in the river west of the study area that was 'convenient for navigation' and gazetted on 8 August 1851 (Figure 5) (Turner 1996:20; Gibbney 1980, 49 & 50; CP M.1423 NSW LRS).

Figure 5: Detail of Crown Plan showing a survey made by Samuel Parkinson of 'Moruya Reserve' and dated 1850. Allotments or portions linked to the study area, in whole or in part, are outlined in red. A roadway from the river south to other towns traverses the study area (CP M.1424 NSW LRS).

Spencer Bransby's survey titled 'Plan of Suburban Allotments at Moruya in the County of Dampier' transmitted to the Surveyor General in 1854 records portions that had been applied to the Crown for purchase. Land was advertised for sale in the NSW Government Gazette from 7 January 1853. Described as 'Suburban allotments,' the portions of land to the east of Moruya township ranged in size from five to 30 acres (2.02 to 12.14 ha) and were bounded on the north by Moruya River (NSW Government Gazette 7 Jan 1853, 17; CP M.11.1459 NSW LRS; Gibbney 1980:50). A considerable number of the allotments, especially those in prime locations, were reserved pending options by squatting lease holders such as William Campbell of Gundary. Other allotments were purchased by agricultural workers, often former tenant farmers already resident in the area. (Gibbney 1980:50). The main part of the study area relates to Portions 54, 65 and 68 (each of 21 acres or 8.5 ha) purchased by William Thomas over several years. The first was purchased in 1858 and the latter two in 1861. A small part of the study area extends into the northeast corner of Portion 51 also of 21 acres (8.5 ha) to the west of Thomas' land purchased by Alexander Munro of the Bergalia cattle run in 1856 (Figure 6) (CP M.11.1459 NSW LRS; DUAP NSW 1996, 171).

Figure 6: Detail of a Plan of Suburban Allotments at Moruya showing the portions purchased by William Thomas and Alexander Munro between 1856 and 1861. The plan shows a track contemporary with the 1855 survey and that traverses Portions 51 and 54. Allotments linked to the study area are outlined (CP M.11.1459 NSW LRS).

In 1850-51 Moruya was surrounded by ranges and consisted of 'light soil, well timbered and grassy.' 'Rich land' was found in the 'gullies and flats' and water could be 'easily procured by sinking.' Land to the east of the township in the vicinity of the study area consisted of areas of open, flat land interspersed with areas of stringy bark and gums, with an occasional oak (swamp oak). The flats lay to the south of Currere or Racecourse Creek and the flats shown on the survey thought to correspond to areas prone to flood after heavy rain (CP M.11.1459 NSW LRS).

The fertile land at Moruya was not the only attraction of the locality and in 1851 gold was found along the Moruya River to the west (Gibbney 1980:52). Gold was found in 1856 at Wamban Creek with the main mine close to Moruya on Dwyers Creek. A stamp battery was set up south of the township in 1859 and ores containing gold, silver and arsenic were exploited in the 1860s. Mining continued intermittently in the district into the twentieth-century (DUAP NSW 1996:171). The district's distinctive granite outcrops contributed to the success of several quarries including that of Joseph Zeigler between the town of Moruya and Moruya Heads. The enormous pillars of the General Post Office in Sydney came from Moruya quarries, as were the pylons of the Sydney Harbour Bridge. Quarries were located on the north and south sides of the Moruya River (ATCJ 22 Mar 1905, 23; DUAP 1996:172-173). Joseph Louttit was also involved in quarrying, and his descendants are linked in the twentieth-century to the study area however there is no documentary evidence of a link to quarrying there (Gibbney 1980:91).

Figure 7: Overlay of the study area over a 1893 map of the Parish of Moruya, County Dampier showing the late 19th century subdivision of Braemer Farm and the Munro, William, Thomas and Addison properties over which the current study area is situated.

4.02 William Thomas' Portions 54, 65 and 68, Parish of Moruya, County of Dampier

William Thomas (c.1809-1882) finalised the purchase of Portion 54 on 18 August 1858, purchasing Portion 65 on 24 July 1861, and Portion 68 on 13 December 1861. The three portions constitute most of the study area. Thomas paid £21 for each 21 acre (8.5 ha) allotment (NSW Government Gazette, 5 Jun 1868). Registration of a livestock brand in 1868 provides evidence of Thomas grazing cattle in the Parish of Moruya but cannot be precisely connected to the study area. Greville's Directory of 1872 describes William Thomas and his son-in-law John Green as farmers of Pleasant View, Moruya (Greville's Directory 1875). Many settlers owned or occupied several landholdings at or near Moruya and it is not known if Thomas and his family lived in the study area or on other land at Moruya.

In 1867 Moruya was relatively isolated and a directory of the time records a population of about 500. Few travellers passed through except during the 'one or two short goldrush periods,' or when visitors or crew arrived on the small coastal ships that visited the river port. Despite isolation, by 1870 the key institutions essential to ongoing growth and management were established in Moruya and the development of a distinctive 'civic ethos' (Gibbney 1980:79)

William Thomas' wife Ellen died in 1862 and, at the time of his death in February 1882, Portions 54, 65 and 68 were inherited by Sarah Ann Green née Thomas, their daughter (NSW BDM Reg No 7989/1882; NSW Govt Gaz 28 Feb 1882, 1180; No 6756 NSW Will Book). The sometimes-unpredictable Moruya River and the low elevation of the surrounding land often made farming in Moruya precarious at times. Moruya was close to the coast and the Moruya River was subject to the tidal influences. It was also bordered on the west by steep mountain country, heightening the risk of flooding on farms after heavy rain. There is ample documentary evidence of flooding on the Moruya River from 1841, with particularly damaging inundations several times in 1860. The financial and emotional toll on the Moruya community due to the regular loss of stock and crops from floods was considerable (Gibbney 1980:88).

In 1882 Sarah Green took out a mortgage on Portions 54, 65 and 68 with respected local surgeon and landholder Edward Boot. It is not known how Sarah Green and her husband John Green, a sawyer and labourer used Portions 54, 65 and 68. A remnant of a tree in the study area shows evidence of notched steps cut in the trunk typical of traditional methods used by sawyers to fell trees. Although the technique was continued well into the twentieth century, it would also have been used by Sarah Green's husband, sawyer John Green (Figure 4).

John Green died in January 1885 in an accident at a saw bench at Wagonga to the south, near Narooma. Forty-one-year-old Green lived in the Moruya District for most of his life and it was where, at the time of his death, he was living with wife Sarah Green née Thomas and their seven children (SMH 16 Jan 1885, 8; Coroners' Inquests, SARNSW). Sarah Green paid off the mortgage with Boot in 1893 and then mortgaged Portions 54, 65 and 68 to farmer Phillip Jeffery of Moruya. Jeffery purchased the property in November 1894. Jeffery came to the district around 1850 to work for John Hawdon an early grazier in the district (SMH 21 Jul 1900:9).

The Australian Town and Country Journal provides a valuable description of the development of the district in 1897 at the time that Jeffery purchased the land. The town of Moruya stood,

> *... in the centre of wide, expansive, fertile, alluvial flats, which produce abundant crops of maize, etc. It has splendid pastures, and cheesemaking is a lucrative business among the farmers. Large quantities of bacon and live pigs are also sent away. It has an Agricultural Society, which is among the most flourishing on the South Coast. The farm homesteads are neat, the farmers busy and enterprising, and the dairy herds are up to the average of those of other parts of the colony... The Moruya River has many possibilities as a highway for commerce; but it requires improving. Light draught ocean steamers can now come to within about a mile of the town. A dredge Is now at work on the river, and a training wall is being constructed close to the town, with a view of bringing the steamers up to the town. While I have spoken of the Moruya flats as rich and fertile, and this is true of the river flats up and down the river for a considerable distance... (ATCJ 13 Nov 1897, 14).*

Yewen's Directory of Landholders of New South Wales records dairy farmer and grazier Phillip Jeffery as living at a property named Summer Hill in the Moruya District where he cultivated maize, oats and other crops. Other family members farming in the district included John Jeffery of Greenwood and William J Jeffery of Wamban. The family held significant landholdings in the town of Moruya and surrounding district (CP M.11.1459 NSW LRS; CP M.1.1423 NSW LRS). Phillip Jeffery is identified in the Thematic History of Eurobodalla Shire as a historically significant person in the locality (Turner 1996). After his death in 1900 Portions 54, 65 and 68 were transferred to sons John Jeffery and Alfred Leggo Jeffery, both farmers of Moruya. In 1902 it was transferred to Alfred Leggo Jeffery and James Jeffery.

In 1905 an article on Moruya provided a picture of the small south coast farming district contemporary with the Jeffery family's ownership of land in the study area. The population of the town had grown and was described as,

> *... a municipal town, with a population of 990 souls, and about 240 dwellings, offices, etc. (It is) 200 miles south of Sydney, and is the shipping port of the surrounding district, which sends a large quantity of cheese, maize, and other products away to Sydney every month (ATCJ 22 Mar 1905, 23).*

Significant to the land in the study area, the article described the '*low-lying land on the south bank of the river, ... (as) liable to floods; but for some years past it has suffered more from drought than from a superabundance of water*.'

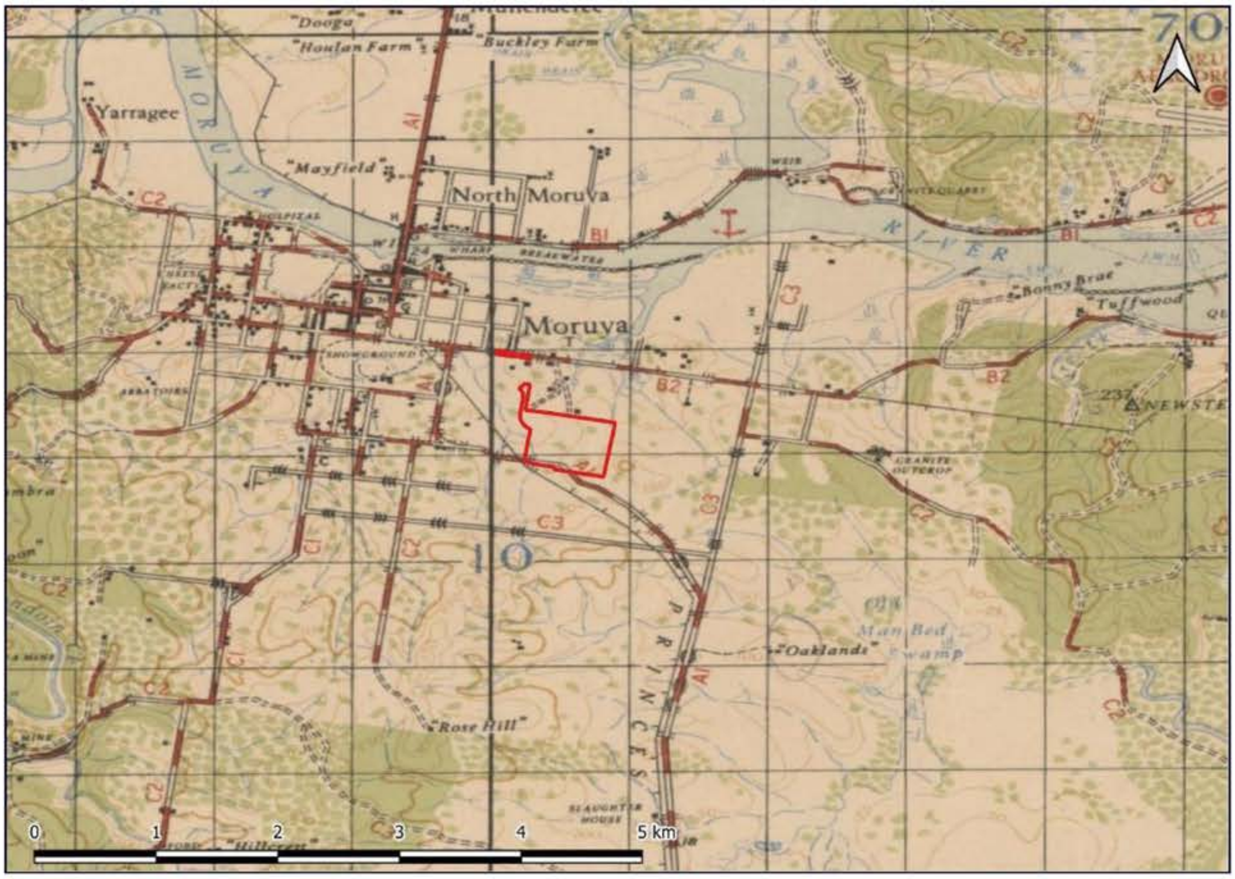


Figure 8: Detail of a map of Moruya, NSW, prepared by Australian Section Imperial General Staff in 1943 (NLA).

In 1941 Noel Llewellyn Jeffery, farmer of Moruya inherited Portions 54, 65 and 68. The Jeffery family are said to have used the land for the grazing of beef cattle (Braemar Homesteads History webpage, nd:1). A map commissioned by the Australian Army in 1943 during the Second World War provides evidence of the study area at this time. The map records a structure on or near the eastern boundary of Portion 50 identified in the legend as a 'house.' The map also provides evidence of a creek and telegraph line traversing the study area from northwest to southeast (Figure 8).

Noel Jeffery also acquired Portions 50 (Braemar), 51 (part of the study area), 55 and 64 to the north and west of the study area in 1950. It is thought to have operated as a dairy farm in conjunction with land in the study area (SHI Item Id 1550136; Braemar Homesteads History webpage, nd:1). Unformed roads to the south and east of Portions 65 and 68 were granted to Jeffery in 1959 and incorporated into the landholding (Vol 7745 Fol 39 NSW LRS). Portions 50, 51, 54, 65 and 68 and adjacent land were purchased by Patent Development Pty Ltd in 1971.

4.03 Alexander Munro's Portion 51, Parish of Moruya, County of Dampier

Alexander Munro of Bergalia purchased Lot 51 in the Parish of Moruya on 29 September 1856 paying £69/6/- for the 21 acres (8.5 ha). A small part of Lot 51 at the northeast corner is included in the study area. Deeds record the landholding as 'Lot 51' in contrast to the land to the east recorded as 'Portions.' For consistency the descriptor 'Portion' rather than 'Lot' is used in this history to describe land associated with the study area or adjoining it. At the time of purchase Munro was based at Bergalia, a lease or run originally occupied by John Hawdon and later acquired by William Campbell and consolidated with the Gundary Run. Henry Clarke purchased the prime parts of Bergalia and Gundary as freehold, employing Alexander Munro as 'managing partner' providing him with opportunities for further advancement in the growing pastoral industry (Gibbney 1980:82).

Along with Portion 51, Munro was able to purchase several other allotments in Moruya including Portions 50 to the north, and Lots 57 and 58 adjacent to the Moruya River. Munro's landholdings were flanked by those purchased by squatter William Campbell, and others by William Munro (thought to be a relative of Alexander Munro). The land purchased by Campbell, a squatter with pre-emptive rights, and those by Alexander and William Munro were in prime locations near the river or areas of fertile land suitable for grazing or agriculture (Gibbney 1980:50). Portion 51 (a small part of which is included in the study area) was located near the eastern boundary of the Town of Moruya and to the west of William Thomas' Lot 54, 65 and 68 also associated with the study area. Munro's Portion 50 to the north of the study area was later part of a property known from circa 1887 as Braemar and included on the Local Heritage Inventory (SMH 10 Nov 1887, 1; State Heritage Inventory Item Id 1550136).

In 1860 Munro imported a Durham Shorthorn bull, thought to be superior to the standard of local cattle and that would improve local herds. He then established a successful business droving cattle to nearby markets (Gibbney 1980:87-88). Described in most records as a farmer, in 1863 Munro and his wife Ann mortgaged Portion 51 (part of the study area) and land outside the study area to George Rowley, solicitor of Newtown. The mortgage was linked to a subdivision of Munro's Moruya landholdings. Possibly unable to service the mortgage or complete the subdivision, the properties were sold to John Rayner, a wharfinger of Victoria Wharf in Darling Harbour. Rayner later settled in the Moruya District. Evidence of Munro, Rowley or Rayner's use of Portion 51 has not been located.

Mary Forster, widow of Dudley Hall, Moruya, formerly of Wagonga purchased Portion 51 (and Portion 50 outside the study area) in December 1876. Portion 50 (later known as Braemar) was purchased by Dr Henry Kirwan King, the town's doctor who practiced in Moruya from 1878 until July 1885 (Shoalhaven Telegraph 16 Jun 1920, 6; Shoalhaven Telegraph 1 Dec 1886:2). The name 'Braemar' is linked to Portion 50 at Moruya from 1887 when it was leased by Dr H Kirwan King to other tenants (SMH 10 Nov 1887, 1). William Henry Simpson of Ninderrah purchased Portion 51 in 1878. Simpson was Moruya's first mayor and held a number of positions in farming and civic organisations. He was considered to be'...a good old sturdy type of men who pioneered the district half a century or more back.' As Simpson wealth increased, he devoted his 'spare time to furthering the interests of the town' (ATCJ 22 Mar 1905:23; SMH 11 May 1910:11; Bega Budget 13 Apr 1910:4).

In June 1882 Portion 51 was purchased by Henry Thomson, a butcher of Moruya who was active in the community and a council alderman in 1894 (NSW Govt Gaz 23 Feb 1894:1284). Given the proximity of Portion 51 to the town it is possible that it was used by Thomson for agistment of stock for sale to local abattoirs or transit to Sydney markets. Corresponding to the approximate location of the study area, in 1895 dogs were reported to have 'got amongst a mob of sheep in a paddock near town owned by Henry Thomson, butcher' (Daily Telegraph 3 May 1895:6). In November 1900 Henry Thomson's wife, Eliza Thomson purchased Portion 50 to the north (Braemar outside the study area), adding to the couples' landholding.

Henry Thomson held the title to Portion 51 until his death in 1902. In 1903 and 1906 widow Eliza Thomson, was living at Braemar (Portion 50) to the north of the study area (Shoalhaven News 16 May 1903:2; Queanbeyan Leader 6 Mar 1906, 2). Eliza was the executor of her husband Henry's estate and retained legal ownership of Portion 51 until the settlement of her estate after her death in 1928.

Moruya farmer Sidney Louttit purchased Portions 51 (and Portion 50 known as Braemar) in 1932. Mr and Mrs S Louttit lived at Braemar to the north of the study area from 1929 until at least 1938 (Braidwood Dispatch 8 Mar 1929, 2; Nowra Leader 8 Apr 1938, 3; State Heritage Inventory Item Id 1550136). Sixty-eight year old Louttit was living in Campbell Street, Moruya at the time of his death in 1949. Sidney Louttit was the son of John and Margaret Louttit and lived for most of his life in Moruya except for a short period when he lived at Camden. After a lifetime of farming, he retired to the town, continuing to be active in civic and community organisations (Kiama Independent 2 Nov 1949, 3). In 1950 the beneficiaries of Louttit's estate sold Portion 51 (and other land including Braemar on Portion 50) to farmer Noel Llewellyn Jeffery. The landholding was consolidated with Portions 54, 65 and 68 to the east of Portion 51 purchased by Phillip Jeffery in 1894. A 1961 aerial photograph provides evidence of the study area at the time (Figure 9).

Figure 9: Aerial photograph of the study area in 1961 (approximate outline of study area in red; Batemans Bay 1 Aug 1961, 1066_3M_108 Spatial Services NSW LRS).

4.04 Lot 51 and Portions 54, 65 and 68, Parish of Moruya, County of Dampier

In August 1971 Patent Development Pty Ltd purchased Portions 51, 54, 65 and 68 linked to the study area in the Parish of Moruya, County of Dampier. The land is reported to have been used for grazing beef cattle together with Portion 50 known as Braemar (Braemar Homesteads History webpage, nd:1).

A 1975 aerial photograph provides evidence of the pastoral characteristics of the study area roughly contemporary with the new ownership in 1971 (Figure 10).

Figure 10: Aerial photograph of the study area in 1975 (Batemans Bay 10 Sep 1975, 2333_07_114 Spatial Services NSW LRS).

4.05 Army Exercises at Moruya and the Study Area

At a site visit by Comber Consultants Pty Ltd to the study area in June 2021 a community member present at the time recalled that in the second half of the twentieth century the study area was used for army manoeuvres or training (Pers Comm Dr Jillian Comber 4 Jun 2021). Although the precise location is not stated, it is thought to relate to annual field exercises by the Royal Military College, Duntroon. The exercises in 1973 reportedly took place 'in the bush off the Princes Highway near Moruya.' The Canberra Times and other newspapers stated that more than '350 staff cadets and 200 support troops and staff participated' in the exercise held between 11 November and 30 November 1973 (The Broadcaster Fairfield 11 Dec 1973:9; Canberra Times 28 Nov 1973:1). It is not known if the cadets, support troops and staff camped on the training site or billeted elsewhere.

Moruya has a history as a camp or base for Australian troops at other times during the early twentieth century. The first instance was as a base for the Bega squadron of the 3rd Australian Light Horse and the Ulladulla 'half squadron' of the 2nd Australian Light Horse in April 1905. The troops 'camped under canvas' at Moruya between seventh and 14 April of that year for the annual training under the command of Captain C A Cork, of the 2nd ALH and staff officer Major Hilliard DSO of the instructional staff (Daily Telegraph 7 Apr 1905). Moruya was exempted from the compulsory military training scheme as the population of 'potential trainees' was too small. The Moruya Showground located to the west of Portion 50 is thought to have been the location of the encampment, but the exact location of training sites isn't known (Gibbney 1980:153).

The second instance of a military camp at Moruya was during the Second World War. It relates to plans that were prepared in 1942 to ensure Australia's defensive position in case of a Japanese invasion, specifically in New South Wales. Defence plans included construction of an air base in the Southern Sector north of Moruya River in 1942. At the same time Moruya Showground was used as the base for two military divisions thought to be the 1st and 2nd Motor Divisions who were directed to defend the Moruya Aerodrome and to put into practice orders in case of invasion. Personnel from the 1st Motor Division posted at the showground comprised two officers and 62 men (Gibbney 1980:177; AWM 52 Unit Diaries 1/5/37-0014). Documentary evidence of a connection between the base at the showground to the west of Portion 50 (Braemar) and the study area has not been located.

5.0 PREVIOUS REPORTS

A review of historical archaeological assessments contained within the NSW Digital Heritage Library revealed no previous historical archaeological assessments undertaken in Moruya.

In 1997 EJE Group (1997) undertook an LGA-wide heritage study of the Eurobodalla LGA. The study identified numerous heritage items, some of which were assessed as having historical archaeological potential. One site identified in the Eurobodalla heritage study is located immediately adjacent to the current study area. The item was included in Schedule 5 "Environmental Heritage" of the *Eurobodalla Local Environmental Plan 2012* (LEP) No. A11 *"Braemar Farm, formerly comprising Farmhouse remains and Outbuildings, and Bunya Pine."*

Braemar Farm is located near the north western boundary of the current study area (Figure 4). The following description is taken from the listing in the NSW State Heritage Inventory (for more detail refer to Appendix B):

Historically the buildings construction is a rare surviving indicator of the post-1867 expansion of the limits of settlement of Moruya by a middle-class immigrant from England keen to avail himself of the "salubrious air" of Moruya. Its location is likely to be associated with this historic fact. Thus, the building has high-level local historic significance. The property has high-level regional social significance because of Englishman, Dr King's direct linkages with the pioneer Emmott family and because of the indications that the property was developed to house local social functions. Scientifically the building and mature plantings have high-level local significance for their potential to provide information about both farming and middle-class living styles on the edges of Moruya township in the late 19th century.

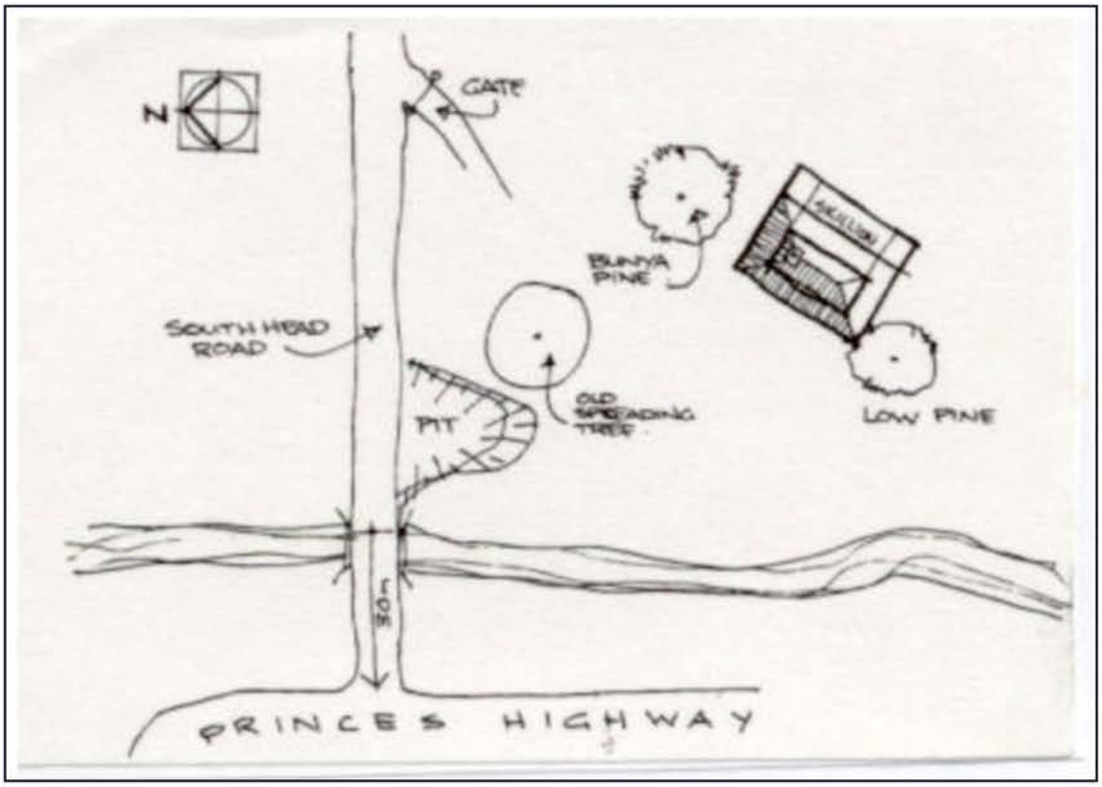


Figure 11: Mud map of the Braemer farm site (courtesy of Heritage NSW; after *Eurobodalla Shire-Wide Heritage Study*, EJE Group 1997)

Braemar Farm has since been demolished to allow for residential development. The current study area was once part of Braemar Farm, although not included in the LEP listing. It had been used for grazing and agriculture. At the date of the residential subdivision the current study area was subdivided from the home paddock.

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6.0 SITE INSPECTION

Photograph 1 shows the entrance to the property. The property is largely cleared and covered with thick pasture (Photographs 2-3). The high ground in the south-east portion of the property has numerous granite outcrops and is lightly covered with open forest. Four shallow swales drain moisture from the high ground into a wetland (Photographs 4-5) which, in turn, runs to the north-west outside of the property to join Racecourse Creek. Evidence of the damming of one of these swales was also present (Photograph 5).

On the entry gate from the Princes Highway is a faded sign with the name 'Braemar Farm' (Photograph 6). The property is fenced with timber fence posts strung with a combination of plain and barbed wire (Photographs 7-9). Along the western border, the wire replaces original wooden rails as evidenced by the presence of from two to three rectangular cuts in the posts (Photographs 7-8). Elsewhere, the wire runs through holes drilled through the post or is wrapped around end posts.

Along the central portion of the southern border is a section where timber rails run along the top of the fence posts. This forms a narrow western border of the property to the south of the study area. One of these rails is fitted into a recess that has been cut into the eastern side of a large tree (Photograph 9). It is possible that this remnant fencing formed an animal pen or race.

Adjacent to the above feature is a stockpile of old sawn timbers including posts and former fence rails (Photograph 10). Nearby is a quarried block of granite that displays the mark of a drill hole formed during the quarrying process (Photograph 11). This block may have come from the site of the former Braemar House, which has been demolished and residential housing constructed. As part of the residential development granite blocks were used to make a retaining wall.

A tree that appears to have been cut by a crosscut saw is located on the western slopes of the high ground (Photographs 12-14). The smaller cuts would have been footholds to climb the tree, whilst the last cut which is larger than the others, possibly held a plank for the sawyers to stand on (Photograph 15). There are also a few trees that have evidence of being ringbarked on the property. These trees are evidence of the historic clearing of the property.

One the north-west facing slopes in the south-west portion of the property, and within the cover of open forest, a series of trenches were recorded. These varied in length from 2-3m to 15m and with a depth of 0.4 to 0.5m (Photographs 16-19). It is possible that these were foxholes excavated during the 1970s when the property was used for army exercises.

No other extant structures or remains of former structures were observed within the study area. The land descends from the eastern and northern borders into a shallow valley of wetland along the western border.

Photograph 2: View of open pasture and trees on upper slopes. View to the south-east.

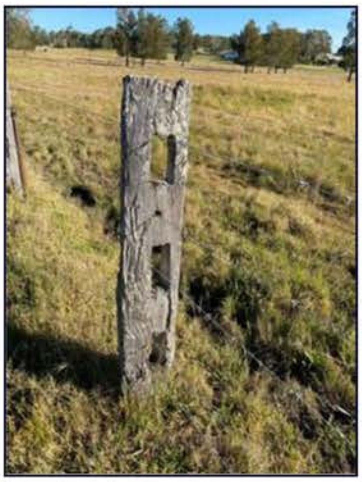
Photograph 3: Soakage swale running south-east to north-west across the property. View to the north-west.

Photograph 4: Wetland near western border

Photograph 5: Small dam on the swale running east to west across the property. View to north-east

Photograph 6: Entrance gate from Princes Highway displaying name 'Braemar Farm'. View to north.

Photograph 7: Wooden fence posts along western border with evidence of former post and rail construction. View to south-west.



Photograph 8: A three rail fence post. View to south-west.

Photograph 9: Fence with top rail recess into tree. This formed a small holding pen or possibly a race. View to south.

Photograph 10: Stockpile of timbers removed from fencing. View to east.

Photograph 11: Section of quarried granite with drill mark from quarrying. View to south-west.

Photograph 12: Tree with notches cut by sawyers to climb before felling with cross-cut saw. View to south.

Photograph 13: Tree with notches cut by sawyers to climb before felling with cross-cut saw. View to north.

Photograph 14: Notch cut by axe in felled tree.

Photograph 15: Showing sawyers standing on planks inserted into notches cut into the tree. Crosscut saw leaning against the centre of the tree.

Photograph 16: Possible foxhole trench

Photograph 17: Line of possible foxhole trenches

Photograph 18: Possible 15m foxhole trench

Photograph 19: Line of foxhole trenches

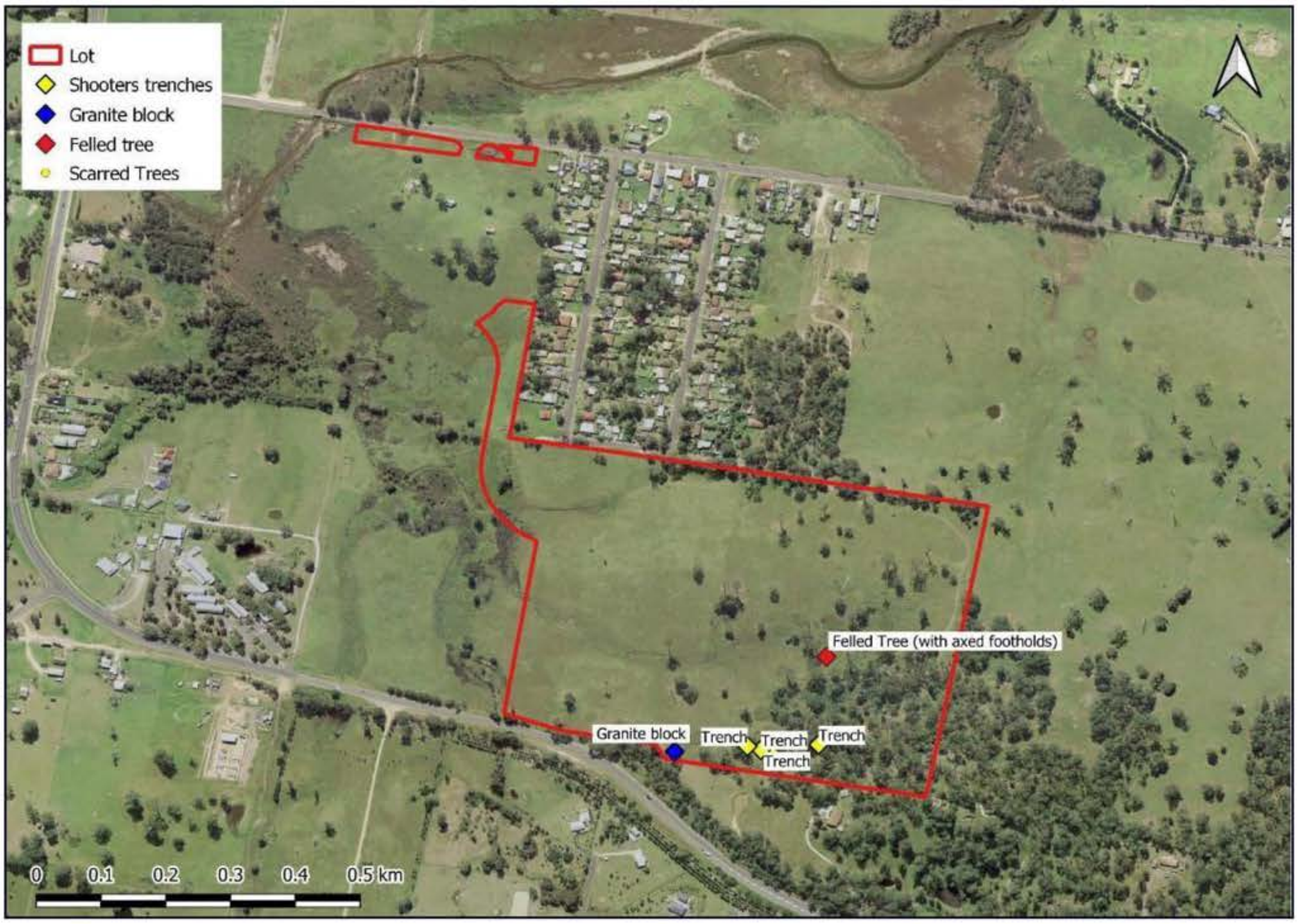


Figure 12: Site inspection results.

6.01 Summary

The results of the site inspection conducted on the 2nd and 3rd June 2021 can be summarised as follows:

- Evidence of non-Aboriginal cultural activity on the property is limited to:
    - The remains of timber post and rail fencing.
    - The felled tree with evidence of the notching by sawyers.
    - Two ring barked trees.
    - A small section of granite with evidence of drill hole from the quarrying process.
    - The faded name 'Braemar Farm' on the entry gate from the Princes Highway
- The is no evidence, either in the historic records or through the site inspection of any other built structures on the property.

7.0 ARCHAEOLOGICAL ASSESSMENT

7.01 Archaeological potential

To undertake an archaeological assessment, it is necessary to assess whether an area contains archaeological potential. For the purposes of this report "archaeological potential" is the likelihood of a site to contain archaeological deposits that are protected by the relics provisions of the NSW *Heritage Act* 1977.

Such an assessment is guided by an understanding of the site as revealed through historical research and a site inspection. This report contains detailed historical research and the results of the site inspection.

It is useful to identify the level of archaeological potential as low, medium or high. This indicates the level of impact on the potential archaeological resource and hence the likelihood of intact archaeological deposits remaining. The degree of archaeological potential does not necessarily equate with the identified level of significance. An area may be mostly intact but it may be assessed as having minimal heritage significance.

The following definitions of high, medium and low archaeological potential will be used to assess the archaeological potential of individual items identified through the historical research.

- A **high** level of archaeological potential indicates that there is a high probability that the archaeological remains of a structure or structures are reasonably intact as there have been little or no impact following the demolition of the known structures.
- A **medium** level of archaeological potential indicates that there is a medium probability that the archaeological remains of a structure are partially or mostly intact but there has been some impact on its integrity through later development.
- A **low** level of archaeological potential indicates that there is a low probability that the archaeological remains survive as there have been extensive impacts by known later development or works

7.02 Phases of occupation

To assist in determining the archaeological potential the site has been divided into 2 phases of occupation or use as detailed below. This provides a framework which assists in determining archaeological potential, as quite often each successive phase of use has impacted on the previous phase or phases:

Phase 1: Farmland (1858-61 till present)

During this phase of occupation, the Kurregal people were displaced and dispossessed, and the study area was converted to farmland on the outskirts of the township of Moruya. Over the next 170 years, the study area was largely deforested and used for cattle grazing. The study area was once part of Braemar Farm. The site was part of several allotments owned by various people. While the various allotments that constituted the study area changed hands on numerous occasions, the purpose of the land remained the same. The land is still being used for grazing.

Phase 2: Military Exercises

A new activity, different to the ones traditionally undertaken in the study area, is represented by a single episode of a military exercise that took place in the locality in the 1970s as attested by physical evidence and oral sources. This phase overlaps with Phase 2.

7.03 Timeline

The following timeline is provided to detail the various structures which have been located on the site at various times.

Table 1: Chronology of structures and features.

Lot 6 DP 1212271				
Phase	**Structure**	**Date Built**	**Source or section in report**	**Date demolished or disposed**
1	The study area was once part of Braemar Farm and was used for grazing and agriculture. The buildings associated with Braemar Farm were demolished for housing development. The current study area formed the southern paddock and no permanent structures were constructed. It has always been used for grazing and agriculture. A felled tree and fences present in the SE part of study area	1887	Page 13	2005
2	A series of possible foxholes in the SE part of the study area	1970s	Page 15	-

7.04 Assessment of archaeological potential

Detailed below is an assessment of the archaeological potential of each of the phases of occupation detailed above:

Phase 1: Pastoral and Farming Lands (1858-61 till present)

The study area was used for grazing and apart from remnant fences no other structures were built. Ringed barked trees and one tree, possibly felled using a cross-cut saw are evidence of the clearing of the land. There was no evidence of agricultural furrows. There is no significant archaeological evidence of this phase.

Phase 2: Military Exercises

The archaeological evidence for this period is represented by a series of possible foxhole trenches. There is no further evidence of this phase, therefore the archaeological potential is nil.

7.05 Summary

Since colonisation and the first purchase by non-Aboriginal people, the study area has been used for grazing and agriculture. In the 1970s a military exercise was staged in the study area and there are possible foxhole trenches within the study area. Archaeological evidence for historical farming and recent military activities has been identified in the study area. Apart from the features already identified, which have low archaeological potential, the archaeological potential is nil. Overall, the archaeological potential of the study area has been assessed as low (Table 2).

The remnant fences are not rare or unusual and are in a poor condition, whilst the possible foxhole trenches are in a very poor condition and are not an unusual feature. These features do not meet the criteria to be considered relics under the NSW *Heritage Act 1977.*

Table 2: Summary of archaeological potential

Phase	Dates	Activity	Evidence	Archaeological potential
1	Pre 17,000 BP – 1858-61	Assessed in a separate report.	-	-
2	1858-61 till present	Grazing and Agricultural	Remnant fencing and trees	Low
3	1970s	Military activities	Possible foxhole trenches	Nil

8.0 SIGNIFICANCE ASSESSMENT

8.01 Preamble

Significance Assessment is the process whereby buildings, items or landscapes are assessed to determine their value or importance to the community.

The following criteria have been developed by Heritage NSW and embody the values contained in the Burra Charter. The Burra Charter provides principles and guidelines for the conservation and management of cultural heritage places within Australia.

8.02 Assessment

Historical
Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area)
The archaeological potential within the study area does not meet this criterion.

Association
Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area)
The archaeological potential within the study area does not meet this criterion.

Aesthetic/Technical
Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)
The archaeological potential within the study area does not meet this criterion.

Social
Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons
The archaeological potential within the study area does not meet this criterion.

Research
Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)
The archaeological potential within the study area does not meet this criterion.

Rarity
Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)
The features identified within the study area are not rare and the archaeological potential within the study area does not meet this criterion.

Representative
Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's

- *cultural or natural places; or*
- *cultural or natural environments.*

or a class of the local area's

- *cultural or natural places; or*
- *cultural or natural environments*

The archaeological potential within the study area does not meet this criterion.

8.03 Statement of significance

The study area has low historical archaeological potential and the features identified are not significant relics.

10.0 SUMMARY AND RECOMMENDATIONS

10.01 Summary

The study area which has previously been used for grazing and agricultural purposes does not contain historical archaeological potential and it is not expected that relics will be located within the property. Therefore, there are no constraints on the proposed development in respect of historical archaeology.

The remnant fencing, possible foxholes, the two ringbarked trees and the tree that was possibly cut using a crosscut saw are not relics under the *Heritage Act 1977* and can be removed, if required. This report provides a record of those items, so no further recording or assessment is required.

10.02 Recommendations

The following recommendations are made on the basis of:

- Legal requirements under the terms of the *Heritage Act 1977*.
- The research and analysis contained in this report.
- Results of the assessment as outlined in this report.

Recommendation 1: Braemar Farm sign
The front entrance gate contains a faded sign containing the name "Braemar Farm". This sign should be carefully removed and donated to the The Moruya and District Historical Society for display in the Moruya Museum. The Museum contains other artefacts removed from the Braemar Farm Homestead before and during its demolition.

Recommendation 2: Interpretation
An interpretation plan and strategy should be developed and implemented which documents the history of Braemar Farm and its occupants.

Recommendation 3: Induction
All employees, contractors and subcontractors working on the hospital development should be provided with an induction into their responsibilities under the NSW *Heritage Act 1977* and that it is an offence to move, damage or destroy a relic.

Recommendation 4: Unexpected Finds Procedure
If any previously unidentified relics are unexpectedly uncovered, all work must cease in the vicinity of that relic whilst advice is being sought from the consultant.

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Six Maps Aerial Photographs, , Spatial Services NSW, as cited in the text.

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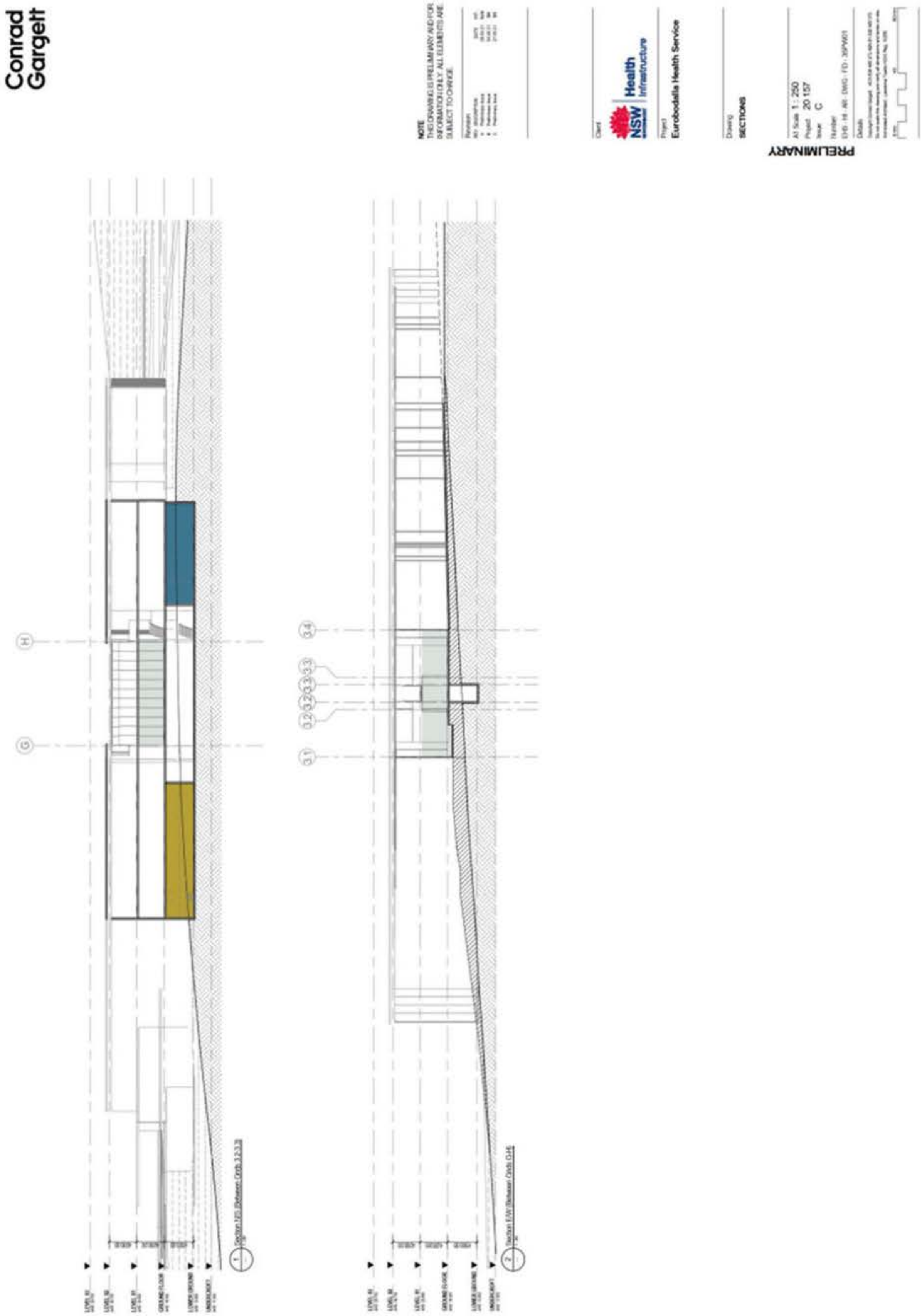
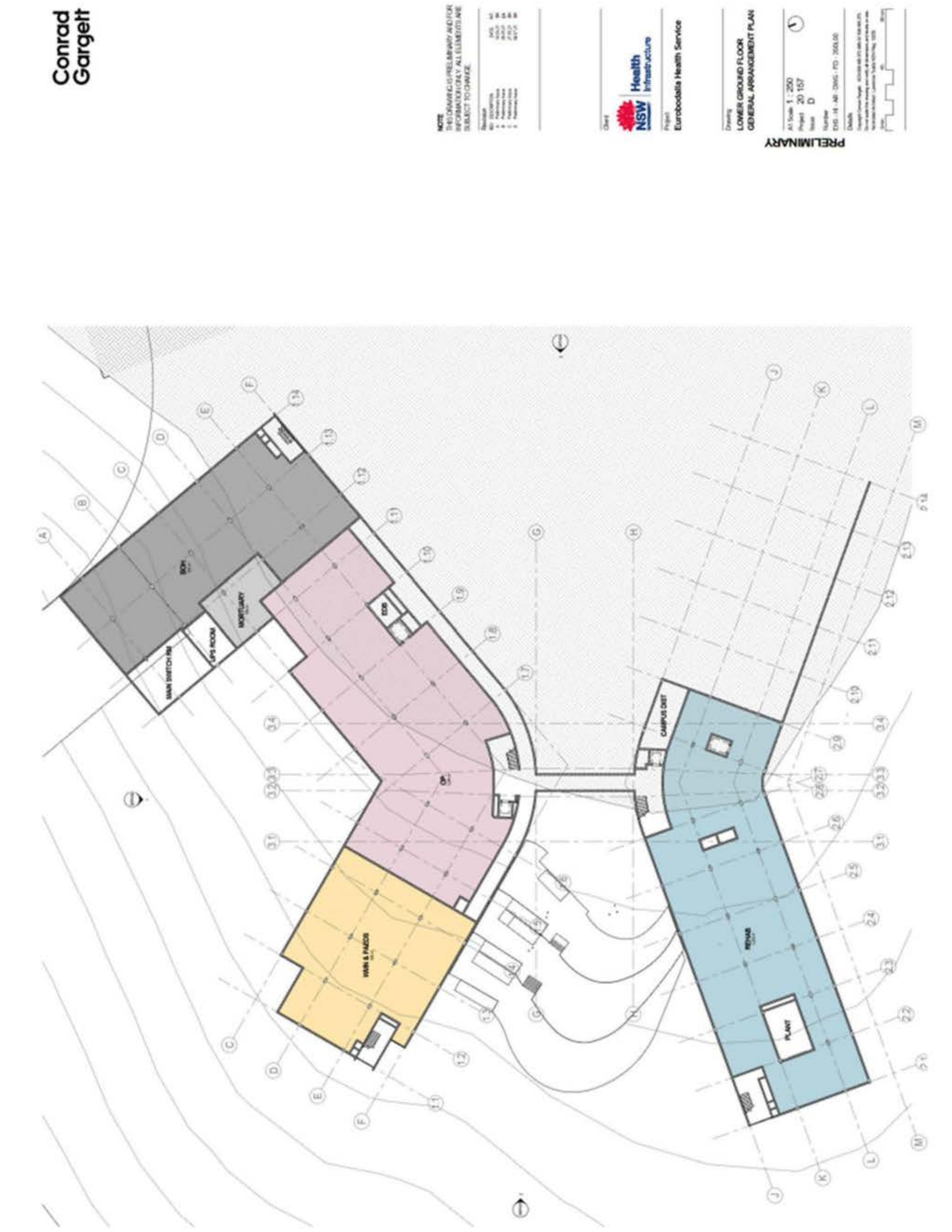
'History of Braemar Farm and the Subdivision,' http://www.braemarhomesteads.com.au/history.php, viewed 17 Jun 2021.

APPENDIX A: PLANS


Conrad Gargett
NSW
Health Infrastructure
Eurobodalla Health Service
MASTERPLAN - OVERALL PROPOSED
PRELIMINARY
CARPARK
ACCESS ROAD
PROPOSED BUILDING
POTENTIAL FUTURE EXPANSION
HELIPAD


Conrad Gargett
NSW
Health Infrastructure
Eurobodalla Health Service
SITE SECTIONS
A1 Scale 1 : 1000
Project 20 157
Issue A
PRELIMINARY


Conrad Gargett
NSW Health Infrastructure
Eurobodalla Health Service
SECTIONS
PRELIMINARY


Conrad Gargett
Eurobodalla Health Service
LOWER GROUND FLOOR
GENERAL ARRANGEMENT PLAN
PRELIMINARY
MORTUARY
UPS ROOM
MAIN SWITCH RM
CAMPUS DIST
REHAB
PLANT

LAND TITLES SCHEDULE

Lot 6, Princes Highway EUROBODALLA HOSPITAL

PORTIONS 54, 65 & 68						
DATE	**LOT & DP**	**CT/V & F**	**INSTRUMENT OF TRANSFER**	**FROM**	**TO**	**DETAILS**
1858, 18 Aug	Portion 54 21 acres	Ser 144 No 1568	Land Purchase	Crown	William Thomas of Nemgaroold [sp?]	Sold as Lot 5 £21
1861, 24 Jul	Portion 65 21 acres	Ser 173 No 1082	Land Purchase	Crown	William Thomas of Moruya	Sold as Lot 4 £21
1861, 13 Dec	Portion 68 21 acres within the Moruya Reserve	Ser 61 No 2425	Land Purchase	Crown	William Thomas of Moruya	Sold as Lot 7 £21
[1882]	Portions 54, 65 & 68			William Thomas	Sarah Green sole executor of Will of William Thomas'	William Thomas, farmer died 12 Feb 1882. Sarah Green née Sarah Thomas m. to John Green 1867 Broulee
1882, 13 Dec	Portions 54, 65 & 68	Bk 260 No 441	Mortgage	Sarah Green and husband John Green, labourer, Moruya	Edward Boot, surgeon of Moruya	John Green a sawyer died before 15 Jan 1885
1893, 3 Aug	Portions 54, 65 & 68	Bk 524 No 907	Reconveyance	Edward Boot, surgeon of Moruya	Sarah Green, widow of Moruya	
1893, 4 Aug	Portions 54, 65 & 68	Bk 524 No 908	Mortgage	Sarah Green, widow of Moruya	Phillip Jeffery, farmer of Moruya	
1894, 15 Nov	Portions 54, 65 & 68	Bk 547 No 602	Conveyance	Sarah Green, widow of Moruya	Phillip Jeffery, farmer of Moruya	£220
1902, 22 Mar	Portions 54, 65 & 68 [and other land]	Bk 708 No 826	Conveyance	John Jeffery, farmer of Moruya and Alfred Leggo Jeffery	Alfred Leggo Jeffery and James Jeffery farmers of Moruya	Phillip Jeffery d. 20 Jul 1900
1941, 6 Sep	Portions 54, 65 & 68 [and other land]	Bk 1901 No 747		Alfred Leggo, Jeffery, farmer of Moruya	Noel Llewellyn Jeffery, farmer of Moruya	
1971, 19 Aug	Portions 54, 65 & 68 [and other land]	Bk 3023 No 477		Noel Llewellyn Jeffery of Moruya	Patent Development Pty Ltd	Deed includes Lot 51 and Portion 50 (Braemar north and northwest of the study area) and other land.

LAND TITLES SCHEDULE
Lot 6, Princes Highway EUROBODALLA HOSPITAL

PORTIONS 54, 65 & 68						
DATE	LOT & DP	CT/V & F	INSTRUMENT OF TRANSFER	FROM	TO	DETAILS
		54/1107020, 65 & 68/752151			Not searched	Prior title Bk 3023 No 477 Next title 3/1164518
2011, 30 Jun		3/1164518			Not searched	Prior titles incl 51/1107021, 54/1107020 & 68/752151 Next title 6/1212271
		1/1165200			Not searched	Prior titles Next title 6/1212271
2015, 22 Sep	Lot 6 DP 1212271 Moruya	6/1212271				Current title not searched

PORTION/LOT 51 (Study area is NE corner of Ptn 51)						
DATE	LOT & DP	CT/V & F	INSTRUMENT OF TRANSFER	FROM	TO	DETAILS
1856, 29 Sep	[Portion] Lot 51 21 acres 'suburban allotment'	Ser 126 No 165	Land Purchase	Crown	Alexander Munro of Bergalia	Alexander Munro of Bergalia [a run south of Moruya] Sold as Lot 3, £69/6/- Munro also purchaser of Portion 50 (Ser 110 No 760, 7 Feb 1855) and town lots to the west
1863, 5 May	Lot 51 21 acres	Bk 83 No 154	Mortgage/subdivision	Alexander Munro, farmer of Moruya & Ann Munro his wife	George Rowley, solicitor of Newtown	As well as Lots and 50, 58 & 57
1865, 5 Aug	Lot 51 21 acres	Bk 94 No 644	Conveyance	Released to George Rowley by Alex Munro	John Rayner, wharfinger of Victoria Wharf	As well as Lots and 50, 58 & 57
1876, 19 Dec	Lot 51	Bk 165 No 405	Conveyance	John Rayner of Sydney gentleman	Mary Forster, widow of Dudley Hall Moruya	As well as Lot 50
1878, 28 Oct	Lot 51	Bk 187 No 382	Conveyance	Mary Forster, widow of Dudley Hall, Moruya	William Henry Simpson of Ninderrah [?] gentleman	£100 Lot 50 sold to Henry Kirwan King Bk 186 No 883
19 Jun 1882	Lot 51	Bk 247 No 371	Conveyance	Wm Henry Simpson of Ninderrah [?] near Moruya, gentleman	Henry Thomson, butcher of Moruya	Henry Thomson b. 1846? Glasgow d. 1899? [by 1902] Only Lot 51 included on

LAND TITLES SCHEDULE

Lot 6, Princes Highway EUROBODALLA HOSPITAL

PORTION/LOT 51 (Study area is NE corner of Ptn 51)						
DATE	**LOT & DP**	**CT/V & F**	**INSTRUMENT OF TRANSFER**	**FROM**	**TO**	**DETAILS**
						deed. Lived at Pompey Point in 1895 Gov Gaz Mar 1895, p1785. Dairy Farmer at Pompey Point, *Yewen's Directory*, 1900, 328
1932, 11 Oct	Lot 51	Bk 1651 No 515	Conveyance	Perpetual Trustee Co Ltd for Eliza Thomson, widow exec of Will of Henry Thomson	Sidney Louttit, farmer of Moruya	Eliza Thomson d. 16 Jul 1928
1950, 10 Nov	Lot 51	Bk 2155 No 883		Victor Leslie Louttit manufacturer & John Sidney Louttit, farmer (Will of Sidney Louttit d. 15 Oct 1949)	Noel Llewellyn Jeffery, farmer	As well as Lot 50 and other land.
1971, 19 Aug	Land incl subdivision of Portion 51 [and Portions 54, 65, 68 in the study area]	Bk 3023 No 477		Noel Llewellyn Jeffery	Patent Development Pty Ltd	Study area is NE corner of Ptn 51. Deed includes Portion 50 (north and northwest of the study area) and other land. Part of southern portion of Lot 51 resumed for the highway.
		51/1107021			Not searched	Prior title Bk 3023 No 477 Next title 3/1164518
2011, 30 Jun		3/1164518			Not searched	Prior titles incl 51/1107021 & 54/1107020 Next title 6/1212271
		1/1165200			Not searched	Prior titles Next title 6/1212271
2015, 22 Sep	Lot 6 DP 1212271 Moruya	6/1212271			Not searched	

APPENDIX C: BRAEMAR FARM HERITAGE LISTING

Site of Braemar Farm, formerly comprising Farmhouse remains and Outbuildings, and Bunya Pine

Item details

Name of item:
Site of Braemar Farm, formerly comprising Farmhouse remains and Outbuildings, and Bunya Pine

Other name/s:
Braemar Farm site and Bunya pine

Type of item:
Complex / Group

Group/Collection:
Farming and Grazing

Category:
Homestead Complex

Primary address:
6 Dr King Close, Moruya, NSW 2537

Local govt. area:
Eurobodalla

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
6 Dr King Close	Moruya	Eurobodalla			Primary Address
4 Braemar Drive	Moruya	Eurobodalla			Alternate Address

Statement of significance:

Historically the buildings construction is a rare surviving indicator of the post-1867 expansion of the limits of settlement of Moruya by a middle class immigrant from England keen to avail himself of the "salubrious air" of Moruya. Its location is likely to be associated with this historic fact. Thus the building has high-level local historic significance. The property has high-level regional social significance because of Englishman, Dr King's direct linkages with the pioneer Emmott family and because of the indications that the property was developed to house local social functions. Scientifically the building and mature plantings have high-level local significance for their potential to provide information about both farming and middle class living styles on the edges of Moruya township in the late 19th century.

Date significance updated: 31 Jul 07

Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the Department of Premier and Cabinet copyright and disclaimer.

Description

Designer/Maker:
Unknown
Builder/Maker:
Unknown
Construction years:
1870-
Physical description:
The Bunya Pine is the only visible physical remains to mark the site of the iconic farmhouse. Farmhouse and outbuildings were demolished.
Modifications and dates:
By 2010 the homestead had been severely damaged and was demolished at direction of the owner in late 2010, leaving only the chimney standing. Since then the developer has also removed the chimney. The Bunya Pine is the only visible physical remains to mark the site of the iconic farmhouse.
Further information:
Galvanised iron shed a later addition.

History

Historical notes:
Dr and Mrs King arrived in Moruya from England in 1877. The land was sold to Dr Kirwin King by Abraham Emmott in the late 1870s. Dr King had the house built in the late 1870s, soon after arriving in the district. He stayed for seven years after which he left (in August 1885) to return to England, expecting to stay there only for a year. The property was purchased by Sid Louttit and in the 1950s was sold to Noel Jeffrey of Moruya, who rented the property as a working dairy farm to partners Cowdroy and Ryan. The Stebbards rented the property next, then Frank Sutherland and his family. The last people to occupy the farmhouse were Aborigines. Dr King installed a flagpole on which he flew a flag whenever he was in residence. When the flag was absent his patients knew he was out. Abraham Emmott, a relation of Dr King, initially opened Braemer Farm which was used as a dairy farm and horse stud. Other buildings included a barn, piggery, fowlhouse, stables and a dairy. There was also a tennis court, an orchard and a garage later for modern owners' motor vehicles. Sidney Louttit bought the property from Abraham Emmott in 1924 and a description can be found in 'Not Just Ordinary People' by Pamela Oxley, although her statement on page 177 that a Dr Love built the house is incorrect according to Dr King's living relatives. Ms Oxley remembers visiting her Louttit relatives at "Braemar" and describes the lounge room as being 26 feet long with a door leading out on to the verandah. French doors graced the doorway between the lounge and dining room. The top half of the doors were stained glass pictures of two Crusaders, one on each door. The house had a large kitchen and pantry and the latter was converted to a bathroom by the Louttit family. The house is now badly deteriorated as a result of neglect.

Recommended management:

Retain Bunya Pine and prevent disturbance of root system and do not allow hardstand within the drip line.

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan	Eurobodalla Local Environmental Plan 2012	A11	20 Jul 12	No.78	3419
Local Environmental Plan - Lapsed	Eurobodalla Urban Local Environmental Plan 1999		10 May 02	No.85	2819
Heritage study		MORU/R049	01 Jan 97		

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Eurobodalla Heritage Study	1997	MORU/R049	The EJE Group	EJE	N o

References, internet links & images

Type	Author	Year	Title	Internet Links
Written			"Not Just Ordinary People , P Oxley, pp 177 and 178.	

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name:

Local Government

Database number:

1550136

Return to previous page

11.11 HLS Report

A division of Resolution Response Pty Ltd
ABN 94 154 052 883

EURORODALLA HEALTH SERVICE HELICOPTER LANDING SITE CONCEPT DESIGN REPORT

2 September 2021	HLS Concept Design Report - Eurobodalla
Prepared for	NSW Health Infrastructure

Version 2.0

AviPro

Document Verification
Page 1 of 1

Job title:	Eurobodalla Health Service Helicopter Landing Site Concept Design Report
Document title:	Aviation Concept Design Report – Mounded Helicopter Landing Site
Document ref:	Eurobodalla CD V2.0

Revision	Date	File name			
V1.0	23.03.21	Description	DRAFT HLS Concept Design Report – Eurobodalla Health Service		
			Prepared by	**Checked by**	**Approved by**
		Name	[redacted]		
		Signature	[redacted]		
V1.1	15.06.21	Description	Amended following feedback and due to issue of CASA Advisory Circular 133-1 Performance class operations on 23 Mar 21.		
			Prepared by	**Checked by**	**Approved by**
		Name	[redacted]	[redacted]	[redacted]
		Signature	[redacted]		
V2.0	02.09.21	Description	Amended for HLS relocation and revised survey requirements due to recent ICAO publication revisions (supported by CASA).		
			Prepared by	**Checked by**	**Approved by**
		Name	[redacted]	[redacted]	[redacted]
		Signature	[redacted]		

This Report is prepared for NSW Health Infrastructure, as instructed by Root Partnerships, in relation to the potential development of a Helicopter Landing Site at the Eurobodalla Health Service (Moruya) by Resolution Response Pty. Ltd. ABN: 94 154 052 883, trading as 'AviPro'.

The Report relates to the aviation aspects associated with the establishment and site design of the potential hospital mounded, on-grade helicopter landing site to inform Design and other Submissions.

Contents

1. EXECUTIVE SUMMARY AND RECOMMENDATIONS

The scope of work required of AviPro includes detailed advice and feedback on the positioning of the helicopter landing site (HLS) within the future Eurobodalla Health Service (EHS) campus; and detailed advice on the design of the HLS approach and departure paths, including their impacts. The analysis has resulted in a workable solution (based on HLS Option 1) that is safe, noting that the design needs to fit with other development considerations, as well as on-site and off-site factors.

The design of the HLS is based upon the current NSW Ministry of Health (MoH) Guidelines for Hospital Helicopter Landing Sites in NSW, reissued on 1 July 2020, supplemented by recent advice on survey requirements issued by the International Civil Aviation Organisation (ICAO). The positioning of the HLS will result in a solution which allows for two obstacle free VFR approach and departure paths positioned 135º-180º apart with directions generally east/west.

The Guidelines relate to the structural requirements for the static and dynamic loads to meet the Design Helicopter limitations drawn from the ICAO Heliport Manual Doc 9261-AN/903 recommendations. For the dimensions, marking and lighting for the LLA, TLOF, FATO and the Safety Area for the Design Helicopter, plus the VFR approach and departure surface, the Guidelines draw upon the FAA document AC 150/5390-2C, Heliport Design and the ICAO Heliport Manual.

In order to achieve the necessary clearance from obstructions for a compliant Performance Class 1 survey, the HLS will need to be raised by a small number of metres to clear terrain immediately to the east.

Care must be taken to ensure that the ramp and walkway from the completed HLS is no steeper than a 1:20 gradient.

Fencing must be provided around the completed, redeveloped HLS.

Approaches and departures to and from the east and west, which are largely dictated by surrounding terrain, vegetation, populated areas and hospital design, will still accord reasonably well with average prevailing winds in Moruya.

The positions of associated buildings, light poles, fences, car parks and gardens will require close coordination to ensure that they do not become obstructions to the chosen approach and departure paths. Some existing trees are likely to be obstructions to the chosen approach and departure paths and will need to be removed. Exact details of which trees would be sentenced to removal will not be known until deeper into the design phase.

Being on-grade, the HLS level will be below the Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation Services – Operations (PANS-OPS) surfaces for Moruya Airport operations. There will be no impact on ATC communications, navigation and surveillance (radar) systems. As this is an on-grade HLS, approvals from CASA and AsA will not be required.

A formal VFR approach and departure path and transitional surface survey would need to be completed as part of HLS commissioning to meet Performance Class 1 requirements prior to operations from a new HLS. This needs to be costed and included in the builder's Scope of Work. The survey must also incorporate a DDO for the purposes of protecting the airspace from future development below the VFR approach and departure paths and transitional surfaces (which do not impact future development considerations).

An HLS Operations Manual must be developed to support operational activities of the completed HLS and to manage safety aspects of helicopter overflight of the new grassed area in the south-eastern corner of the hospital campus.

2. BACKGROUND

2.1. Establishment

In December 2020, the NSW Government announced the site location for the new $200 million Eurobodalla Health Service in south-east Moruya. The new Eurobodalla Health Service will be a sustainable, modern and purpose-built facility that supports the needs of the entire Eurobodalla Shire from Narooma to Batemans Bay. Using the latest health care solutions and models of care, the new health service will deliver patient-centred health services closer to home.

As part of the development, it is proposed to include a Helicopter Landing Site (HLS) in the design. AviPro has been engaged by NSW Health Infrastructure to undertake a review of the aviation specific requirements relative to the construction of a suitable on-grade HLS on the hospital campus. Considerations include: wind analysis, obstacle analysis, size and area requirements, structural design standards, markings, lighting, approach and departure paths etc.

2.2. HLS Terms of Reference and Applicability

Currently within Australia, there are no set rules or regulations applicable to the design, construction or placement of HLS'. There may however be local council planning, location and movement approvals required. The appropriate national regulatory guidance at present for the use of HLS' is Civil Aviation Regulation (CAR) 92 which places the onus on the helicopter pilot to determine the suitability of a landing site.

CASA, the regulator of aviation in Australia divested itself of direct responsibility for regulating HLS' in the early 1990s and currently provides only basic operating guidelines via Civil Aviation Advisory Publication (CAAP) 92-2 (2) Guidelines for the Establishment and Operation of Onshore Helicopter Landing Sites. CASA does not provide design, structural information or advice beyond that provided in the CAAP. CASA, as a component of a Regulatory Reform Program, does propose to prepare rules for HLS' and currently has a panel established for this purpose. The new rules will form Civil Aviation Safety Regulation (CASR) Sub-part 139R, and it is expected that they will be published in 2021. If and when they are introduced, there will be an implementation phase and "grandfather" clauses. Standards set by NSW Health Infrastructure and NSW Ambulance were established to meet or exceed anticipated CASA requirements.

Considerable work has been undertaken internationally over many years in this area, particularly through the International Civil Aviation Organisation (ICAO) and the US Federal Aviation Administration (FAA). The resulting documents on the subject provide excellent advisory material, guidelines and best practice standards.

ICAO sets out international Standards and Recommended Practices (SARPS) for the safe conduct of civil aviation activities in the Annexes to the Convention on International Civil Aviation (Chicago, 1944), with the following Annexes applicable to helicopter operations:

- Annex 6: Operation of Aircraft - Part III: International Operations – Helicopters, 10th Edition July 2020 (AL 0), and
- Annex 14: Aerodromes - Volume II: Heliports, 5th Edition 2020 (AL 9).

Even though the current edition of Annex 14 is dated 2020 and released in 2021, recent amendments are largely superficial and the basic document dates back to 1995. Additional guidance on the design of heliports and HLS was, in the past, provided in ICAO's Heliport Manual (Doc. No. 9261-AN/903). This document was re-released as the 5rd Edition in 2021, with a caveat that states as follows: "Part II is of this document is an unedited version of an ICAO publication and has not yet been approved in final form. As its content may still be supplemented, removed, or otherwise modified during the editing process, ICAO shall not be responsible whatsoever for any costs or liabilities incurred as a result of its use." This document presently provides supplementary guidance on HLS in the onshore environment (noting the restrictions/risk on its use). Importantly, CASA recommends use of this document.

ICAO Annex 14 Volume II: Heliports 5th Edition 2020 (AL 9) provides SARPS for the planning, design, operation and maintenance of HLS facilities for use by the providers of these facilities. CAAP 92-2(2) provides only limited guidance material on the minimum physical parameters required to assist helicopter pilots and operators in meeting their obligations under CAR 92.

As a signatory to the Convention on International Civil Aviation, Australia has undertaken to apply the ICAO SARPS, except where specific differences have been notified to ICAO.

The Australian Supplement to Annex 14 Volume II dated 3 December 2020, lists 85 pages of CASA recommended differences to the ICAO SARPS relating to heliports. Subject to these (and earlier) differences, CASA supports the adoption of Annex 14: SARPS for heliports. The differences recommended by CASA are generally no longer considered by NSW Ambulance, Helicopter Emergency Medical Service (HEMS) contractors or the industry as either best practice or appropriate.

CASA has for some years been undertaking a Regulatory Reform Program in the rotary wing area and it is assumed that the ICAO SARPS with some of the differences removed, will form the basis of the proposed Civil Aviation Safety Regulations (CASR).

Proposed new CASRs include:

- Part 133 pertaining to Commercial Air Transport Operations;
- Part 138 pertaining to Aerial Work operations; and
- Sub-part 139.R pertaining to HLS.

Within Australia HEMS comes under Aerial Work, however from 2 December 2021 helicopter aeromedical functions come under the proposed Air Transport operations category as Medical Transport Operations (MTO) within Part 133. CASA issued Advisory Circular (AC) 133-1 Performance class operations on 23 Mar 21 to commence implementation of the change. From 2 December 2021, the highest standards required of Air Transport (the carriage of passengers for hire and reward) will apply to MTO, including all HEMS operators in Australia.

Many years of experience operating large numbers of helicopters in a range of roles, have resulted in the production of comprehensive HLS and heliport design and operating procedures in some parts of the world. The US FAA has produced an Advisory Circular, the content of which is actually required in the US, detailing the necessary standards. Within the AC is a comprehensive section devoted to hospital based "helicopter landing sites", and where more than one HLS is co-located, "heliports".

The resulting documents on the subject provide excellent advisory material, guidelines and best practice standards. Key current documents are as follows:

- Annex 14: Aerodromes - Volume II: Heliports 5th Edition 2020 (AL 9)
- ICAO Heliport Manual Doc 9261-AN/903 (once Part Two for onshore heliports is approved for unrestricted use),
- US FAA Advisory Circular AC 150/5390-2C, Heliport Design, (covers both operational and design criteria, particularly for hospital-based HLS' in Chapter 4, Hospital Heliports),
- Australian CASA Civil Aviation Advisory Publication (CAAP) 92-2 (2) Guidelines for the Establishment and Operation of Onshore Helicopter Landing Sites (covers essentially operational specifications only),
- CASA Advisory Circular 133-01 Performance class operations,
- Australian Department of Infrastructure, Transport, Regional Development and Communications: National Airports Safeguarding Framework (NASF) - Protecting Strategically Important Helicopter Landing Sites - Guideline H, and
- NSW Health GL2020_014 Guidelines for Hospital Helicopter Landing Sites in NSW issued 1 July 2020 (referred to in this report as "the Guidelines"), were prepared primarily around the ICAO and FAA guidelines and standards utilising the most appropriate recommendations and practical HEMS operating procedures.

The Guidelines are the primary standards used in this report and will be the primary document against which the commissioning compliance is measured, noting some enhanced standards due to recent CASA and ICAO advice.

Other publications and documents of relevance include:

- Adherence to the performance requirements specified in the Rotorcraft Flight Manual (RFM) of the primary helicopter types used by NSW Ambulance, and those likely to be used in the future;
- Acknowledgement of the proposed requirements of CASA CASRs Parts 133 and 138 effective from 2 December 2021; and
- Noise effect as a result of approaching and departing helicopters over particular flight paths, and thus the use of "Fly Neighbourly" techniques.

There is an additional very important consideration which is not aviation related, but clinical. That is, that the HLS should be within easy reach and travel of the ED, ICU or NICU as the case may be. This is generally considered to be not more than approximately 100m. There is no authoritative source for the distance of 100 metres, however according to the original author of these Guidelines, this distance has been accepted and included since its first edition. The distance was derived through consultation with a wide range of NSW Health and NSW Ambulance staff.

2.3. Background Material

Reference material provided by the new Eurobodalla Health Service Project Team is included in this report.

2.4. Methodology

A desktop assessment of revised material provided by the Eurobodalla Health Service Project Team was completed and a second visit to the site was made on 6 August 2021. Criteria from all relevant references were assessed, with the Guidelines and recently-released ICAO publications used as the primary tool.

2.5. Explanation of Terms

Aircraft. Refers to both aeroplanes (fixed wing) and helicopters (rotorcraft).

Approach and Departure Path (IFR). The flight track helicopters follow when landing at or departing from the FATO of an HLS under the Instrument Flight Rules. The IFR approach and departure path extends upwards and outwards from the edge of the FATO safety area with an obstacle free gradient of 2.6^0/4.5%/ 1:22.2 (22.2 units horizontal in 1 unit vertical), to a height of 152m above the FATO at a distance of ~3,386 m. The approach and departure path commences at the forward edge of the FATO safety area at a width of 34m, and increases in width uniformly to 152m m above the elevation of FATO surface at a distance of ~3,386 m.

Approach/Departure Path (VFR). The flight track helicopters follow when landing at or departing from the FATO of an HLS. Updated standards to align with ICAO requirements now has the VFR (day and) night approach and departure path extending upwards from the forward edge of the FATO safety area with an obstacle free gradient of 2.6^0/4.5%/ 1:22.2 (22.2 units horizontal in 1 unit vertical), to a height of 152m above the FATO at a distance of ~3,386 m. The approach and departure path commences at the forward edge of the FATO safety area at a width of 34m, and expands uniformly, laterally at an angle of 8.7^0/15%/1:12.8 to a total width of 140 m, then remains parallel to a distance of ~3,386m, where the height is 152 m above the elevation of FATO surface.

Design Helicopter. The Agusta AW139 contracted to the NSW Ambulance. The type reflects the new generation Performance Class 1 capable helicopters used in HEMS and reflects the maximum weight and maximum contact load/minimum contact area. The design helicopter has a maximum all up mass of 7 tonnes, however for HLS design purposes it is assumed the helicopter will never exceed 6.8 tonnes on the HLS.

D Value (Overall Length). The distance from the tip of the main rotor tip plane path to the tip of the tail rotor tip plane path or the fin if further aft, of the Design Helicopter.

Elevated Helicopter Landing Site. An HLS located on a roof top or some other elevated structure where the Ground Effect Area/Touchdown and Lift-off Area (TLOF) is at least 2.5m above ground level.

Final Approach. The reduction of height and airspeed to arrive over a predetermined point above the FATO of an HLS.

Final Approach and Takeoff Area (FATO). A defined area over which the final phase of the approach to a hover, or a landing is completed and from which the takeoff is initiated. For the purposes of these guidelines, the specification of 1.5 x D Value or Overall Length of the Design Helicopter is used and equates to 25m. diameter. Area to be load bearing.

Ground Taxi. The surface movement of a wheeled helicopter under its own power with wheels touching the ground.

Hazard to Air Navigation. Any object having a substantial adverse effect upon the safe and efficient use of the navigable airspace by aircraft, upon the operation of air navigation facilities, or upon existing or planned airport/heliport capacity.

Helicopter Landing Site (HLS). One or more may also be known as a **Heliport**. The area of land, water or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities.

Helicopter Landing Site Elevation. At an HLS without a precision approach, the HLS elevation is the highest point of the FATO expressed as the distance above mean sea level.

Helicopter Landing Site PC1 Survey Reference Point. A position at the forward edge of the FATO safety area in the centre of the approach and departure path, from which the PC1 survey at 2.6º (4.5%) is initiated.

Helicopter Landing Site Reference Point (HRP). The geographic position of the HLS expressed as the latitude and longitude at the centre of the FATO.

Hospital Helicopter Landing Site. HLS limited to serving helicopters engaged in air ambulance, or other hospital related functions.

> ***Note:***
>
> *A designated HLS located at a hospital or medical facility is an emergency services HLS and **not** a medical emergency site.*

Heliport. Two or more co-existing helicopter landing sites (HLS). There are no implications for operating a heliport as opposed to an HLS, other than having a “Heliport Operations Manual” rather than an “HLS Operations Manual” which would address the various interactions and interoperability (aviation, clinical etc) at the dual sites.

Hover Taxi. The movement of a helicopter above the surface, generally at a wheel/skid height of approximately one metre. For facility design purposes, a skid-equipped helicopter is assumed to hover-taxi.

Landing and Lift Off Area (LLA). A load-bearing, nominally paved area, normally located in the centre of the TLOF, on which helicopters land and lift off. Minimum dimensions are based upon a 1 x metre clearance around the undercarriage contact points of the Design Helicopter.

Lift Off. To raise the helicopter into the air.

Movement. A landing or a lift off of a helicopter.

Object Identification Surface. The OIS are a set of imaginary surfaces associated with a heliport. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to a helicopter during an entirely visual approach.

Obstacle Limitation Surface. The OLS are a set of imaginary surfaces associated with an aerodrome. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to aircraft during an entirely visual approach.

Obstruction to Air Navigation. Any fixed or mobile object, including a parked helicopter, which impinges the approach/departure surface or the transitional surfaces.

Parking Pad. The paved centre portion of a parking position, normally adjacent to an HLS.

Performance Class 1 (PC1). Similar to Category A requirements. For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to land within the rejected take-off distance available, or safely continue the flight to an appropriate landing area, depending on when the failure occurs. For an elevated HLS, the reject area is that area within the FATO (25 m. diameter) and therefore this area is to be load bearing. PC1 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 2 (PC2). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to safety continue the flight, except when the failure occurs early during the take-off manoeuvres, in which case a forced landing may be required. PC2 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 2 With Exposure (PC2WE). PC2WE is very similar to PC2 as mentioned above. The primary difference is that there need not be any provision for a suitable forced landing area during the take-off and landing phases of flight, within the designated exposure period for the rotorcraft. PC2WE offers operators alternative mitigation strategies based on: a defined exposure time limit, demonstrated engine reliability, engine maintenance standards, pilot procedures and training, and operator risk assessments. Specific approval to operate with exposure is required from CASA and will require a number of mitigation strategies from the operator to gain that approval.

Performance Class 3 (PC3). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit at any time during the flight, a forced landing:

- in the case of multi-engine rotorcraft – may be required; or
- in the case of single-engine rotorcraft – will be required.

Pilot Activated Lighting (PAL). A PAL system utilises a hospital-based VHF radio and timed switching device, activated by the pilot via a radio transmission on a pre-set frequency, to turn on the associated HLS lighting.

Prior Permission Required (PPR) HLS. An HLS developed for exclusive use of the owner and persons authorized by the owner, i.e. a hospital-based emergency services HLS.

Note:

The HLS owner and the HEMS operator are to ensure that all pilots are thoroughly knowledgeable with the HLS (including such features as approach/departure path characteristics, preferred heading, facility limitations, lighting, obstacles in the area, size of the facility, etc.). This is addressed as part of the HLS commissioning process.

Rotor Downwash. The volume of air moved downward by the action of the rotating main rotor blades. When this air strikes the ground or some other surface, it causes a turbulent outflow of air from beneath the helicopter.

Safety Area. A defined area on an HLS surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. This area should be free of objects, other than those frangible mounted objects required for air navigation purposes. The Safety Area for the Design Helicopter extends 4.5 m. beyond the FATO perimeter forming a 34 m. X 34 m. square or a 34m. diameter circle.

Safety Net. Surrounds the outer edge of a rooftop HLS. It is to be a minimum of 1.5 m. wide and have a load carrying capacity of not less than 122 kg/m^2. The outer edge is not to project above the HLS deck, and slope back and down to the deck edge at approximately 10 degrees, and not more than 20 degrees. Both the inside and outside edges of the safety net are to be secured to a solid structure.

Shielded Obstruction. A proposed or existing obstruction that does **not** need to be marked or lit due to its close proximity to another obstruction whose highest point is at the same or higher elevation.

Standard HLS. A place that may be used as an aerodrome for helicopter operations by day and night.

Take off. To accelerate and commence climb at the relevant climb speed.

Take off Position. A load bearing, generally paved area, normally located on the centreline and at the edge of the TLOF, from which the helicopter takes off. Typically, there are two such positions at the edge of the TLOF, one for each of two takeoff or arrival directions.

Touchdown and Lift-off Area (TLOF). A load bearing, generally paved area, normally centred in the FATO, on which the helicopter lands or takes off, and that provides ground effect for a helicopter rotor system. Size is based on 1 x main rotor diameter of Design Helicopter, and is 14m diameter.

Transitional Surfaces. Starts from the side edges of the FATO safety area parallel to the approach and departure path centre line, and extends upwards and outwards (to the sides) at a slope of 2:1 (two-units horizontal in one-unit vertical or 26.6°) to a height of 45m above the elevation of the FATO surface. Further, from the forward edge of the side transitional surfaces, the transitional surface joins the outer edges of the approach and departure surface, and proceeds upwards and outwards until the outer edges are 152m wide at ~3386m which corresponds with the end of the approach and departure surface.

Unshielded Obstruction. A proposed or existing obstruction that may need to be marked or lit since it is **not** in close proximity to another marked and lit obstruction whose highest point is at the same or higher elevation.

2.6. Applicable Abbreviations

Acronym	Meaning
AC	US FAA Advisory Circular
ACC	Aeromedical Control Centre (HQ Eveleigh). Responsible for control and tasking of HEMS
ACMA	Australian Communication and Media Authority
AsA	Airservices Australia
CAAP	Civil Aviation Advisory Publication (Australia)
CASA	Civil Aviation Safety Authority (Australia)
CAOs	Civil Aviation Orders (Australia)
CARs	Civil Aviation Regulations (1988) Australia
CASRs	Civil Aviation Safety Regulations (1998) Australia
CTAF	Common Traffic Advisory Frequency (5 nm. Radius, ground level to 3,000')
DDO	Design and Development Overlay
ED	Emergency Department
EHS	Eurobodalla Health Service
ESC	Eurobodalla Shire Council
FAA	Federal Aviation Administration, USA
FATO	Final Approach and Take-Off Area (1.5 x helicopter length)
FARA	Final Approach Reference Area
FMS	Fixed Monitor System (foam fire-fighting system)
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Service

Acronym	Meaning
HI	Health Infrastructure
HLS	Helicopter Landing Site
HLSRO	HLS Reporting Officer (Airservices Australia requirement)
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions - requiring flight under IFR
L	Length (also referred to as Overall Length), in relation to a helicopter, the total distance between the main rotor and tail rotor tip plane paths when rotating
LDP	Landing Decision Point (Category A/Performance Class 1 operations)
LHD	Local Health District
LLA	Landing and Lift Off Area. Solid surface meeting dynamic loading requirements, with undercarriage contact points + I metre in all directions
MoH	Ministry of Health NSW
MRI	Magnetic Resonance Imagers
MTOW	Maximum Take Off Weight
NOTAM	Notice to Airmen. Issued by Airservices Australia in relation to airspace and navigation warnings
NVG	Night Vision Goggle(s)
OIS	Object Identification Surface(s) (Heliport/HLS)
OLS	Obstacle Limitation Surface(s) (Aerodrome)
PC1	Performance Class 1
PC2	Performance Class 2
PC3	Performance Class 3
RD	Main Rotor Diameter
SARPS	Standards and Recommended Practices developed by ICAO and promulgated in the Annexes to the Convention of International Civil Aviation
TDP	Takeoff Decision Point (Category A/Performance Class 1 operations)
TLOF	Touch Down and Lift Off Area. Load bearing min. 1 x main rotor diameter.
VFR	Visual Flight Rules
VHF	Very High Frequency radio
VMC	Visual Meteorological Conditions - allowing flight under VFR
V_{TOSS}	Take off Safety Speed

2.7. List of Figures

3. GENERAL AVIATION REQUIREMENTS AND CONSIDERATIONS

3.1. Section Description

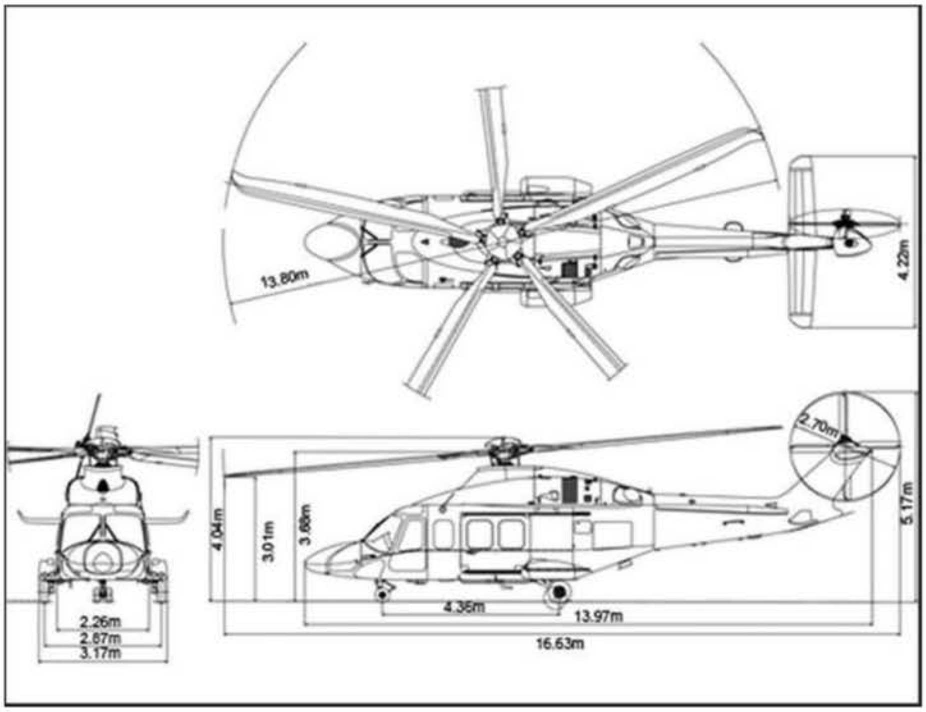
This Section provides general principles considered for all HLS developments at hospitals in NSW. Section 4 provides commentary specific to the new Eurobodalla Health Service HLS.

3.2. Design Helicopter

The predominant helicopter type to use the proposed HLS is the Agusta Westland (Leonardo) AW139. The AW139 is the largest/heaviest of the types employed by NSW Ambulance and is the "Design Helicopter" for planning purposes. The Design Helicopter is almost the same dimensions as the Bell 412 series formerly in common use, but has a normal Maximum Take Off Weight (MTOW) of 7,000 kg. See Figures 1 and 2.

Figure 1: NSW Ambulance AW139 "Design Helicopter"

The external dimensions of the AW139 are seen at Figure 2.



3.3. Helicopter Landing Site Loading and Dimensions

The primary reference for the following information is the NSW MoH Guidelines for Hospital Helicopter Landing Sites in NSW. All loadings and dimensions are based upon the Design Helicopter at Maximum Take Off Weight (MTOW) of 6.8 tonnes.

The minimum acceptable static loading for the HLS is 6.8 tonnes.

3.3.1. Surface Level HLS Strength

For a surface level HLS, advisory information recommends that the dynamic loads will be met with a sealed TLOF constructed of 15cm thick reinforced Portland cement/concrete.

3.3.2. FATO

Diameter minimum 1.5 x Length = 1.5 x 16.62 m. = 24.93m., and a maximum slope in any direction not exceeding 3%. Rounded up, the FATO is required to be a **diameter of 25m.** The FATO is to be load bearing (See Figure 3).

3.3.3. TLOF

Diameter minimum 1 x main rotor dia. of 13.8 m. Rounded to a **diameter of 14m.** The TLOF is load bearing (See Figure 4).

3.3.4. Safety Area

The FATO shall be surrounded by a Safety Area which is to be free of all obstacles.

The purpose of a Safety Area is to:

- reduce the risk of damage to a helicopter caused to move off the FATO by the effect of turbulence or cross-wind, mis-landing if on- grade, or mishandling; and
- protect helicopters flying over the area during landing, missed approach or take-off by providing an area which is cleared of all personnel and obstacles except small, frangible objects which, because of their function, must be located on the area.

Since CASA issued Advisory Circular (AC) 133-01 v2.0 Performance class operations on 23 March 2021, the Safety Area surrounding a FATO intended to be used in visual meteorological conditions (VMC) is to be calculated differently to what is stated in the Guidelines. It is now based on twice the maximum length (D value) of the Design Helicopter and rounded up. This size assumes that all markings and lighting will be in place. For the Design Helicopter, the D value is 16.62 m. (see Figure 2 above) rounded up to 17 m.

The new Safety Area calculation is 2 x D (17 m.) = **34m** (See Figure 4 below) instead of the previous 33 m.

No fixed object shall be permitted on a Safety Area, except for frangibly mounted objects which, because of their function, must be located on the area. No mobile object shall be permitted on a Safety Area during helicopter operations. Objects whose functions require them to be located on the safety area shall not exceed a height of 20- 25 cm. when located along the edge of the FATO, nor penetrate a plane originating at a height of 20-25 cm. above the edge of the FATO and sloping upwards and outwards from the edge of the FATO at a gradient of 5%.

The surface of the Safety Area shall not exceed an upward slope of 3º or 5% outwards from the edge of the FATO.

The surface of the Safety Area abutting the FATO shall be continuous with the FATO and the whole of the Safety Area when on-grade shall be treated to prevent loose items and any other flying debris caused by rotor downwash. The minimum recommended Safety Area surrounding the FATO is dependent upon whether there are suitable markings for the FATO, the TLOF and the central "H". The Safety Area surrounding an elevated HLS may incorporate the Safety Net and may be partially in space.

Figures 3 and 4 following are examples of round HLSs showing the dimensions.

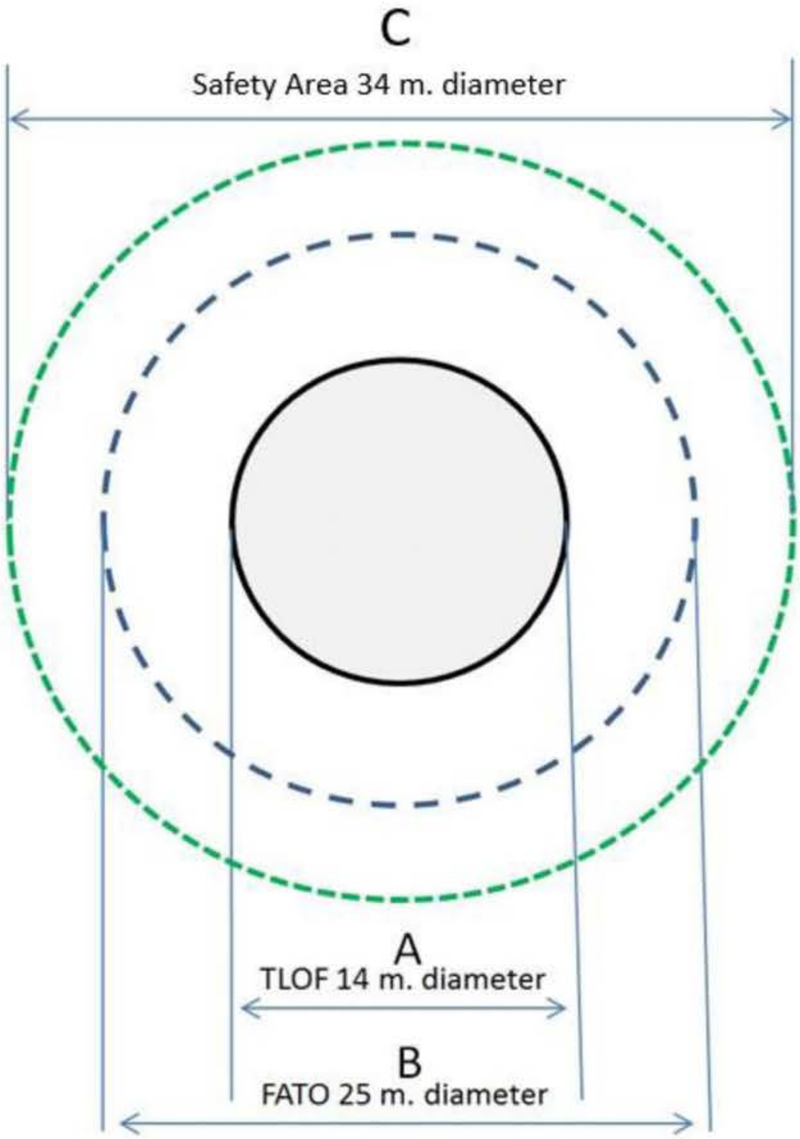


Figure 3: TLOF and FATO/Safety Area Relationships and Dimensions

<u>**Note**</u>: Preference is for a round HLS.

Design Helicopter:	**Agusta AW139**
RD:	Rotor diameter of the design helicopter
L:	Overall length of the design helicopter
A – TLOF diameter:	1.0 x RD (14 m.) All load bearing.
B – FATO diameter:	1.5 x L (25 m.). All load bearing.
C – Safety Area width:	2 x D (17 m.)

Min separation between perimeters of the TLOF and FATO: 0.5 (1.5 x L – 1.0 x RD) (5.5 m.)

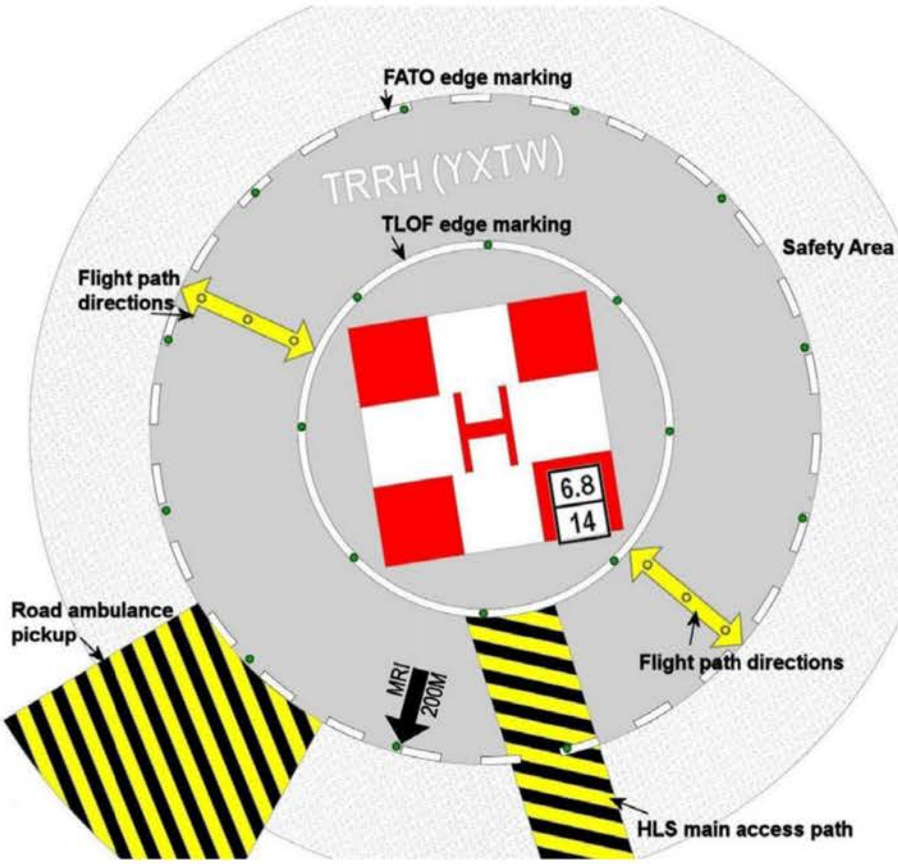


Figure 4: TLOF, FATO, "H" and Weight/Rotor Diameter Markings
(ground level – no safety net)

Note:

1. The "H" is orientated to Magnetic North.
2. The perimeter of the TLOF is defined with a continuous, 30cm. wide white line.
3. The perimeter of the FATO is defined with a 30cm. dashed white line approximately 1.5m. in length, and with end-to-end spacing of approximately 1.5m.
4. VFR approach/departure path direction are examples only.
5. HLS deck static weight limit for the AW139 is 6.8 tons.
6. The rooftop HLS will not have a road ambulance pick-up area.

3.4. Approach and Departure Paths

The purpose of approach and departure path is to provide a portion of airspace sufficiently clear of hazards to allow safe approaches to, and departures from, the HLS. Approach and departure paths can be designed for both visual (VFR) use by day and by night using different criteria; and for instrument (IFR) flight (also by day and night, albeit there are no differences in design requirements).

VFR approach and departure paths should be such that there are no downwind operations and crosswind operations are kept to a minimum. To accomplish this, an HLS must have more than one path which provides an additional safety margin and operational flexibility.

The preferred flight approach and departure path should where possible, be aligned with the predominant, prevailing wind when taking account of potential obstacles. Other approach and departure paths should also be based on an assessment of the average, prevailing winds and potential obstacles. The separation between approach and departure paths should not be less than 135^0, and should preferably be 180^0.

3.5. VFR Approach and Departure (Take-off Climb) Surface

VFR approach and departure surfaces can be designed for both day and night operations. Because all NSW hospital HLS' are required to be capable of both day and night use, the night tolerances are always used. A (day and) night approach and departure surface starts at the forward edge of the FATO safety area and slopes upward at 2.6^0/4.5%/1:22.2 (22.2 units horizontal in 1 unit vertical) for a distance of ~3,386 m. The approach and departure path commences at a width of 34 m and expands uniformly, laterally at an angle of 8.7^0/15%/1:12.8 to a width of 140 m, then remains parallel to a distance of 3,386 m, where the height is 152 m above the elevation of FATO surface. The VFR approach and departure paths are to be obstacle free. It is important to achieve the 2.6^0/4.5%/1:22.2 obstacle free slope to account for the performance requirements of one engine inoperative (OEI) flight following an emergency. See Figures 5 and 6 below.

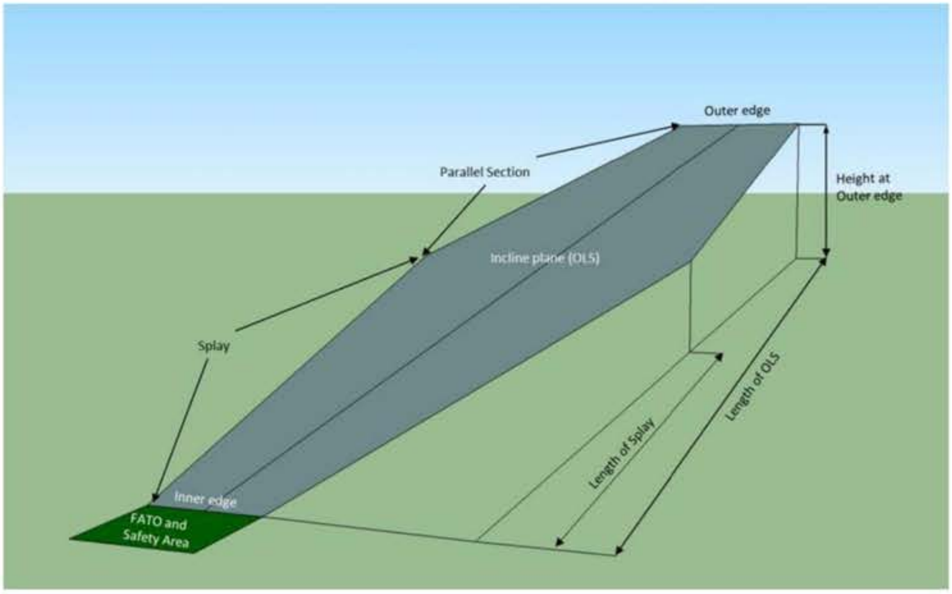


Figure 5: HLS VFR Approach and Departure Surfaces (1)

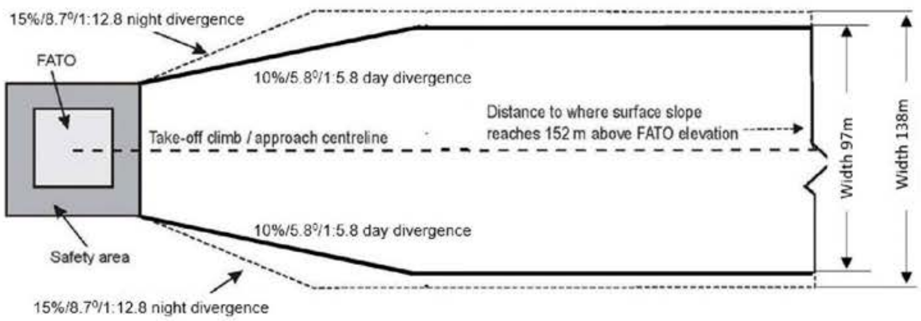


Figure 6: HLS VFR Approach and Departure Surfaces (2)

There are no transitional surfaces for VFR approach and departure paths.

3.6. Protected Side Slope

A VFR-only HLS is to be provided with at least one, and preferably two, protected side slopes, rising at 45^0 from the edge of the safety area and extending to a distance of 10m. See Figure 7 below. Due to the proximity of lift lobbies and other infrastructure, it is often difficult to provide the second protected side slope.

The surface of a protected side slope must not be penetrated by obstacles.

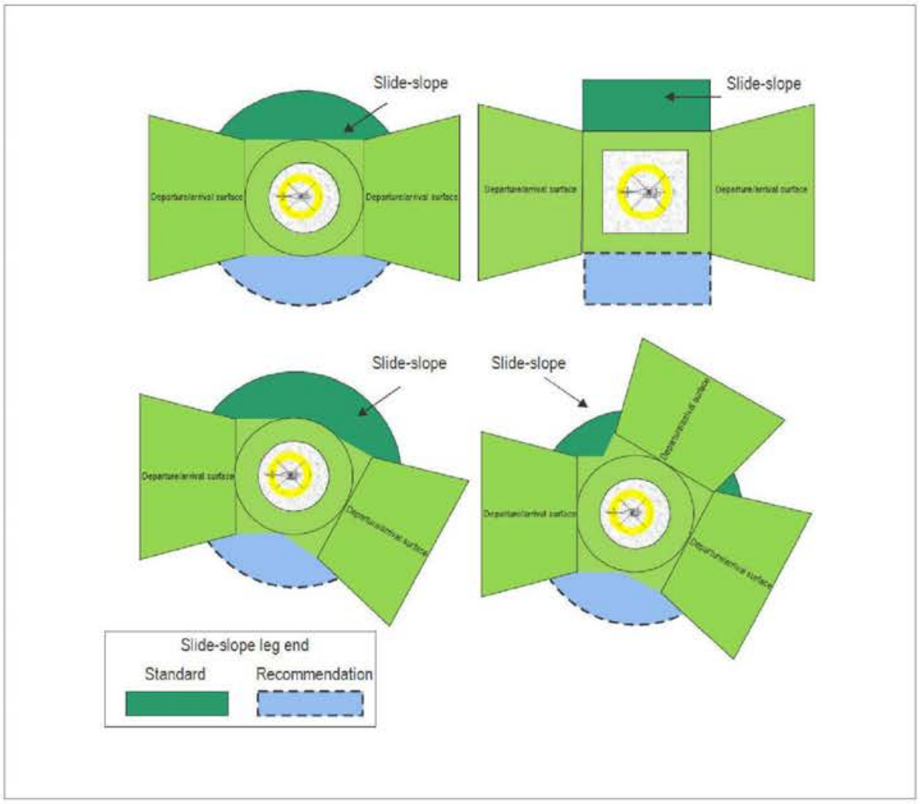


Figure 7: Protected Side Slopes

3.7. IFR Approach and Departure Paths

NSW has very few hospital HLS' with instrument approaches, however this can change at any time depending on needs and priorities. To that end, all NSW hospital HLS' should be surveyed so as to permit IFR operations, whether immediately or at some time in the future.

The IFR approach and departure surface, like the VFR approach and departure surface, commences at the safety area edge. They diverge uniformly to a width of 152m at 3,386m from the safety area edge (approximately 1:45).

The FATO transitional surfaces start from the edges of the FATO and safety area, parallel to the approach and departure path centre line, and extend outwards (from the sides of the FATO and safety area) at a slope of 1:2 (2 units horizontal in 1 unit vertical or 26.6°). They provide very similar protection at an IFR-capable HLS as the protected side slope does at a VFR-only HLS; but extend 45m above FATO level (rather than 10m). The approach and departure transitional surfaces commence at the forward edge of the safety area, overlaid over the approach and departure surface; and from the outer edges of the approach and departure surface. The outer sides are 76m from the centreline, i.e. the outer edges are 152m wide. The approach and departure transitional surfaces extend to the end of the approach and departure surface at 3,386m. See Figure 8.

> ***Note:***
>
> *The transitional surface is not applied on the safety area edge opposite the Approach/Departure surface.*

The approach and departure surface is to be free of penetrations. Any penetration of the transitional surface is to be considered a hazard.

Figure 8 illustrates the IFR Approach/Departure and Transitional surfaces.

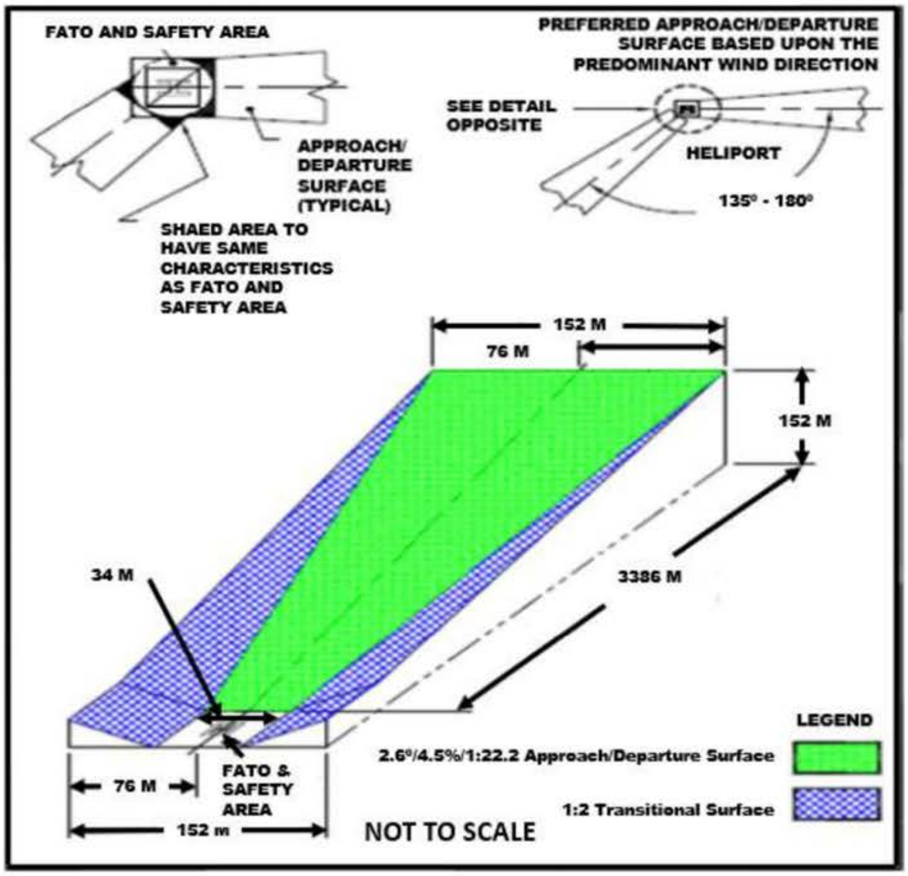


Figure 8: HLS IFR Approach/Departure and Transitional Surfaces

3.8. Visual Segment of a Point-in-Space Approach/Departure Procedure

ICAO Doc 9261 Heliport Manual, Part 2, Chapter 4, Section 4.2 addresses this highly specialised requirement. It will not apply at the majority of NSW hospitals.

3.9. Object Identification Surfaces (OIS)

Where possible, the Object Identification Surfaces (OIS) are to remain free of obstructions. However, at most hospital HLS, particularly at ground level, existing obstacles and infrastructure do not allow this. Clear OIS can normally only be accommodated at a “new” rural hospital “green field” location or on a roof top HLS which is high above the surroundings.

The object identification surfaces can be described as:

- Under the IFR approach and departure surface, the object identification surface starts from the outside edge of the FATO safety area and extends horizontally out for a distance of ~700m. From this point, the OIS extends out for an additional distance ~2,686m while rising on a 2.6° or 1:22.2 slope (22.2 units horizontal in 1 unit vertical). From the point ~700m from the FATO safety area perimeter, the OIS is ~30 m. beneath the approach and departure surface.
- In all directions from the safety area, except under the approach/ departure paths, the OIS starts at the safety area perimeter and extends out horizontally for a distance of ~30m.
- The width of the OIS extends outwards as a function of distance from the edge of the safety area. From the safety area perimeter, the OIS diverges from each side of the IFR approach and departure path. At the outer end of the surface, the OIS extends laterally ~60 m from each side of the IFR approach and departure path. See Figure 9.

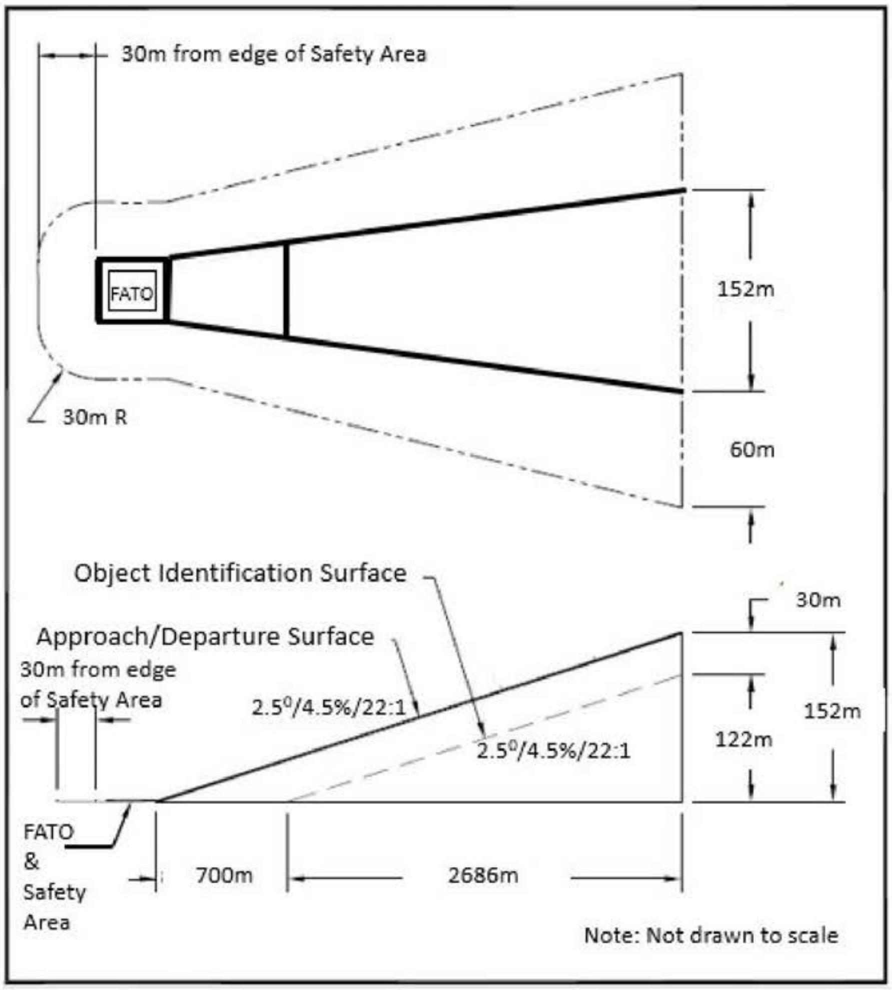


Figure 9: Object Identification Surface

The OIS is used also for the purpose of the Design and Development Overlay (DDO) to provide protection from future adjacent development. The OIS below an IFR approach and departure path is the limit for the penetration of obstructions below that path. That is, there should be no future development penetrating the OIS. The OIS extends out to 3,386m from the forward edge of the FATO safety area.

3.10. Category A Backup Procedure

A Category A back-up procedure, i.e. without a lateral component, is one of the PC1 HLS profiles provided in RFMs along with the dimensions of the backup area. Category A The backup procedure is depicted in Figure 10 below.

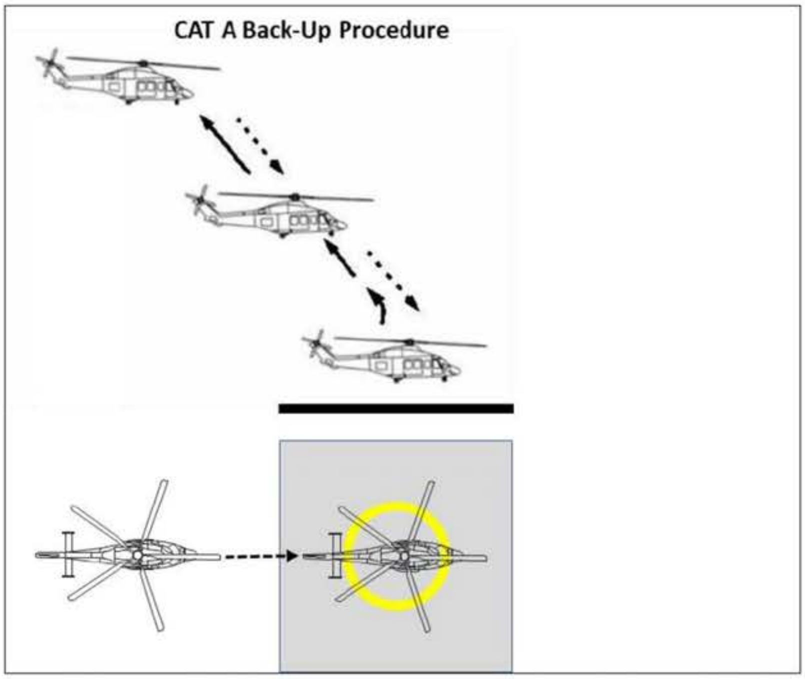


Figure 10: Category A Backup Procedure Profile

The back-up area should consist of two elements: an ascent/descent path/surface and an obstacle limitation surface. The dimensions of these are normally contained in tabular form in the Category A supplement of the RFM. For NSW hospitals which are to be both day and night capable, the splay is to be 15%. Where the backup area is coincident with a reciprocal VFR approach and departure surface, no additional airspace protection measures will be required. Where the back-up area does not overlay the VFR approach and departure surface, a specific ascent/descent path/surface and obstacle limitation surface will need to be surveyed. See Figure 11 below.

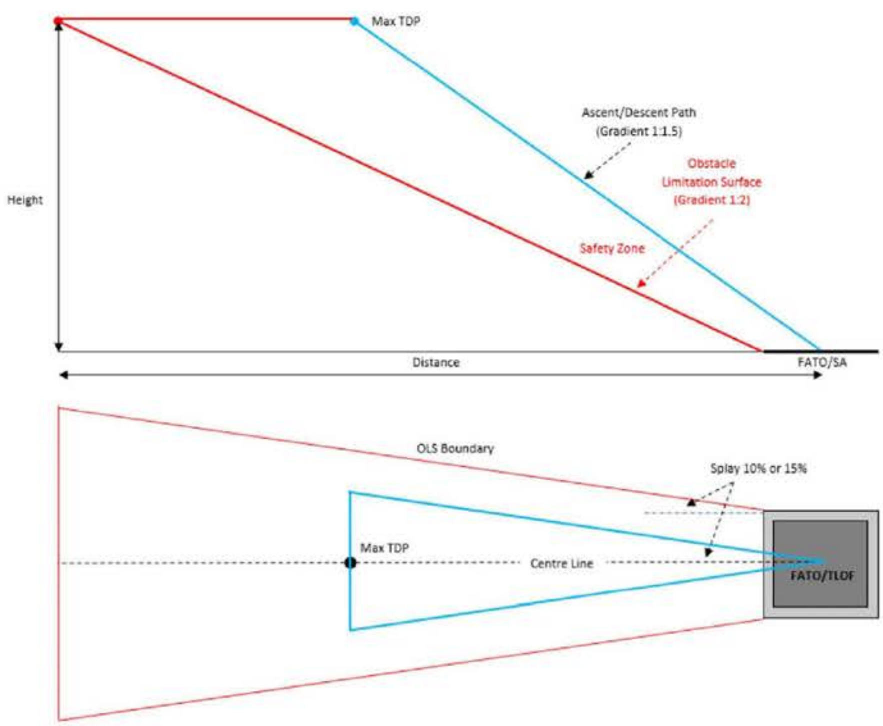


Figure 11: Category A Backup Procedure Surfaces

3.11. Obstructions on or in the Vicinity of the HLS

The adverse effect of an object presumed or determined to be a hazard to air navigation may be mitigated by:

- Removing the object.
- Altering the object, e.g. reducing its height.
- Marking and/or lighting the object, provided that the object would not be a hazard to air navigation if it were marked and lit.

An example of an obstruction light required close to the HLS would be that required on top of the windsock pole. Other obstacles in close proximity to the HLS may include light poles, radio aerials or exhaust stacks etc. All such obstacles are required to have low intensity steady red obstacle lights fitted.

3.12. Obstructions in close Proximity but Outside and Below the Approach/Departure Surface

Unmarked wires, antennas, poles, mobile phone towers, and similar objects are often difficult to see even in the best daylight weather, and in time for a pilot to successfully take evasive action. While pilots can avoid such objects during enroute operations by flying well above them, approaches and departures require operations near the ground where obstacles may be in close proximity. Where possible obstructions are to be moved, however if this is impractical, markings and/or obstruction lighting is to be placed upon them.

3.13. Prevailing Winds

Helicopters use head wind to advantage during both takeoff and landing. NSW HEMS operators are not approved to land with a tail wind. During departure it will improve performance by reducing the amount of power required and/or allow for increased payload and/or allow for an increased angle of climb, and will allow for a reduction in power required for landing. A headwind is effectively air flow through the rotor system (disc) which provides its first positive performance benefit during departure at approximately 15kts (translational lift) depending on the type of helicopter. The performance improves until best rate of climb speed is achieved at approximately 70kts.depending on the helicopter type. The transition from hover to takeoff safety speed (V_{TOSS}) during takeoff is the most critical phase of flight. V_{TOSS} is dependent on the helicopter type and is generally between 40-50 kts.

It is therefore important to review the prevailing wind direction and speed when considering approach and departure paths to and from an HLS. It is however even more important to achieve two approach and departure paths which are at least 135° apart and preferably 180° apart. Achieving two approach/departure paths 180° apart is far more important than aligning a path or paths with the estimated prevailing wind. As long as there is a headwind component there is an advantage. Except for periods of extreme weather with excessively strong winds and turbulence, there is almost no time that an HLS would be unusable due to wind direction if two paths 180° apart are available.

The most common methods of securing local wind information is via the Bureau of Meteorology automated weather stations. A less effective and less popular method is the use of the CSIRO's TAPM (The Air Pollution Model). TAMP is designed to estimate the spread of air pollution and is a simulation and purely a prognostic model which provides only a very rough idea. It does not take account of the local topographical situation. TAPM is invariably of little assistance due to its unreliability.

If a BoM weather station is within a reasonable distance of the location of interest, it is the most accurate and reliable source of information.

3.14. Turbulence

Air flowing around and over buildings, stands of trees, terrain irregularities, etc. can create turbulence that may affect helicopter operations. Rotor downwash coming up against a close wall can also produce considerable turbulence and recirculation.

Turbulence from wind effect is usually more pronounced on a rooftop HLS, when compared with an HLS which is elevated on pylons 1.8m or more above the level of the rooftop. The reason is that the turbulent effect of air flowing over the roof edge is minimised if the HLS is elevated with an "air gap" above a rooftop.

Strong winds can cause considerable updrafting on the windward side of a building supporting a rooftop HLS due to the vertical slab sides. Turbulence on the leeward side of the HLS is normally much reduced.

3.15. Exhaust Gas Ingestion

The Design helicopter uses approximately 450kg of kerosene per hour of flight and of this quantity, 99.9% is burnt. Sitting "at idle" on the HLS, 99% of the fuel is burnt. When approaching to land and preparing to takeoff, exhaust fumes may be prevalent. Under particular wind conditions the exhaust gases emitted from the helicopter engines exhausts can travel for some distance. Hospital air conditioning air intake systems should not be positioned in the vicinity of an HLS; indeed, they should be positioned as far away as possible and shielded from rotor downwash emanating from the HLS. Reference to a Qualitative Turbulence and Air Quality (Wind) Study of the area may be appropriate.

3.16. HLS Covering and Marking

The HLS is to be sealed/covered in a light grey, hydrocarbon, water and UV resistant non-slip paint. All marking materials are to meet the same resistance requirements. FATO and TLOF dimensions are to be defined by markings which also include the hospital cross, the "H", the static weight limit and main rotor diameter of the Design Helicopter. Additionally, the name of the HLS and its ICAO identification code are to be marked on the surface.

When the hospital has an MRI, its direction and distance are to be marked on the HLS. Where there are multiple MRIs, all must be indicated on the HLS. Figure 4 provides an example of markings for a ground level HLS. Markings for an elevated HLS are similar, with the exception that there is no adjacent vehicle parking.

Complete marking details are found in the current NSW Ministry of Health (MoH) Guidelines for Hospital Helicopter Landing Sites in NSW.

3.17. HLS Lighting

For night operations, the TLOF, FATO, and windsock must be illuminated. Lights other than flood lights must be Night Vision Goggles (NVG) compliant and must be visible from a distance of at least 3km at the prevailing Lowest Safe Altitude (LSALT) in clear conditions. That is, all lighting must be visible both with and without the use of NVGs under these conditions.

To meet NVG requirements, all lights must operate within the wavelength range of 600 and 900 nanometer (nm). Current generation LED lights have been found noncompliant unless they are equipped with additional IR LEDs providing a wavelength of approximately 850nm.

A statement relating to Ambulance NSW NVG compliance is required from the lighting contractor. The approach/departure paths are to have the appropriate NVG compliant yellow lights over yellow arrows.

3.17.1. TLOF Perimeter Lights

Eight uniformly spaced NVG compliant flush mounted green lights are to define the perimeter of the TLOF. Flush mounted lights are to be used, and they are to be located preferably within the white TLOF defining circle, but in no case more than 30cm. from the outside edge of the TLOF perimeter.

3.17.2. FATO Perimeter Lights

Twelve uniformly spaced NVG compliant flush mounted green lights are to define the perimeter of the FATO. Flush mounted lights are to be used, and they are to be located preferably within the white FATO defining (broken) circle, but in no case more than 30cm. from the outside edge of the FATO perimeter.

3.17.3. Landing and Take-Off Direction Lights

Landing and Take-Off direction lights are a feature of surface and elevated HLS'. Lights are positioned equally-spaced within yellow direction path arrows located between TLOF and FATO markings.

Landing direction lights are a configuration of three NVG compliant yellow, flush mounted omni-directional lights on the centreline of a yellow two-headed arrow with black borders painted on the HLS. The arrows and lights also signify the PC1 surveyed Approach/Departure path directions. See Figure 12.

Figure 12: Approach/Departure Directional Arrow and Lights

__Note__: 1. Lights are flush mounted NVG compliant yellow omni-directional.

2. Arrow is yellow with a black border.

3.17.4. Windsock Lighting

The windsock is to be illuminated from above by four closely mounted white lights to ensure that it may be seen clearly from all directions. A steady red low intensity obstruction light is to be positioned on the top of the mast. See Figure 13.

Figure 13: Example Windsock Lighting

3.17.5. Flood Lights

Flood lights are to be appropriately positioned to illuminate the TLOF and the FATO for the purposes of aiding patient loading and unloading.

The flood lights are to be clear of the TLOF, the FATO, the Safety Area, and the approach/departure surfaces and where possible, any required transitional surfaces. Care should be taken to ensure that flood lights and their associated hardware do not constitute an obstruction hazard.

Flood lights are to be aimed down and provide a minimum of 3-foot candles (32 lux) of illumination on the HLS surface, and are to illuminate the area of the HLS between the helicopter and the entry/exit. Flood lights can interfere with pilot vision during takeoff and landings and must be capable of being independently manually turned off. They are to be on a separate circuit to that of all other lights. Flood lights are normally only illuminated for patient loading and unloading, and are **not** to be illuminated during landing and takeoff. See Figure 14.

Figure 14: Example Floodlights (and obstruction light)

3.17.6. HLS Identification Beacon

A hospital HLS identification beacon is to be located on the highest, reasonably available point, of the hospital. The beacon is to be visible through 360°. The HLS identification beacon should be a low intensity **10**nm beacon capable of flashing white/green/yellow at the rate of 30 to 45 flashes per minute. With a Pilot Activated Lighting (PAL) system, the beacon will be on the PAL circuit.

3.17.7. Lighting Activation

HLS lighting is to be on two independent circuits. Flood lighting is to be on one independent circuit, and all other lighting including FATO, TLOF, approach/departure directional lighting, windsock, the hospital HLS identification beacon, local obstruction lighting and any visual glideslope indicator installed, is to be on the second circuit. The second circuit is normally controlled by a PAL system, whereas the flood lights are manually controlled only.

3.17.8. Pilot Activated Lighting

The PAL circuit must also have a manual override switch for testing and for use if there is a problem with the PAL activation. At an elevated HLS, this switch and the manual flood light switch, are normally co-located in the lift lobby. The PAL system utilises a hospital-based VHF radio and timed switching device. The pilot is able when within range (~20 nm.), to activate via a VHF radio transmission from the aircraft, on a pre-set frequency. The PAL illumination system is to be set for 45 minutes duration. The PAL system will automatically flash the windsock lights at 35 minutes, i.e. ten minutes prior to automatic turn off.

An application must be made to the Australian Communications and Media Authority (ACMA) for allocation of a Very High Frequency (VHF) frequency for the PAL system; and also, for a license to operate it.

3.18. Slope and Drainage

The maximum slope in any direction across the FATO should not exceed a maximum of 3% and is recommended at 2%. Adequate water/spill drainage is required to account for prolonged heavy rain.

3.19. Walkways and Paths

Surface level or on-grade walkways and paths must be sealed, not exceed a slope of 1:12 for short paths. If the path is longer than 10m, a slope of 1:20 or less is to be sought. They should have no steps and be not less than 1.8m wide. Turns are to be gentle or sweeping. If possible, they should be covered to within 20 metres of the HLS Safety Area boundary.

3.20. Road Ambulance Ramp

For an on-grade HLS, consideration should be given to a road ambulance ramp for loading patients direct from a road ambulance. See Figures 4 and 25.

3.21. Airspace

For elevated structures it is necessary to obtain advice from the CASA and AsA to determine if there will be any adverse impact on the airspace; aviation communications/navigation systems; and air traffic management systems for local aerodromes. AsA will advise whether or not any prescribed/ protected airspace will be impinged by the development. Primary prescribed airspace includes an airport's Obstacle Limitation Surfaces (OLS) involving a set of imaginary surfaces associated with an aerodrome that should be kept free of obstacles. Additionally, the Procedures for Air Navigation Services – Aircraft Operations (PANS- OPS) that takes account of the airspace associated with aircraft instrument procedures, must be considered.

Although HLS are not currently regulated by CASA, come commissioning time for this HLS, they probably will be. It is anticipated that prior to commissioning, CAAP 92-2 (2) will be rescinded and replaced with Civil Aviation Safety Regulation (CASR) Part 139, Sub-part R and subsidiary documents dealing with heliports; and therefore it is believed that CASA will most likely take an increasingly higher level of interest in HLS developments for HEMS operations over the course of the next 12 months.

3.22. Noise and Vibration

Noise and vibration are not insignificant hazards. This is true for both the hospital structure (for an elevated HLS) and also the surrounding community (medical precinct and residential). The Design Helicopter is a product of modern design and rotor blade technology and has been selected for its reduced vibration characteristics. As a consequence, the impact of noise and vibration in the vicinity of the HLS and during flight is markedly reduced.

Assessment of the surrounding obstructions, prevailing wind directions and potential 'no-fly' areas (e.g. mental health facility, sensitive residential areas) will help determine the approach and departure paths to and from the HLS. The contracted helicopter operator will develop specific procedures for the HLS that will take into consideration noise and vibration minimisation.

Whilst all attempts are made to minimise overflight and noise impact, the safety of the helicopter (and occupants) is the prime responsibility of the pilot and therefore in certain weather conditions, overflights of noise sensitive areas may not be avoided.

When considering noise mitigation strategy (glazing etc), it is important to understand what constitutes a helicopter 'noise event' at a hospital HLS. The following is a normal activity breakdown:

Arrival:		1 minute approach and land
		2 minutes engine stabilise before shutdown
	Total	3 minutes
Departure:		2 minutes start-up and hover
		1 minute backup and depart
	Total:	3 minutes

The AW139 helicopter has been assessed by the US Federal Aviation Administration (FAA) and the International Civil Aviation Organisation (ICAO) for its noise outputs. Figures from these independent studies differ slightly however the combined worst-case noise readings for an AW139 at 6400kg (this weight will almost never be exceeded) registered the following levels of Effective Perceived Noise in Decibels (EPNDb):

Takeoff:	90.5
Fly over:	89.8
Approach:	93.0

3.23. Main Rotor Downwash

Potentially the most damaging impact of a landing or departure is the effect of helicopter downwash. The Design Helicopter, the AW 139 has a maximum takeoff weight of up to 6.8 tonnes. Typically, by the time the helicopter arrives at the destination hospital HLS, it will up to 6.4 tonnes. That means it is pushing up to 6.4 tonnes of downwash over the areas it flies over during the final (arrival) or initial (takeoff) segments of flight. This equates to "localised cyclonic" winds and must be considered in planning.

The following Table 1 provides the final velocity of the down wash for the AW139 and should be used in any modelling.

	Disc Loading		Air Density at Sea Level		Final Velocity	
	Metric	Imperial	Metric	Imperial	Metric	Imperial
	kg/m^2	lbs/ft^2	kg/m^3	slugs/ft^3	m/sec	ft/sec
AW 139	42.78897861	8.764518314	0.1225	0.002377	26.43095854	85.87454191
S 76C	37.56814994	7.695129654	0.1225	0.002377	24.76605641	80.46525238
B412 EP	34.95960439	7.16081811	0.1225	0.002377	23.89077335	77.62144588
EC 155	38.89652174	7.96722166	0.1225	0.002377	25.20010423	81.8754796

Table 1: Main Rotor Downwash Final Velocity

3.24. Main Rotor Downwash Hazard Management

3.24.1. Personnel Risk

Some hospitals have open area atriums for patient care, outdoor children play areas, or restaurant use. In all cases, individual site review will be needed to assess the potential for effects of the downwash and potentially the need for strong and effective shielding or protection from the downwash. From an HLS perspective, the mitigation is to keep personnel well away from approach and departure paths and well away from the HLS whenever rotors are operating.

3.24.2. Procedures

The HLS Operations Manual will need to address downwash risk mitigation in detail. Impacts on roofing, facades, windows and vertical structures need to be considered. In particular, the effects of rotor wash on hinged doors, verandahs and balconies, playgrounds and open spaces, gardens and landscaping, wall hangings, flues, exhaust vents and cooling towers need to be assessed.

3.25. Fire Fighting Equipment

Firefighting equipment is to be available at all hospital HLS'. The Guidelines detail the minimum level (N.B. not the "acceptable level") of firefighting appliance coverage for a relatively low use HLS. It is expected that a formal risk assessment will be undertaken to determine the additional, specific risk factors e.g. projected usage, for each site. It is also expected that if the minimum level coverage is to be adopted, that the reasons for not enhancing the coverage will be documented. NSW Ambulance is the relevant authority to advise on predicted HLS usage. The minimum standard is:

- a water hydrant with fire hose available;
- 1 x CO2 extinguisher 3.5 kg;
- 1 x Dry Powder extinguisher 9.0 kg;
- 1 x Foam extinguisher 90 litres; and
- 1 x Fire Blanket.

3.26. Security

Appropriate measures are required to restrict access to the HLS and this is typically managed by the hospital security department. This includes suitable fencing for on-grade HLS'. Under CASR Part 175, it is a requirement to have a designated HLS Reporting Officer registered with AsA. The HLSRO/ Security Department would therefore manage the HLS on a day-to-day basis, including daily inspections, attendance at the HLS for all helicopter movements, the manual activation of flood lighting by night, and coordination of HLS maintenance.

3.27. Local Approvals

The various legislative requirements relating to HLS' in NSW are complex. Current legislation excludes emergency service landing sites from the definition of "designated development" in the Environmental Planning and Assessment Regulation (which otherwise includes most HLSs). Generally, hospital HLS are considered "ancillary-uses" to hospital purposes and are thus not separate "development". The same cannot necessarily be said about off-site emergency medical HLS, e.g. local sports fields.

Local Governments frequently include a clause on "Airspace Operations" in their Local Environment Plans. Where these exist, detailed airspace assessment often needs to be undertaken.

To ensure that all requirements are met, close consultation with a Health Infrastructure preferred Aviation Consultant should be maintained throughout the design and construction phase.

When operational transition of the HLS is complete, a report will be provided to NSW Ambulance by the Aviation Consultant. When all is satisfactory, an acceptance letter from NSW Ambulance will be provided to HI or the local LHD to acknowledge that the HLS is ready to commence operations.

3.28. Performance Class 1 Approach and Departure Paths Survey

Under proposed changes to CASA Rules, HEMS operations will fall under Medical Transport Operations, an extension of a new Air Transport flight category. Operations are proposed to be undertaken to PC1. Both PC1 and PC2 (or PC2WE) require a Category A certified helicopter meeting the relevant Category A requirements, approaching and departing a PC1 accredited HLS along approach and departure paths which have been surveyed for obstacles. The survey must be "current" and must be provided to HEMS operators so that appropriate Category A procedures may be planned.

To meet PC1 requirements, VFR approach and departure paths are to have no obstacles penetrating the 2.6º/4.5%/1:22.2 surface. Likewise, IFR approach and departure paths must have no obstacles penetrating the 2.6º/4.5%/1:22.2 surface, however, some penetration of the adjacent transitional surfaces may be accepted depending on the amount of penetration and the proximity to the relative approach and departure path. The survey is to be prepared by a licensed surveyor and involve:

- A survey covering the entire VFR approach and departure surface; IFR approach and departure surface and associated transitional surfaces area for each approach and departure path; protected side slope(s); and backup procedure safety area (where required).
- Plan drawings out to the limit of any obstruction along the approach and departure paths accompanied by a statement to the effect that no obstructions exist within the relevant distance.
- Side elevation drawings out to the extent of the obstructions along the approach and departure paths. Drawings are to clearly show the horizontal distance to obstructions, the height of the obstruction above the HLS elevation and the height of the penetration above 2.5º.
- 3D modelling along the flight paths is a very effective method of showing obstacles and their relative position etc., is to be provided.
- A written report. Refer to NSW Ambulance for advice on content.

Advice on survey providers who meet NSW Ambulance requirements can be provided.

A completed survey and accompanying DDO report is required to meet NSW Ambulance HLS acceptance/certification requirements.

These survey requirements should be included in the contractor's Scope of Work.

3.29. Airspace Protection/Design and Development Overlay

Currently no Federal or NSW State legislation is in place to protect approach and departure paths and the transitional surfaces associated with hospital HLS'. Guideline H of the Australian Department of Infrastructure, Transport, Regional Development and Communications' document "National Airports Safeguarding Framework (NASF) - Protecting Strategically Important Helicopter Landing Sites" is gradually being adopted in NSW as best-practice policy in protecting important airspace around hospital HLS'. The DDO produced as part of this development will be passed to the local Council with advice that the approach and departure paths require protection and that any proposed development in the vicinity be referred to MoH.

3.30. Hospital HLS Operations Manual

Each hospital HLS is required to hold an HLS Operations Manual. Under the proposed incoming CASA legislation CASR Sub-part 139.R, CASA will also require a "HLS Exposition" which is in effect an Operations Manual. The purpose of the HLS Operations Manual is to document the personnel responsibilities, activities and procedures necessary for the efficient and safe operation of the Hospital HLS. Details include the AsA HLSRO requirements and procedures, inspection and maintenance procedures, and aircraft and clinical procedures on the HLS. Information is located within the NSW MoH Guidelines for Hospital Helicopter Landing Sites in NSW (reissued as of 1 July 2020).

4. EHS SPECIFIC REQUIREMENTS

4.1. EHS HLS Options

The broad layout (within the site) and design (orientation, shape, size and profile) for the EHS HLS have now been determined. As such, this now provides a good opportunity to ensure that the essential requirements for the establishment of a successful on-grade HLS are fully considered. The essential requirements of a successful HLS are addressed in the Guidelines and in Section 3 of this report, however to summarise, the primary features are:

- Alignment with direction of prevailing winds,
- Availability of emergency landing areas,
- Avoidance of vertical structures and obstacles/hazards,
- Avoidance of airspace restrictions and limitations,
- Avoidance of areas sensitive to noise and vibration, and
- Avoidance of ecologically and environmentally sensitive areas.

Important criteria for approach/departure paths is that there be a minimum of two that are at least 135° apart. In addition, the Guidelines state that the HLS should be no more than 100m from the ED, ICU which therefore makes proximity to the hospital a very important consideration. Obtaining two obstacle-free approach and departure paths, together with positioning the HLS close to the hospital, at the same time avoiding a clash between helicopter main rotor downwash and people, vehicles and fixtures/furnishings has been the major challenge in siting the EHS HLS.

Following much analysis and planning, there appears to be only one workable option; a design known as HLS Option 1. See Figure 15 below. This location provides adequate proximity of the HLS to the hospital entrance while keeping it somewhat remote from pedestrian and vehicular activity within the campus. The HLS is to be mounded up to RL 16.85 which is slightly lower than the terrain immediately to the east. Allowing for the required survey clearance of 2.6° (4.5% or 1:22.2 vertical to horizontal), this positioning is acceptable. It is critically important to the success of the HLS that no obstructions are permitted to be erected within the airspace that must be reserved for HLS approach and departure paths.

Figure 15: The Recommended EHS HLS Location

4.2. Approach and Departure Directions

The proposed, approximate approach and departure path directions for the HLS are depicted in Figure 16 below:

Figure 16: Proposed Approach and Departure Paths

From the approximate position of the HLS in Figures 15 and 16 above, the approach and departure path to the west would appear similar to Figure 17 below:

Figure 17: Westerly Approach and Departure Path

From the approximate position of the HLS in Figures 15 and 16 above, the approach and departure path to the east would appear similar to Figure 18 below (noting that mounding/elevation of the HLS is planned and some reduction of the height of the ridge is also planned):

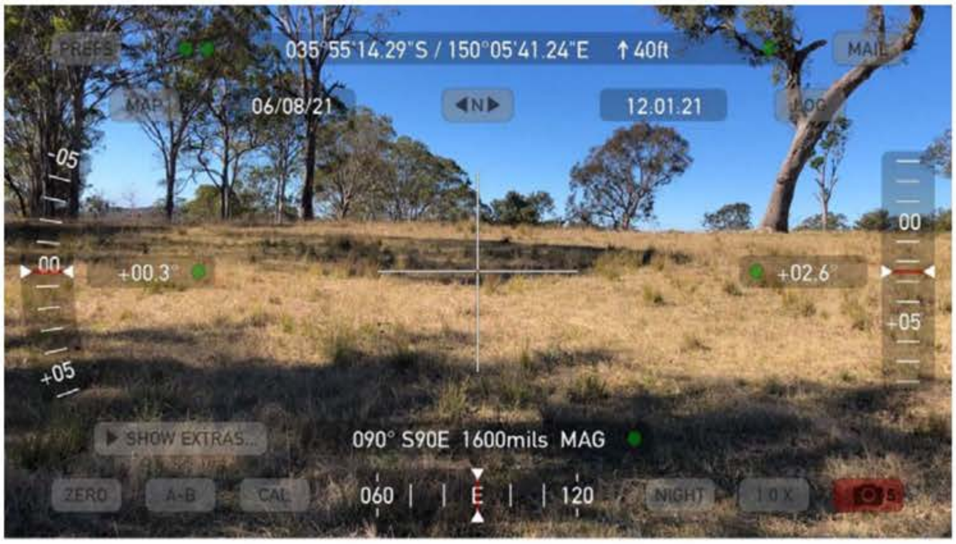


Figure 18: Easterly Approach and Departure Path

Clearly, as can be seen from Figures 17 and 18 above, it will be necessary to remove a number of trees in order to provide safe approach and departure paths. The final surveyed approach and departure path alignment of the HLS will determine which trees will need to be removed.

An example of a raised HLS (this is a **non-compliant**, legacy HLS and no assumptions should be drawn on its dimensions) is shown in Figure 19 below:

Figure 19: Example of a Raised (Mounded) HLS

4.3. Airspace over Moruya

The general airspace arrangement in the vicinity of Moruya is depicted in Figure 20 below. Section 6.17 of the Eurobodalla Local Environment Plan 2012 covers "Airspace operations" and specifies relevant restrictions on development. The Obstacle Limitation Surfaces for Moruya Aerodrome are depicted in the Moruya Airport Master Plan 2015 (available at: Master-Plan-for-Moruya-Airport.pdf (nsw.gov.au) and permit construction up to approximately RL105. Being an on-grade/mounded HLS, the OLS (and the PANS-OPS surfaces) for Moruya Aerodrome are not impacted by the EHS development.

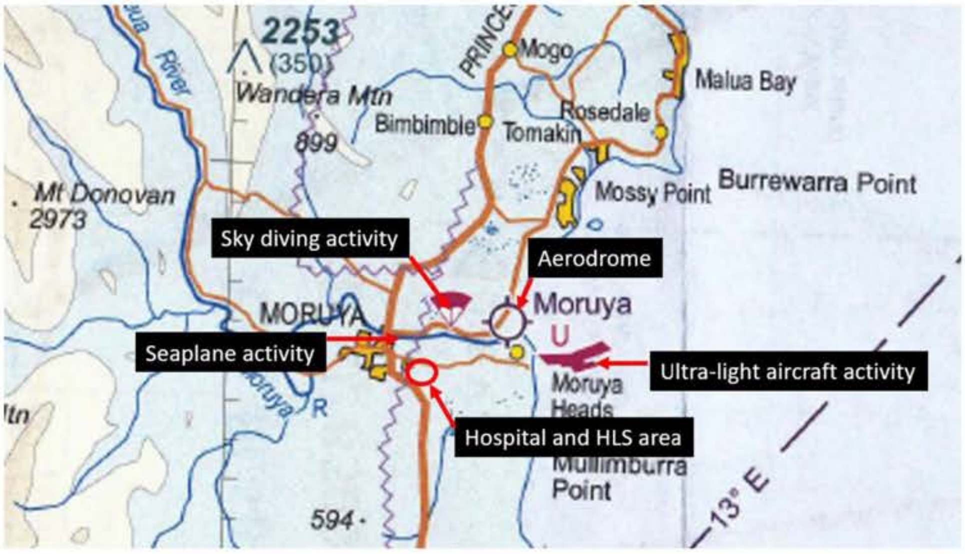


Figure 20: Airspace layout for Moruya Airport

4.4. Prevailing Moruya Winds

The Bureau of Meteorology has an automated weather station at Moruya Airport, approximately 2.5nm/5km from the EHS campus. The wind roses for this location show data based on annual, average wind readings for Moruya at 0900 and 1500 since 1999. The wind data correlates quite well with the preferred approach and departure paths i.e. to/from the east and west. See Figure 21 below.

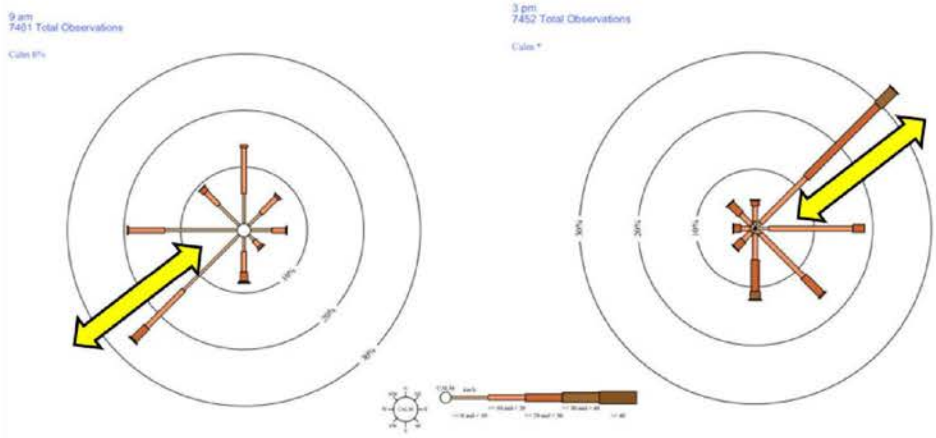


Figure 21: Moruya Airport Wind Rose – Annual Average

4.5. Obstructions and Approach and Departure Surfaces

Prior to HLS operational acceptance by NSW Ambulance, an Approach and Departure Path and Transitional Surface survey combined with a DDO survey will need to be completed. This is part of the commissioning process. As mentioned earlier, the VFR Approach and Departure Surfaces, IFR Approach and Departure Surfaces and Transitional Surface survey will identify any obstructions that require treatment such as: removal or lighting and marking. The DDO will identify areas requiring protection from future vertical development that could impede safe flight to and from the HLS.

The approximate Approach and Departure paths run 080°/260°M. The selection of these paths aims it to achieve an obstacle free gradient of 2.6° (4.5% or 1:22.2 vertical to horizontal),

Clearly, there are currently several obstructions within the selected approach and departure paths that will need to be removed. The survey will confirm precisely the offending obstructions.

4.6. Acoustic Mapping

The approach and departure paths are very close to an urban area to the north. For this reason, it is recommended that acoustic mapping be undertaken using the directions depicted in Figure 16. The Acoustic Engineer will need to use the data for the Leonardo Agusta Westland AW139 helicopter. See Sub-section 3.21 of this report.

4.7. HLS Object Identification Surfaces (OIS)

The OIS situation for the likely approach and departure will be as good as can be developed for such a site. The final positioning of the HLS will determine the best outcome available in the general area.

4.8. HLS Design

4.8.1. Size and Loading

The proposed HLS comprises of a single-spot operational area. The HLS will be load bearing statically. Refer to Sub-section 3.3. of this report for loading and dimensions requirements.

The distance between the HLS and the ED/ICU should be kept within the recommended 100m maximum distance if possible.

4.8.2. Lighting

The HLS requires in-slab flush mounted NVG compliant green FATO and TLOF perimeter lighting, as well as in-slab flush mounted NVG compliant yellow directional lighting.

An illuminated windsock with a steady red low intensity obstruction light is required. It must be mounted a minimum of 2m above the highest point, preferably within 30m of the HLS and is best mounted at the furthest point from the FATO boundary to minimise the obstruction. On top of the hospital will be ideal.

HLS lighting is to be on two separate circuits, a flood light circuit and a PAL circuit. The PAL circuit is to include the FATO, TLOF and VFR Approach/ Departure lighting, the wind sock illumination, hospital HLS identification beacon and directly associated red obstruction lights. A manual override switch is to be located within the lift lobby/reception room. Refer to the example lighting override switching arrangement at Figure 22.

Two flood lights for the illumination of the HLS during patient loading/unloading are normally positioned on a single pole well outside the approach and departure surfaces and the safety area (see Figure 14) and preferably in the direction of the ramp/walkway. The ramp/walkway will normally be located approximately 90° to the approach and departure surfaces.

Flood lights are on a separate circuit and only illuminated when the helicopter is on the ground and shut down for patient loading/unloading. A manual control switch is to be located within the lift lobby.

The hospital HLS identification beacon is on the PAL circuit and likely to be positioned close to the HLS. The lights are very bright and can affect the NVG lenses within the goggles when within 50-100 m. It may therefore be necessary to provide a manual override switch in the circuit to turn the beacon OFF prior to the helicopter approach to the HLS. In such a case the PAL manual override, flood light and beacon override switches are normally co-located. Refer to Figure 22.

Figure 22: HLS Lighting Override Switches

4.8.3. Safety Area

The FATO is surrounded by a safety area extending out 4.5m from the FATO perimeter.

4.8.4. Markings

Markings, including FATO, TLOF, approach/departure paths, name and identifier, MRI, walkways and escape exits are all covered within the Guidelines.

The final drawings for the HLS layout are to incorporate:

- HLS orientated to Magnetic North;
- Hospital HLS identification beacon positioned;
- HLS lighting meeting NVG specs and correctly positioned;
- VFR approach/departure path arrows correctly aligned;
- HLS name and designator;
- MRI indicator (if applicable);
- Maximum static loading and rotor diameter marked;
- Windsock positioned; and
- Walkway markings.

The example HLS markings at Figure 23 are typical. Note no MRI marking or road ambulance ramp.

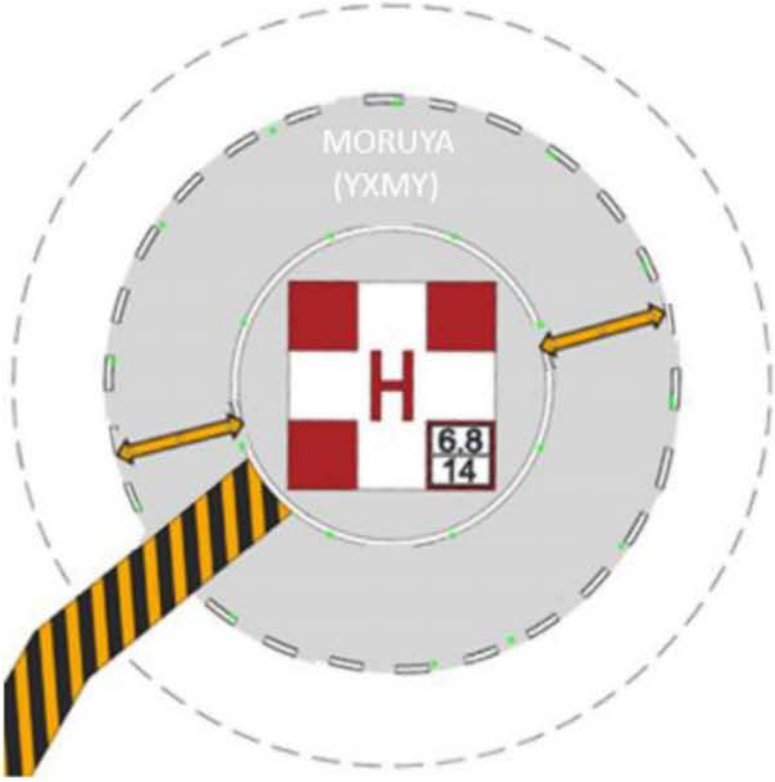


Figure 23: Typical HLS Marking

4.8.5. HLS Drainage and Spill Collection

To ensure adequate drainage the slope from the centre of the HLS should be between 2% and 3%. A suitable system of spill containment is required in the event of a spillage of aircraft fuel and/or lubricants.

5. SAFETY IN DESIGN

5.1. Introduction

The following section identifies the hazards associated with the HLS and also presents risk mitigations. The HLS is inherently a hazardous work place from a structural and operational setting. Training, inductions and physical measures are used to ensure the risks associated with the operation of the HLS are minimised.

Essential Staff. It is critical that only those essential personnel with duties on the HLS are granted access. All others must be escorted by suitably trained staff.

Access to the HLS must be limited to essential staff only. These may include:

- Security staff – flight reception
- Porters or orderlies – patient transfer
- Maintenance staff – periodic inspections and maintenance work
- Aviation audit staff – training, audit and compliance inspections

Training. In all cases, the hospital staff need to be appropriately inducted with a formal HLS orientation, risk awareness and emergency procedures training package. This would normally be conducted during the HLS commissioning process by the contracted Aviation consultant.

Signage and Markings. Appropriate signage is used on the HLS to indicate exits and the location of fire appliances. Markings on the HLS surface indicate walkways and paths to normal and any emergency egress locations.

Procedures. Training, safety and emergency procedures associated with the HLS are to be included in the HLS Operations Manual will address fall from height risk mitigation.

Use of Mobile Phones. Phones cause a distraction and therefore could result in the user falling into the safety net or worse. Using mobile phones is restricted to inside the lift foyer.

5.2. Working around helicopters

This is the second major hazard associated with the HLS.

From a hospital staff perspective, induction and helicopter awareness training will be conducted as part of the HLS commissioning program.

Staff will be required to remain at a safe distance whenever the helicopter rotors are running. It is NOT a NSW Ambulance policy to conduct a 'rotors-running' patient unload or load activity. In all cases, the helicopter rotors must be stopped before the crew will invite the porter/orderly onto the HLS.

The HLS is to have appropriate markings that indicate the walking areas for staff during the normal conduct of their duties.

Procedures. The HLS Operations Manual will address 'working around helicopters' risk mitigation in further detail.

5.3. Spill Containment

There are two types of spill that may occur on the HLS. They are:

a. Fuel/oil spill, and
b. Bodily fluid spill.

Fuel/Oil. The hazards associated with the fuel/oil spill include:

- slipping and potential personal injury
- slipping and further patient trauma
- potential environmental contamination

The likelihood of the above hazards occurring are low and are mitigated in the following ways:

- the helicopter does not drop fuel/oil when it shuts down
- helicopter maintenance is normally NOT conducted on the HLS
- refueling activities are NOT conducted on the HLS, and
- the surface of the HLS (including the painted HLS markings) is coated with a slip-resistant grit that is very course.

Bodily Fluids. A highly unlikely occurrence as the clinical aircrew will always have the patient stabilized and appropriately contained prior to exiting the helicopter. The hazards associated with a bodily fluid spill include:

- potential bio-hazard contamination
- slipping and potential personal injury
- slipping and further patient trauma

The likelihood of the above hazards occurring are low and are mitigated in the following ways:

- the surface of the HLS (including the painted HLS markings) is coated with a slip-resistant grit that is very course
- clinical helicopter staff manage the patient appropriately prior to exiting the helicopter
- the helicopter is washed and decontaminated following each mission

Procedures. The HLS Operations Manual and the Operator's Procedures Manual will address 'spill containment' risk mitigation in further detail.

5.4. Slipping due to water

The HLS is open to the elements and will be subject to rain. The design of the HLS includes a maximum of 3% slope to ensure water pooling does not occur.

In addition, the surface of the HLS including all walkways, is coated with a slip-resistant grit that is very course.

The slip hazard due to water is therefore very low.

5.5. Rotor Downwash

The rotor downwash effect can be quite pronounced in some wind conditions especially on exposed areas of a hospital campus. The hazards are the strong wind events created by the rotors from arriving and departing helicopters.

A 6.8 tonne helicopter has 6.8 tonne downwash in certain conditions.

Personnel Risk. Some hospitals have open area atriums for patient care, outdoor children play areas, or restaurant use. In all cases, individual site review will be needed to assess the potential for effects of the rotor downwash and potentially the need for strong and effective shielding from the hazards or procedures to limit exposure. From an HLS perspective, the mitigation is to keep personnel well clear of approach and departure paths when helicopters are arriving or departing.

Procedures. The HLS Operations Manual will need to address rotor downwash risk mitigation in detail.

5.6. Noise and Vibration

Noise and vibration are not insignificant hazards. This is true for both the hospital structure and also the surrounding community (medical precinct and residential).

Assessment of the surrounding obstructions, prevailing wind directions and potential 'no-fly' areas (mental health facility, sensitive residential areas) will normally determine the flight paths to and from the HLS. The contracted helicopter operator will develop specific procedures for the HLS that will take into consideration noise minimisation.

Whilst all attempts are made to minimise flight path and noise impact, the safety of the helicopter (and occupants) is the prime responsibility of the pilot and therefore in certain weather conditions, overflights of noise sensitive areas may not be avoided.

5.7. MRI Location

MRI within the hospital campus need to be identified and marked on the HLS. The hazard posed by the MRI is on aircraft instrumentation and therefore the pilot needs to understand the location of strong electro-magnetic forces.

5.8. Extraneous Light

The lighting arrangements for an HLS recognise, and are designed for, the use of Night Vision Goggles (NVG) by the helicopter's pilot. NVGs are designed to operate by "intensifying" (amplifying) available light. Originally, in the military context, such light was expected to be from stars and the moon. As NVGs started to be used in urban environments, light from man-made sources became problematic.

Although modern NVG design has ameliorated the problem to some extent, strong light sources (particularly red and white light) closest to an HLS still pose a significant hazard to safe flight. It is therefore important that "offending" lights close to, but not associated with the HLS are considered during design and construction. This includes lights on adjacent buildings as well as those on the building hosting the HLS. Blue and green lights are more "compatible" with NVGs and therefore pose less risk.

An audit should be conducted of the possible locations of light sources extraneous to the HLS with a view to eliminating any potential hazards to safe flight. The attached Figure 24 below is an example of what lights look like under NVGs.

Brightness under NVGs is indicative of colour, power intensity and direction (in that order); or a combination of all three. A powerful blue light directed straight towards the helicopter will cause less "flare" than a much lower powered red light angled away from the helicopter.

Figure 24: NVG Images

6. HOSPITAL ON-GRADE AND RAISED HLS EXAMPLES

6.1. HLS Layout

The following photograph at Figure 25 shows the Tamworth Rural and Referral Hospital HLS which is designed for a single helicopter, and which meets all requirements of the NSW Ministry of Health (MoH) Guidelines for Hospital Helicopter Landing Sites in NSW. It has a road ambulance ramp. It is still somewhat distant from the ED/ICU.

Figure 25: Aerial view of Tamworth Rural Referral Hospital HLS

Figure 26 shows the Narrabri Hospital HLS (with incorrect TLOF markings and approach/departure arrows) and nearby obstructions (trees and electricity poles) exceeding compliant heights.

Figure 26: Narrabri District Hospital HLS

Figure 27 shows the HLS at Mona Vale Hospital. The distance from the HLS to the hospital is significant.

Figure 27: Mona Vale Hospital HLS

Figure 28 shows the South-East Regional Hospital HLS at Bega. The approach and departure arrows are incorrect (they go outside the FATO circle). Note the amount of clear area to the upper left of the photo which is demonstrable of the amount of space required to meet survey requirements. Note that there is no parking in the vicinity of the HLS and no pedestrian thoroughfares nearby.

Figure 28: South-East Regional **(**Bega) Hospital HLS

Figure 29 shows the HLS at Burnie in Tasmania. This is an elevated HLS but not on a rooftop. Its design could easily see it being on an earth mound. It is close to the ED, connected via a bridge. The positioning of car parks below an elevated HLS is not ideal but in legacy situations where space is a premium, this can be unavoidable.

Figure 29: Burnie Hospital HLS

Figure 30 shows the HLS at Dubbo. The proximity of large rubbish bins on castors in the compound in the foreground of the photo proved to be problematic as these moved when helicopters approached over them.

Figure 30: Dubbo Base Hospital HLS (no approach/departure arrows)

Figure 31 shows the HLS at Parkes. The walkway/path links to the ambulance bay which in turn links to the ED. The HLS is well out of the way of vehicles and pedestrians.

Figure 31: Parkes District Hospital HLS (incorrect approach/departure arrows)

Figures 32 and 33 show NVG compliant lighting at night. N.B obstruction lights on lift overrun and lift lobby entrance lights shining onto the walkway (these are not floodlights).

Figure 32: HLS Lighting

Figure 33: HLS Approach/Departure Path Lighting

11.12 Functional Briefing Issues Register

ROOT PARTNERSHIPS

Eurobodalla Health Service

Title: Functional Briefing Issues Register
Date: 06-Oct-21
Rev: 1.4

Open
Pending
Closed
Noted

Item	HPU	Forum	Title	Issue Description	Status	Status Description	Next Steps	Escalate to EUG (Y/N)
2	Overarching	EUG	Workforce Plan	Workforce Profile to be completed to inform facility planning and ABW.	Pending	Final Workforce Plan required for BC.	To be resolved during SD	N
3	Overarching	EUG	Models of Care	Models of Care under development.	Pending	Final MoC Plan required for BC.	To be resolved during SD	Y
4	Overarching	EUG	Benefits Realisation Plan	Benefits Realisation Plan under development	Pending	Final BRP required for BC.	To be resolved during SD	Y
5	Overarching	EUG	FIS	FIS under development	Pending	Final FIS required for BC	To be resolved during SD	Y
6	Overarching	EUG	Change Management Plan	CMP under development	Pending	Initial CMP required for BC	To be resolved during SD	Y
8	Overarching	EUG	ABW	Hubs of ABW workspaces to be identified.	Pending	Groupings to be confirmed.	To be resolved during SD	N
10	Maternity, Neonatal & Paediatrics	PUG 1	Hoists	Hoists - Ceiling vs Mobile hoists. What type of hoists will be provided in the new facility?	Pending	EUG endorse mobile hoists (not ceiling) for in-patient maternity. (NB ceiling track hoists will be required elsewhere)	To be resolved during SD	N
14	Maternity, Neonatal & Paediatrics	PUG 1	Carparking	Staff parking adjacent to ED - to support urgent After Hours access.	Pending		To be resolved during SD	N
16	Maternity, Neonatal & Paediatrics	PUG 1	Planning	Need a space where a family can be with one another.	Pending		To be resolved during SD	N
17	Maternity, Neonatal & Paediatrics	PUG 1	Models of Care	Capacity for managing patients with mental health issues (67% of biopsychosocial issues) to address vulnerabilities in pregnancy.	Pending		To be resolved during SD	
25	Maternity, Neonatal & Paediatrics	PUG 1	Models of Care	LHD to continue to develop defined clinical pathways for antenatal, maternal, fetomaternal and specialised antenatal and postpartum care, integrating services into the community child and family community health, community based multidisciplinary post-natal care and referral to GPs and specialist allied health for ongoing care as required.	Pending	Refer to Item 3.	To be resolved during SD	N
28	Maternity, Neonatal & Paediatrics	PUG 2	Treatment Spaces	Feedback for additional maternity inpatient beds.	Pending	Women's & Paeds No. of treatment spaces required BC.	To be resolved during SD	Y
31	Medical Imaging	PUG 1	Paperless hospital	Aspiration for imaging department to be paperless with no printers. – iPad for patient consent form signing. – May not be possible for ultrasound. – One big central printing hub for the entire hospital could work. – No hard copy x-ray viewers required in the facility; able to get a digital copy of a hard copy if required.	Pending	ICT Strategy to confirm	To be resolved during SD	N
45	Pathology	PUG 1	Speciman Collection	Feedback to provide Specimen Collection in Ambulatory Care.	Pending	Refer to FDB, Speciman Collection located with Pathology. Statelite Collection Centre in Ambulatory to be resolved.	To be resolved during SD	N
47	Pathology	PUG 1	Location	Feedback for pathology to be located within easy access to both Ambulatory Care and ED/clinical areas to allow efficient use of technical/phlebotomy staff	Pending		To be resolved during SD	Y
47	Ambulatory Care	PUG 1	Equipment Storage	LHD to consider introduction of RFID to facilitate centralised storage of resources and loan equipment.	Pending	ICT Strategy to confirm	To be resolved during SD	N
49	Ambulatory Care	PUG 1	Opioid Service	CSP identifies requirement for Opioid Program.	Pending	Opioid Clinic not supported however opiate storage and administration to be confirmed	To be resolved during SD	N
51	Ambulatory Care	PUG 1	Mental Health	Additional consult/interview rooms required to meet demand (proposed treatment spaces recommended) including Mental health requirement for specific clinical spaces.	Pending	Configuration of spaces to be identified in SD	To be resolved during SD	N
53	Emergency Department	PUG 1	ED Short Stay	Request for ED Short Stay	Pending	Refer to FDB, 4 ED short stay included	To be resolved during SD	N
55	Emergency Department	PUG 1	Treatment Spaces	LHD to review existing and CSP ED treatment spaces (including physical vs funded). Refer email from V Chapman 210627, R Ardlie 210507.	Pending	ED under assessment. No. of treatment spaces required for BC.	To be resolved during SD	Y
57	Emergency Department	PUG 2	Safe assessment spaces	Feedback for dedicated Forensic Sexual Assault room	Pending	Dedicated area not supported. Safe and discrete provision of Sexual Assult Services to be considered in SD	To be resolved during SD	
58	Emergency Department	PUG 1	Models of Care	LHD to develop MoC and Change strategies to manage demand / support avoidance of presentations including Implementation of post-discharge rapid review clinics (outreach and/or outpatient)	Pending	Final MoC Plan required for BC.	To be resolved during SD	N
59	Whole of Hospital	PUG 1	District Staff	Feedback to accommodate locally based District staff in ABW. SOA impact not known pending workforce plan.	Pending	Final Workforce Plan required for FDB and BC.	To be resolved during SD	Y

ROOT PARTNERSHIPS

Item	HPU	Forum	Title	Issue Description	Status	Status Description	Next Steps	Escalate to EUG (Y/N)
60	Whole of Hospital	PUG 2	ABW	Application of ABW across facility i.e. provision of office/s on wards (i.e. NUM) with all other staff using ABW Hubs	Pending	Final Workforce Plan required for FDB and BC. Variations from MOH Policy requires governance approval.	To be resolved during SD	Y
65	Education & Training	PUG 1	University shared space	ANU and other universities arrangements within the new facility. There is potential for a shared space with universities at the new hospital, but this is subject to further consultation.	Pending	Refer to Education PWG, decision required for BC.	To be resolved during SD	Y
66	Back of House	PUG 2	Mortuary Services	Feedback to provide additional body storage (existing capacity is 10, CSP suggests 12, FDB allows for 9).	Pending	Refer to FDB, 9 included.	To be resolved during SD	N
83	IPU	PUG 1	Trail of Care Suite	Link to no 149. Feedback to provide Trial of Care suite within both SARU and Medical Ward. Included in SARU SOA.	Pending	To be assessed.		N
102	FOH	PUG 1	General FoH	Transit Lounge model to be considered.	Pending	To be assessed against bed platform. Consideration to be given to PTV paths of travel with/without Transit Lounge.	To be resolved during SD	Y
109	Maternity, Neonatal & Paediatrics	PUG 3	Treatment Spaces	Feedback to provide 4 x Paediatric single rooms and 2 bays.	Pending	To be assessed. 2 x single room swing beds 2 x single paed rooms 2 x bed and 2 x chair short stay unit (escalated to MoH)	To be resolved during SD	Y
116	Whole of Hospital	PUG 1	Security Control Room	Feedback to provide a security control room near ED with easy access to other public areas	Pending		To be resolved during SD	N
117	Whole of Hospital	PUG 1	Operations Centre	Feedback to provide an Operations Centre to manage patient flow and in home monitoring/virtual support. Refer email from J Kennedy 210625	Pending	Refer to FDB, operations centre/patient flow unit and intake/virtual care service included. Workforce Plan required to finalise.		N
119	Back of House	HI BOH Guidelines	Kitchen	Feedback to adopt HI BOH Guidelines for kitchen, docks, storage, waste and linen.	Pending	Kitchen and logistic consultant to confirm FDB allowances.		N
123	Emergency Department	Email	Ambulance Bay	Feedback to allow for six ambulance bays plus PTV. J Herford (S Owen) email 210611	Pending			
127	Ambulatory Care	EUG 7	Renal	Feedback to provide second isolation room, clinical workroom, shared staff room with Oncology.	Pending	Refer to FDB. One Class S isolation room and staff station included. Clinical Workroom to be shared with Oncology.	To be resolved during SD	N
131	Maternity, Neonatal & Paediatrics	PUG 3	Maternity	Feedback to provide spaces for grieving families as a swing between maternity and paeds. Larger room with multiple uses	Pending		To be resolved during SD	N
133	Perioperative	PUG 3	Digital Operating Room	Inclusion (and quantity) of DOR to be confirmed	Pending	Refer to ICT Strategy.	To be resolved during SD	N
135	Perioperative	FDB Review	Waste Management	Confirm perioperative waste is segregated at the point of generation as per FDB	Pending		To be resolved during SD	N
136	Perioperative	FDB Review	SOA	Feedback to include a two person office for Directors of Anaesthetics and Surgery and single offices for NM & NUM	Pending	Final Workforce Plan required for FDB and BC.	To be resolved during SD	N
138	Perioperative	FDB Review	SOA	Feedback to provide cleaners room (5m2), medication room (6m2), surgeon write up (in theatre suite, not grey zone)	Pending	Refer to FDB. Second cleaners room included. One Medication room and write up bay provided	To be resolved during SD	N
139	Perioperative	FDB Review	SOA	Feedback to provide general and chemical storage in scope reprocessing area (9m2).	Pending	Refer to FDB. Clean zone, dirty zone, endoscope store and dispatch/receiving included.	To be resolved during SD	N
140	Perioperative	FDB Review	SOA	Feedback to provide chemical storage in clinical support area	Pending		To be resolved during SD	N
141	Perioperative	FDB Review	SOA	Feedback to provide pathology fume cabinet and dispensing area within periop.	Pending		To be resolved during SD/DD	N
142	Perioperative	FDB Review	SOA	Feedback to provide additional equipment bays for ECG, WOW, equipment in preop holding	Pending		To be resolved during SD	N
143	Ambulatory Care	FDB Review	SOA	Feedback to provide additional spaces for Renal	Pending	Project team to review and assess.	To be resolved during SD	Y
148	Asset Management	FDB Review	SOA	Feedback to separate biomedical/ICT workshop or increase size by 15m2	Pending	Refer to FDB, large workshop, AWB and amenities included.	To be resolved during SD	N
151	IPU	PUG 3	Palliative Care	Feedback to include Palliative Care in Medical Ward. Quantity to be advised.	Pending	Refer to FDB. Palliative Care included in Medical IPU.	To be resolved during SD	N
153	Pharmacy	FDB Review	Pharmacy	Feedback to consider introduction of electronic drug registers	Pending	Refer to ICT Strategy		N
156	Education & Training	PUG 3	Education Space	Feedback to include a third training room (and storage space) to support staff training (additional 34m2).	Pending	Refer to Item 65		N
157	IPU	PUG 3	FFE	Feedback to allow for fridges for dysphagia products in each IPU	Pending		To be resolved during SD / DD	N
166	Pharmacy	FDB Review	Workforce profile	Feedback that workforce is to be reviewed for pharmacy considering additional clinical roles in ED and wards, and provide 24/7 etc. Refer feedback from Amelia Whittaker	Pending	Final Workforce Plan required for FDB		N
169	Pathology	FDB Review	Models of Care	Feedback to consider the inclusion of Glucose Tolerance Testing (GTT) noting that at Mudgee GTT is not working well and collection rooms are with pathology. Can these patients be monitored by day medical services? Update Change Management Strategy to include consideration of GTT.	Pending	Refer to Item 45		N
170	Pathology	FDB Review	ICT Strategy	Feedback to consider additional phone line efficacy, noting that this was an issue during bushfires. Update ICT strategy.	Pending	Refer ICT Strategy		N

ROOT PARTNERSHIPS

Item	HPU	Forum	Title	Issue Description	Status	Status Description	Next Steps	Escalate to EUG (Y/N)
173	Back of House	FDB Review	Change Management	Feedback to consider implication of sharing space for RMD and soiled mattresses considering AS4187	Pending		To be resolved in SD	N
174	Education & Training	FDB Review	Workforce profile	Feedback to consider ability to engage FACEM in workforce.	Pending	Final Workforce Plan required for FDB		N
175	Whole of Hospital	FDB Review	Models of Care	Feedback to review MoC for HITH/Virtual Care services for in home Monitoring.	Pending	Refer to FDB, Executive Unit and Admissions Unit including Patient Flow (24hrs) and Virtual Care (8hrs) collocated for service efficiency and disaster management activities. Location of Virtual Care and Patient Flow to be confirmed.	To be resolved in SD	N
182	Emergency Department	FDB Review	TECs workspace	Feedback to consider functional requirements of TECs spaces including staff and equipment safety.	Pending		To be resolved in SD	N
183	Whole of Hospital	FDB Review	Security	Feedback to include MHAOD in development of security service model	Pending		To be resolved in SD	N
204	Whole of Hospital	SD PUG 1	Patient Transport	Feedback to consider patient transport flows with/without Transit Lounge as well as vehicle parking	Pending		To be resolved in SD	N
205	Education & Training	SD PUG 1	Sim Lab	Feedback to incude high fidelity simulation space between ED and ICU. https://swscssc.med.unsw.edu.au/settings/simulation-theatres Link provided by M Metelo	Pending	Education/training room currently provided in Exec Area	To be resolved in SD	N
206	Back of House	SD PUG 1	Cleaning	Consideration for including space for washing machines for washing mopheads.	Pending	Not currently in FDB as future state is washing machines for BOH are not preferred.	To be resolved in SD	N
207	Ambulatory Care	SD PUG 1	Point of Care Testing	Feedback to consider quantity and location of POCT	Pending	Currently provided in ED, ICU, Periop	To be resolved in SD	N
208	Emergency Department	SD PUG 1	Mental Health	Feedback to consider preferred location of SAR	Pending	Currently shown on periphery of ED with potential for direct access to outside	To be resolved in SD	N
209	FOH	SD PUG 1	Multifaith Space	Feedback to consider location of multifaith space noting 24 hour access requirements	Pending	Currently shown in FOH	To be resolved in SD	N
210	Whole of Hospital	CDR Review	Vehicle Access / Parking	Feedback to consider vehicular drop off / travel distances for renal, oncology and patients with chronic conditions accessing Ambulatory Care	Pending	External access including vehicle movements to be further developed during schematic design	To be resolved in SD	N
211	Whole of Hospital	CDR Review	Parking	Feedback to consider car parking peak demand requirements	Pending	Final Workforce Plan to inform Traffic Engineering Report	To be resolved in SD	N
212	Whole of Hospital	CDR Review	ICT	Feedback to incorporate ICT Project Working Group feedback on ICT planning	Pending	Feedback received 27/09. Under review by Electrical/ICT consultant	To be resolved in SD	N

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