

SILVER CITY DRAFT STRUCTURE PLAN

3 September 2025



Approval Page

To be inserted by the WAPC upon approval

Table of Amendments		
Amendment No.	Summary	Date approved by the WAPC
1		
2		
3		
4		
NOTE: The previous and current versions of the Structure Plan are available on the Western Australian Planning Commission (WAPC) and Shire of Christmas Island websites.		

EXECUTIVE SUMMARY

The Silver City Structure Plan (the Structure Plan) has been prepared on behalf of the Shire of Christmas Island (SOCI) under the Australian Government's Housing Support Program (HSP) designed to help achieve the National Housing Accord target of building 1.2 million new, well-located homes over 5 years from 1 July 2024. The HSP Stream 1 supports the delivery of increased housing supply by focusing on projects, such as this Structure Plan, that improve building planning capability for areas targeting future housing projects.

Silver City is a suitable location to provide the long-term expansion of the urban area on Christmas Island. The Structure Plan developable topography is no more severe than the adjoining existing Silver City settlement, most parts of its elevated position enjoy sweeping ocean view, it can capture existing services in close proximity and offers enhanced vehicular accessibility to the port and coastal settlements.

The need to formulate a Structure Plan at Silver City is a pre-requisite to future development under the Local Planning Scheme No.2 (LPS No 2). The SOCI current Local Planning Strategy (LPS 2015) endorsed by the Western Australian Planning Commission (WAPC) in May 2015 specifically advocates to *“Plan for a total population of 5000 permanent people as per the community-endorsed 2018 Plan.”* The aim of the LPS 2015 at the time and pertinent to Silver City ten years later, is to *“Provide short term opportunities to increase the housing stock on the Island and encourage local private investment. Developments should be encouraged to make more efficient use of land as well as attract additional small businesses.”*

Like many isolated small communities, Christmas Island is experiencing the challenging correlation between population levels, job opportunities and housing capacity. The permanent resident population, at its highest at the 2011 Census with 2,072, came down to 1,692 at the 2021 Census and was estimated at 1250 at the end of 2024.

The SOCI considers that a renewed economic output, supported by improved air accessibility and driven by the Department of Planning Land and Heritage (DPLH) Crown land Enquiry Form (CLEF) process and the Department of Finance Commonwealth Property Disposal Policy (CPDP) is an important method to ultimately attract investment in new economic drivers (mainly targeting Singapore) such as urban food export, higher education, research and tourism. Such economic approach continues to coincide with community expectations.

A whole of island *Christmas Island Strategic Assessment (CISA)* was active between 2019 and 2023 and designed as a land use planning tool for the streamlining of environmental approvals under the *Environmental Protection and Biodiversity Conservation Act 1999*. The life of the assessment was set at 30 years. From the outset the SOCI sought to ensure the CISA land use plan was to coincide with future land use planning associated with the review of the Shire LPS and capable of accommodating a permanent population of 5000 residents in order to maintain a sustainable economic output on the Island post-mining and be aligned with the population target of the SOCI 2015 LPS in force

The CISA was paused in June 2023 by the Australian Government due to significant ongoing policy and law reforms however the Silver City Structure Plan has taken into account all environmental, planning and land use aspects envisaged for the precinct during the 2019 to 2023 CISA activities.

The Structure Plan area will play a role in ensuring the resilience of the Flying Fish Cove community residing at the Kampong. In 2010 the Attorney-General's Department commissioned the Indian Ocean Territory Climate Change Risk Assessment that identified the following risks and vulnerabilities for the Kampong at Flying Fish Cove:

- Sea level rise expected to exacerbate inundation, storm and tidal surge, erosion and other coastal hazards potentially threatening Flying Cove jetty, wharf and boat ramp as well as the Kampong sea wall and buildings beyond and

- Increase intensity in cyclonic rain inducing land slide and associate rock fall around Flying Fish Cove with potential impact to the structural integrity of buildings and amenities.

The need to address the vulnerability of the Kampong community is echoed in the SOCI's 2015 LPS that specifically advocates: *“Develop a long-term residential transition plan (20-30 years) for the Kampong towards safer existing and new urban areas”*.

Published by the Australian Institute for Disaster Resilience and the Commonwealth Department of Home Affairs, the *2020 Land Use Planning for Disaster Resilient Communities Handbook* provides guidance on national principles and practices relevant to communities at risk and the role land use planning can play. Following the handbook guidance to achieve disaster resilience, the SOCI has facilitated workshops with the Kampong community to explore relocation options and opportunities in 2020 and 2021 whilst pursuing its review of its LPS 2015.

As part of the HSP-Stream 1 program, the SOCI has facilitated workshops on the 7 and 14 November 2024 to further gauge the community's sentiments and expectations. This highlighted the need to consider at Silver City medium density apartments, low density residential homes for families with children, housing for ageing persons, local commercial outlets and neighbourhood public open spaces.

As of November 2024, the Kampong population is 427 of which 147 are children.

This indicates that the orderly relocation of the Kampong residents could require land to accommodate up to 170 dwellings on single lots or apartment format. The Structure Plan, will allow the SOCI to prosecute its commitment to identify, reserve, protect and ultimately supply land assets and oversee the construction of affordable housing to ensure the long-term resilience of the Kampong community.

The Structure Plan covers an area of 28.33Ha of which 52.42% is a dedicated natural area forming a permanent Environmental Conservation buffer with Murray Road and the adjacent National Park. This environmental impact mitigation approach is supplemented by the additional allocation of 1.73Ha of Public Open Space accommodating neighbourhood parks, natural drainage infrastructure with enhanced ecological features and remnant vegetation on steep slopes.

The main purpose of the Structure Plan is to finalise the consolidation of the existing Silver City residential area by facilitating the establishment of some 190 homes over the next 30 years. It provides for an additional mixed-use precinct in the most elevated area with multiple road frontage providing employment opportunities with 3,500 m² of commercial floor space to cater for local neighbourhood shops and the possible establishment of facilities for visitors.

In the longer term, approximately 170 homes could be introduced in the precinct without impacting on the proposed service infrastructure. Vehicular movement to and from the Structure Plan Area is mainly provided via two road connections introduced along Murray Road to minimise traffic impact on the adjacent established residential area; and a road link with Sunset Place to enhance local vehicular connectivity. The Structure Plan capacity is expected to meet the social and affordable housing immediate demand and in the longer term attract new businesses and investments to the Island in order to pivot the Island economy post mining.

The Plan also provides the SOCI with the opportunity to implement a near zero carbon emission policy for the build form expected maximise the capture solar energy on roofs and well exposed walls and set aside land assets for the establishment of community batteries.

Silver City Executive Summary Table				
Total area covered by the Structure Plan	28.33 Hectares			
Area of each proposed land use				Area %
Residential	Hectares	Lot Yield	Dwellings	
Residential R 17.5 (Average lot size 900 m2)	2.13	26	26	7.52
Residential R 40	2.00	4	80	7.06
Residential R 60	1.37	3	83	4.84
Total estimated residential lot yield		33		
Other Residential (transfer to adjoining residential)	0.21			0.74
Mixed use	3.49	1		12.32
Parking/Landscaping 30%	1.05			
Commercial 10% (Estimated floor space)	0.35	gross lettable		
Residential 60% (Dwellings @ R80)	2.09		168	
Total residential	7.80			27.55
Total estimated number of dwellings			357	
Estimated dwelling density	24	per hectare		
Estimated population (@ 2.5 p/household)			893	
Neighbourhood Parks	0.49	3		1.73
Landscaped Corridors (ecology and drainage)	1.24	9		4.38
Environmental Conservation (natural area)	14.85			52.42
Road Reserves	2.55			9.00

Housing Support Program (HSP) Team

This Structure Plan has been prepared with the collaborative technical input from the following entities:

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Affordable housing needs	Christmas Island Women's Association
Project Coordination and Town Planning	Calmy Planning & Design
Geographic Information System	Jeffrey Planning & Mapping
Civil Engineering and Essential Services	David Wills & Associates
Electrical Engineering	APD Global
Geophysical Survey	MNG SubSpatial
Environmental Assessment and Approvals	JBS&G
Clean Energy Input - Stage 1A	Unlimited Energy
Neighbourhood Wind Power Generation – Stage 1A	VAWT-X and Flinders University

Disclaimer

This document follows the prescribed format of the ***WA Panning Manual Guidance for Structure Plans August 2023***

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ACRONYMS

CHP	Community Housing Provider
CIDHS	Christmas Island District High School
CI	Christmas Island
CIP	Christmas Island Phosphates
CISA	Christmas Island Strategic Assessment
CIWA	Christmas Island Women's Association CIWA
CLEF	Crown Land Enquiry Form
DFES	Department of Fire and Emergency Services
DITRDCA	Department of Infrastructure, Transport, Regional Development, Communication, Sport and the Arts
DOS	District Open Space
DPLH	Department of Planning Land and Heritage
DWA	David Wills & Associates
DWER	Department of Water and Environmental Regulation
EAR	Environmental Assessment Report
HAFF	Housing Australia Future Fund
HSP	Housing Support Program
IDC	Immigration Detention Centre
IOT	Indian Ocean Territories
LPS 2015	Local Planning Strategy 2015 (active and under review)
LPS No.2	Local Planning Scheme No.2 (active)
POS	Public Open Space
PRL	Phosphate Resources Limited
R-Codes	Residential Design Codes of Western Australia
SOCI	Shire of Christmas Island
VAWT	Vertical Axis Wind Turbines
WAPC	West Australian Planning Commission

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PART ONE - Implementation

1. STRUCTURE PLAN AREA AND OPERATION

The Structure Plan (the Plan) applies to the area depicted at **figure 1 p.23**.

The Plan is in effect from the date stated on the approval page (a date decision letter will be distributed to the SOCI) and for a period of 10 years or for any other period approved by the WAPC. The instruments that will inform the implementation of the Structure Plan will be the reviewed 2015 Local Planning Strategy (LPS 2015) and ultimately a new Local Planning Scheme (LPS No.3).

2. PURPOSE

The Silver City Structure Plan aligns with the core objective the Australian Government's Housing Support Program (HSP) designed to help achieve the National Housing Accord aspirational target of building 1.2 million new, well-located homes over the next five years.

One of the immediate actions of the Accord is to improve zoning, planning and land release and identify whether suitable Commonwealth land can assist as part of the contribution to delivering social and affordable housing. The HSP is designed to accelerate the delivery of increased housing supply by funding the SOCI to advance planning and environmental approvals associated with the objectives of this Structure Plan and increase housing affordability on the island.

The key objectives of the Structure Plan are to:

- a) assist the DITRDSCSA in exploring options for disposal of Crown Land;

- b) increase social and affordable housing offerings on the island in line with identified needs spanning more than a decade;
- c) provide choices for the local community in need of housing and develop dwellings on single lots or grouped format;
- d) facilitate the orderly growth of the permanent resident population to 5000 over the next 30 years;
- e) provide an integrated transition solution to support the resilience and, in time, the relocation of the Kampong residents at risk from the effects of climate change at Flying Fish Cove;
- f) capture the possibilities to connect to the existing service infrastructure available within and around the Silver City settlement;
- g) create two direct road connections onto Murray Road and the port area and or Gaze Road that by-passes Poon Saan;
- h) allow for the establishment of a 100m wide environmental conservation and ecological buffer with the National Park along Murray Road; and
- i) ultimately assist the island economic transition from mining and immigration to tourism, higher education, research and agri-businesses by facilitating the establishment of sufficient housing to allow these new economic drivers to thrive.

3. STAGING

3.1 Introduction and funding mechanisms

The implementation of the Structure Plan is intended to be prosecuted in 4 stages as depicted at **figure 2 p.14**. The release of Crown Land is subject to agreement by the Minister for territories and the Minister for Finance. Subsequently it may become possible for the SOCI to subdivide land in accordance with the Structure Plan and the stages defined in this section.

Consistent with the objective of the HSP Stream 1, the four stages will be subject to a Form 1A application to the WAPC for approval of freehold subdivision (refer to preliminary concept subdivision layout at **Appendix 1**). A concurrent application for a permit to clear native vegetation under *Part V of the Environmental Protection Act 1986 (CI)* will be submitted to the Department of Water and Environmental Regulation (DWER).

This early subdivision and land clearing process is the essential tool for the timely identification and creation of developable lots required to construct housing projects. The construction of roads and services for these early projects will be dependent on the *2022 National Housing Accord* collaborative and innovative financing arrangements available to the SOCI through the National Housing Infrastructure Facility (NHIF) and other avenues. As the primary land owner, the SOCI will have responsibility for the orderly programming and coordination to establish roads and install essential services and will cover infrastructure costs and maintenance from rates and the proceeds of land sales of the new housing area.

The Housing Australia Future Fund (HAFF), for its part, will seek to assist superannuation and institutional capital investment in social and affordable housing, alongside established state and territory programs. The SOCI will continue to explore models for funding and construction of social housing. This may include the availability of Government grants. Land allocation will be made for affordable housing where the SOCI may be eligible as funding recipient of the NHIF facility for the construction of roads and services whilst affordable housing providers could be eligible as funding recipients of the HAFF

3.2 Short term (2 to 3 years)

Stage 1 is intended to expedite the early release of social and affordable housing on an as needed basis. This stage lays on the lowest east side terrace of the Structure Plan area. It offers the best option to develop new housing projects along a new 1,550m road within a 16m wide Road Reserve, connecting Murray Road (altitude 85m AHD) directly to Sunset Place. That new road link is depicted as a neighbourhood connector on the Structure Plan Map at **figure 1 p.23**. This stage provides three R60 lots that could accommodate up to 82 dwellings and 3,800m² of POS. The dwelling yield is not expected to be entirely realised given the height limitation to three storeys and building length not exceeding 30m to increase access to natural light, encourage natural ventilation and reduce dependency on air conditioning. The provision of sewer will require a pump station to allow discharge on an existing sewer access chamber close to sunset Place as illustrated at **figure 2 p.14** (refer also to the infrastructure and servicing strategy at **Appendix 3**).

3.3 Medium term (5 years)

Stage 2 occupies the larger developable land area of the Structure Plan. It relies on the construction of the second 1,330m road connector from

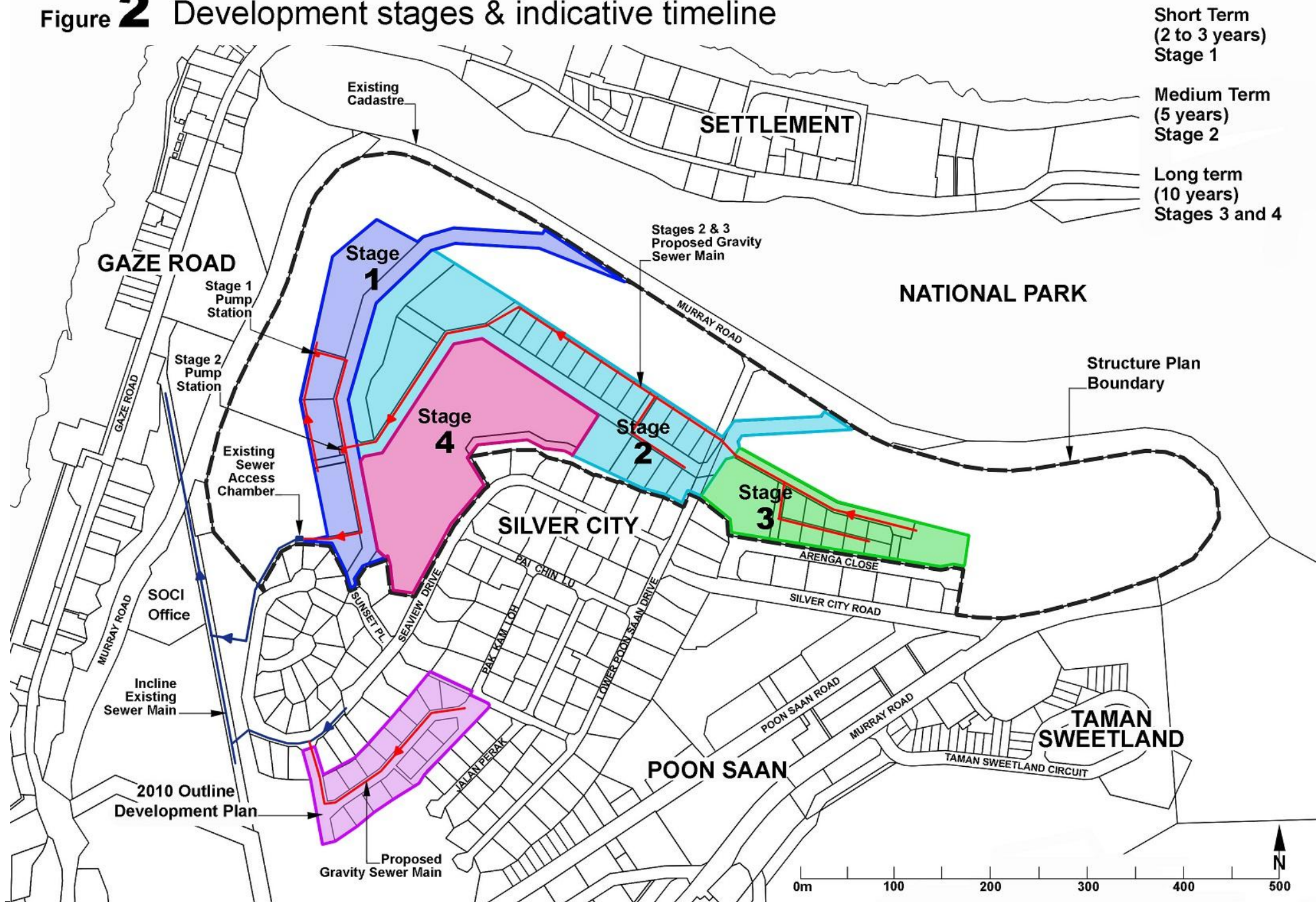
Murray Road (altitude 115m AHD) westward to the Stage 1 connector. This second neighbourhood connector, within a 16m Road Reserve, will provide access to two R40 lots with capacity to establish 43 dwellings and 16 R17.5 lots with a lot average of 928m². The total POS area for Stage 2 is 1.1Ha with 22% allocated for recreation, 14% to facilitate road drainage and 64% associated with terrace cliff. The bulk of the sewer system for stage 2 operates by gravity mainly from east to west until the sewer main reaches the stage 1 road where a second pump station will be required for the system to continue southward as per stage 1.

3.4 Long term (10 years)

Stage 3, located on the eastern side of the Structure Plan, relies on the construction of a 430m road in a cul de sac configuration within a 12m Road Reserve. The road will service 2 R40 lots with capacity to establish 36 dwellings and 5 R17.5 lots with an average lot size of 626m². A further 5 R17.5 lots with a lot average of 671m² and access from Arenga Close are also included in this stage.

Stage 4 has a challenging topography not conducive to small lot subdivision. It relies on the completion of stages 1 and 2 in terms access to its lower section and overall serviceability. This 3.49Ha site is not included in the Housing Support Program Stream 1 subdivision and land clearing program. The Structure Plan identifies a Mixed use zoning for this single land parcel with 30% allocated to parking and landscaping, 10% to accommodate some 3,500m² of commercial space and 60% or 2.09Ha for residential use at R80 thus potentially yielding up to 168 dwellings.

Figure 2 Development stages & indicative timeline



4. SUBDIVISION AND DEVELOPMENT REQUIREMENTS

4.1 Land use zones and reserves

The designated proposed zones/precincts and reserves are depicted in the Structure Plan map at **figure 1 p.23**.

4.1.1 Zones

Zoning

The zones shown on the Structure Plan map are consistent with all aspects of the Local Planning Scheme No.2.

The aims of the LPS No.2 zones are to:

- appropriately plan for the Island's diverse cultural, topographic and climatic characteristics;
- provide for future urban expansion in appropriate areas;
- enhance and diversify the Island's economic base through the provision of land for a range of economic activities;
- recognise and enhance the Island's unique heritage, both built and cultural;
- provide appropriate controls to protect development from the effects of extreme weather events; and
- preserve the Island's unique natural attributes and environmental values.

4.1.2 Road reserves

The Road Reserves shown on the Structure Plan map are consistent with those found in the LPS No.2 map. The Reserves represents 2.55Ha or 9% of the total Structure Plan area. The hierarchy of these Reserves which, for the purpose of definition only have relative correspondence with Main Roads WA Road types, are solely used as a point of reference since

the mainland traffic criteria cannot reflect the island circumstances where there is no possible interference or impact of regional external traffic on local vehicular movements.

The geographic location of the Structure Plan and its topography illustrate the importance of the dual access onto Murray Road. In this the Structure Plan area does not offer nor expect any significant through traffic from the other neighbourhood of the island apart from a few residents in the lower part of Silver City.

The Reserves for the two neighbourhood connectors are expected to mainly service the internal need of the Structure Plan area and as such can be identified as Access Road A with a width set at 16m. This reserve type is commonly found in the Silver City and Drumsite residential network. There is no immediate intention from the SOCI to plant trees on the verges of this Reserve type.

The width of the Reserve for the road servicing stage 3 is set at 12m.

Street verge

The care and maintenance of all street verges is the responsibility of the SOCI. Verge landscaping, including natural lawns, verge gardens (ornamental or food producing) are the responsibility of the householder of the property adjacent to the verge. The SOCI encourages residents and businesses to take pride in their verges to enhance the aesthetic value of their properties and the streetscape as a whole. At the time of implementation, the SOCI will introduce a *Street Verge Landscaping Guidelines* document for every Reserve type to cover what will be restricted or permitted to private owners including dedicated visitor's and or longer-term street parking arrangements.

4.1.3 Public open space

The POS distribution across the Structure Plan Area is 3 Neighbourhood Parks totalling 0.49Ha(1.73%) and 9 Landscaped Corridors (ecology and drainage) totalling 1.24Ha (4.38%). An average of 6% of the POS areas should be used for stormwater drainage purposes. It is expected that a maximum of 10% of the POS area will be required for stormwater drainage purposes.

Neighbourhood parks

Three Neighbourhood Parks representing 0.49Ha, or 1.73%, of the total Structure Plan area are to address the needs of the residential areas. Two are strategically positioned adjacent the R60 lots at the lower Terrace and the third one sits amongst the R17.5 lots in the upper section of the Structure Plan.

Drainage

The location of drainage basins are shown on the Structure Plan Map at **figure 1 p.23**. An average of 12% of the POS areas is expected to be used for stormwater drainage purposes (refer to infrastructure and servicing strategy at **Appendix 3**).

4.1.4 Other reserves

Environmental conservation

The Structure Plan proposes the creation of a 14.85Ha Environmental Conservation area, representing 52.42% of the total area covered by the Structure Plan area, to provide an ecological buffer to the Christmas Island National Park.

Remnant vegetation in Silver City, zoned Urban Development under LPS No.2 has been identified as part of a 120m buffer to habitat critical to the survival of the species.

The Future Environmental Conservation area will ensure visual amenity is maintained, will act as a buffer to the nearby Christmas Island Frigatebird colony.

4.2 Density and development

4.2.1 Density and R-Codes

The Structure Plan map at **figure 1 p.23** designates the proposed Zones and Reserves for the Structure Plan area.

The Structure Plan identifies a number of areas suitable for urban expansion, and future subdivision of these areas will be required to have consideration for the objectives and requirements of the R-Codes. The Structure Plan guiding principles for density distribution is influenced by the topography, the vehicular entry points from Murray Road and the ability to maximise ocean views for the larger number of dwellings, in particular for Stage 1.

4.2.2 Locational criteria

An R-Codes plan is to be submitted at the time of subdivision for the entire Structure Plan area. The plan will allocate R-Codes for proposed street-blocks/lots (as the case requires). Once approved by the WAPC, the R-Codes plan forms part of the Structure Plan.

The SOCI's locational criteria for the R60 zoning within the greenfield Structure Plan are:

- ability to offer housing affordability cost effectively by prioritising multi-storey apartments at Stage 1;
- apartment types and sizes expected in public and social housing;
- the expectation that higher R-Codes have visual connectivity to Flying Fish Cove; and
- respond to community aspiration from Kampong residents eager to maintain such visual contact to the ocean.

The locational criteria for the R40 zoning are:

- larger apartment types and sizes expected in social and affordable housing at Stage 2;

- the need to achieve housing affordability for such apartment format for all age groups and single women in particular; and
- provide further supply for R40 at Stage 3.

The locational criteria of the R17.5 zoning are:

- highest and best use of low gradient land at Stage 2;
- offer large 900m² lots to accommodate large families;
- allow for the comfortable development of ancillary dwellings to maintain family cultural cohesion with the seniors age group; and
- provide further supply for R17.5 at Stage 3.

Lots zoned R17.5 found at the Silver City residential area are most popular. They are larger than the regulatory 571m² and range from approximately 820m² to 1000m². The total R17.5 zoned area of the Structure Plan covers 2.13Ha divided in 26 lots thus generating an average lot size of 821m². This provides sufficient space to accommodate large families, the parking of boats, the establishment of fruit and vegetable gardens and the comfortable development of ancillary dwellings offering the opportunity to maintain family cultural cohesion with the seniors age group.

The total R40 zoned area of the Structure Plan covers 2.0Ha divided in 4 lots that could accommodate 80 dwellings. This R-Code is expected to provide a built form not exceeding two storeys in small clusters of apartments.

The total R60 zoned area of the Structure Plan covers 1.37Ha divided in 3 lots, that could accommodate 83 dwellings. This R-Code is expected to provide a built form not exceeding three storeys with modest size apartment blocks sufficiently separated from one another to increase vista choices and capture the natural cooling benefit of the ocean winds.

There is a presumption that the R40 and R60 lots will not be further subdivided in smaller parcels unless otherwise supported by the SOCI. A finer grain preliminary concept subdivision layout for Stages 1-3 is attached at **Appendix 1**.

4.2.3 Development provisions

The development provisions applicable to the Structure Plan area are as follows:

- a) land use permissibility and general provisions in the residential zones shall be the same as those within those zones under the Local Planning Scheme No. 2.
- b) all dwellings are required to comply with the Residential Design Codes unless otherwise provided for in this Structure Plan.
- c) development for each site is to be in accordance with the density coding identified in the Structure Plan Map (refer to **figure 1 p.23**).
- d) solar arrays on skillion roofs in one or more segments to maximise decarbonisation are mandatory on all buildings.
- e) a minimum of one third of east, north and west façade areas are to be utilised for the capture of solar energy.
- f) for R40 & R60 lots:
 - i. with the exclusion of undercroft parking, buildings on sites zoned R40 are not to exceed 2 storeys.
 - ii. with the exclusion of undercroft parking, buildings on sites zoned R60 are not to exceed 4 storeys (including ground level).
 - iii. a minimum of one on-site parking bay per dwelling/apartment shall be provided.
 - iv. all outdoor parking areas are to be paved with green pavers with exception of the mandatory disabled bays.
 - v. loft areas within roof spaces permitted (as a result of skillion roof forms).
- g) all developments are to be set back 6m from all streets.

- h) where lots share a boundary with POS the side setback is to be 4m.

4.2.4 Development layout

Land uses within the Mixed use lot are calculated as a percentage of the lot area as follows: Parking/Landscaping 30% representing 1.05Ha, Commercial 30% representing 3500m² of gross lettable area and 60% Residential representing 2.09Ha with an R80 density that could accommodate 168 dwellings. The Mixed use lot will require the formulation of a Precinct Plan pursuant to the requirements of the *State Planning Policy 7.2* and where the building height will be at the SOCI's discretion.

4.2.5 Local Development Plans (LDP)

The formulation of LDPs, pursuant to Schedule 2, Part 6, Clause 48(1) of the *Planning and Development (Local Planning Schemes) Regulations 2015*, is not considered desirable or appropriate for the orderly implementation of the Structure Plan.

4.2.6 Interface with adjoining areas

The Structure Plan interfaces with adjoining areas in four directions, identifiable at **figure 5 p.30** and as follows:

- a) to the north, east and west, no land use transition or development interface are envisaged as the future environmental conservation area provides a significant vegetation (and visual) buffer to Murray Road in all three directions;
- b) to the south, the Structure Plan integrates with the existing residential context of the Silver City neighbourhood area and is purposely connected via the extension of Sunset Place into the proposed neighbourhood connector in Stage 1 through to Murray Road;

4.2.7 Heritage

There are no heritage features or buildings within the Structure Plan area that would require a protection mechanism

4.3 Other requirements

4.3.1 Bushfire protection

Christmas Island is not identified as a bushfire prone area on the WA Department of Fire and Emergency Services (DFES) Map of Bushfire Prone Areas that covers the Indian Ocean Territories. In this instance, the *WA State Planning Policy 3.7 Bushfire* and accompanying *Planning for Bushfire Guidelines* are not applicable to the proposed Structure Plan.

There is no historical record referring to bushfires having occurred on the island, due to generally unfavourable fire weather conditions (i.e. monsoonal climate, high annual rainfall, winter dry season, high relative humidity) and vegetation characteristics that are not conducive to bushfire occurrence (i.e. rainforest with very high moisture content and minimal surface fuel due to nutrient cycling).

No island wide Bush Fire Management Plan has ever been formulated. There is no Fire Danger Ratings available for Christmas Island to assist in determining Bush Fire Risks. A bushfire Management Plan may be formulated in the future to inform risk management approaches.

From a planning perspective the LPS No. 2 has no provision to implement and or enforce the prescriptions of the *Bush Fires Act 1954 - Part III Prevention of bush fires - Division 6 General restrictions, prohibitions and offences - Section 33 Local government may require occupier of land to plough or clear fire-break*.

4.3.2 Infrastructure arrangements

Roads

The proposed roads are typically 6m wide with kerbing on one or both sides. All roads and intersections have been designed to allow a 19m long articulated truck to access the roads.

The intersections of the two connecting roads to Murray Road have been designed with slip lanes provided for vehicles heading west on Murray Road. These slip lanes will enable vehicles to slow down after turning from Murray Road to access the development area. These two roads have grades of up to 6%, with the steepest grade at the exit from the development onto Murray Road with a maximum grade of 15%.

The proposed road extending from the northern end of Sunset Place is required to be located over steep limestone terrain, which is at approximately 27%. The limestone in this location is to be cut and retained where required so that the road gradient is reduced to a maximum of 15%. The rest of the proposed roads are within typical gradients of less than 12%.

Red Crab Migration

Vehicular movements represent a major threat to the red crab during the migration period that can span during the wet season from October to January where sections of roads can be closed under the direction of National Park. At the road detail design and or construction stage, the SOCI will consult with the National Park staff to ensure the design, and location of impact mitigation infrastructure for red crab migration is adequately provided.

Sewer

The existing sewer in Silver City serves the residential area with a 150mm diameter PVC pipe. This 150mm diameter PVC pipe discharges to the northwest of Silver City at an average grade of approximately 1 in 6. The Water Corporation is to confirm whether the sewer system downstream of Silver City is required to be upgraded. It is anticipated that there is adequate capacity in the existing system to serve Stage 1 of the development.

Water

The existing residential lots in Sunset Place are served with a 63mm diameter MDPE water main extending from a 150mm diameter PVC Class 12 main in Seaview Drive. The houses along Seaview Drive (section running northwest to southeast) are served at the rear of the lots with a 100mm diameter Galvanised Wrought Iron (GWI) pipe.

The residential lots along Arenga Close are served with a 110mm diameter High Density Polyethylene (HDPE) water main.

Power

Overall estimated electrical load requirement for the proposed infrastructure is calculated based on AS3000 standards. The proposed structure plan for Silver City is estimated to need 1.12MVA where 41kVA is residential demand and 1.040MVA is commercial demand. The proposed structure plan requires the installation of a new 1MVA for the commercial lot and the residential lot will be fed from the existing transformers.

The design provides the electrical supply connections for the proposed lots in Silver City which will be supplied by IOTPS. The design basis for this connection are as follows:

- Maximum demand of Silver City not to exceed 1.1 MVA- the maximum demand was done on basis of AS 3000 (KVA/m²). The exact maximum demand will be done once the modelling of the area is done by IOTPS.
- The new residential lots will be supplied from the existing transformer 112 and 503.
- The site will have an individual 1MVA transformer to supply the load.

Communications

Following a review of the existing communications infrastructure in the Silver City area, it is assumed that optic fibre infrastructure is available in

Seaview Place. This presents an opportunity to extend high-speed connectivity to support key facilities in the area.

To implement this, the following infrastructure works are proposed:

- Identification and confirmation of existing fibre routes along Seaview Plan, including location of existing pits and conduit pathways;
- Installation of new P50 communications conduits to provide connections to existing fibre infrastructure;
- Connection of the new conduits into the existing pits to integrate with the current network pathway and enable seamless fibre extension;
- Upgrade of existing communication pits where necessary to meet current standards for size, accessibility, and capacity; and
- Installation of new pits where required to support conduit runs, allow for efficient cable pulling, and provide access points for future maintenance.

These works will ensure reliable, standards-compliant connectivity to the NBN, with flexibility for future network expansion. The combined use of existing and new infrastructure will also minimize disruption and reduce overall construction costs.

4.3.3 Development contributions

The Shire lodged a Crown Land Enquiry Form (CLEF) with the WA Department of Planning Land and Heritage (DPLH) on the 12 December 2024 in order to obtain in freehold from the Commonwealth the section of the Structure Plan shown at **figure 4 p.28**. This step is considered necessary to facilitate the orderly construction of affordable and social housing projects.

The early steps to implement the greenfield Structure Plan will be a public endeavour. The financial participation to clear vegetation, initiate land and

geotechnical surveys, produce deposited plans and register titles, conduct earthworks, construct roads and install the infrastructure to provide essential services for each lot and build housing is expected to be achieved with Commonwealth assistance.

The *National Housing Accord 2022* designed to facilitate collaboration and improve financing for new social and affordable housing projects intends to “Provide availability payments and other innovative financing techniques through the Housing Australia Future Fund (HAFF) and/or National Housing Infrastructure Facility (NHIF) that will seek to facilitate superannuation and institutional capital investment in social and affordable housing, alongside established state and territory programs”. The SOCI is committed to explore the most appropriate avenues to obtain funding for the implementation of the Structure Plan.

Notwithstanding and without ignoring the standard infrastructure contribution requirements associated with the *WA State Planning Policy 3.6* and the outcome of the CLEF process, the SOCI and the DITRDCA are at the early stage of negotiating a development contribution framework that could reflect the unique circumstances of Christmas Island displaying close market characteristics.

These negotiations, affecting development contributions, could include but are not limited to the following actions and or intentions:

- land allocation for public housing where the Commonwealth will fund the construction and pay the appropriate SOCI rates;
- the SOCI to redirect rates towards infrastructure and maintenance;
- land allocation for affordable housing through Government affordable housing schemes and funding programs with rates and sale processes to be allocated to the infrastructure and maintenance for the new housing areas; and

- allocation of free hold land blocks where the income for sale processes and rates to also be allocated to the infrastructure and maintenance with the new housing area.

The reservation of land to specifically assist with the relocation of the Flying Fish Cove residents is likely to require the design and creation of an agreed funding scheme allowing freehold owners to access, on a like for like basis, developed freehold titles in the new allocated areas.

4.3.4 Protection or management of landscape features

The Environmental Assessment Report (EAR) ([Appendix 2](#)) describes the environment and outlines proposed environmental management strategies for the Structure Plan Area. These will be dependent on conditions of approval but are likely to include a weed management plan and a fauna management plan. No conservation significant flora has been found in the Structure Plan Area so it is unlikely that a flora management or relocation plan will be required.

4.3.5 Water resource management

On Christmas Island, the use of infiltration basins and channels offers a viable and sustainable approach to water management. Given the island’s porous limestone terrain, these systems are simple widely used and particularly well-suited to the environment. They require minimal maintenance and deliver multiple benefits, including reducing surface runoff, improving water quality, and enhancing groundwater recharge. Their integration into local infrastructure planning supports nature-based solutions tailored to the island’s unique ecological and geological conditions.

5. ADDITIONAL DETAILS

5.1 Information to be submitted with an application

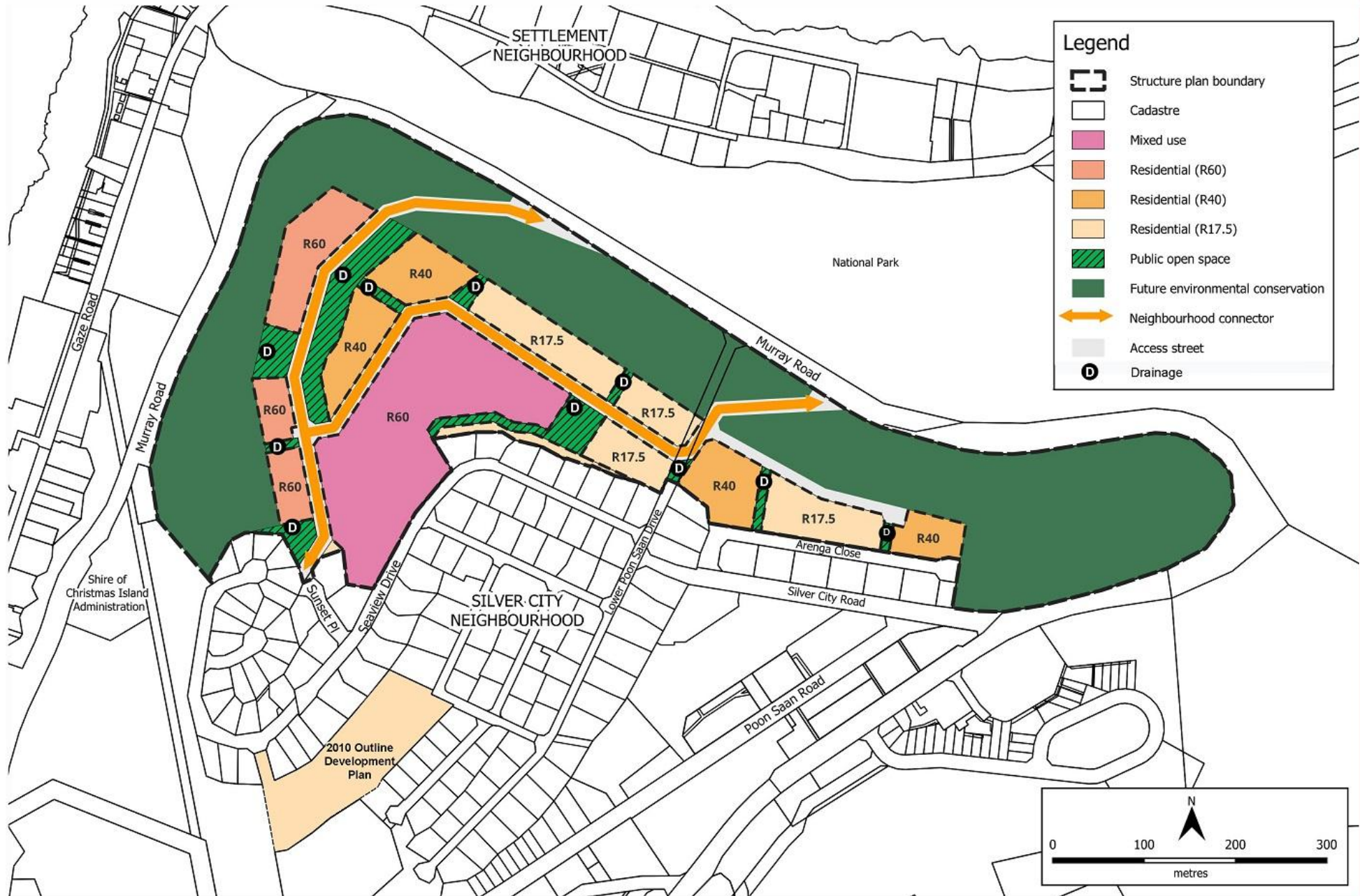
Additional information/purpose	Approval stage	Responsible agency (consultation required)
Conveyance Infrastructure Report for Water Supply	Subdivision (pre-design)	Water Corporation
Treatment Plant and Conveyance Infrastructure Report for Sewerage System	Subdivision (pre-design)	Water Corporation
Building Site Profile / Level Guidelines Plan	Subdivision	Shire of Christmas Island
R-Code Plan (to allocate R-Codes for proposed street blocks/lots)	Subdivision	Shire of Christmas Island

5.2 Studies required under condition of subdivision/development approval

Additional information/purpose	Responsible agency
Geotechnical Report, including locating underground voids and certification the land is physically capable of development.	Shire of Christmas Island
Stormwater Drainage Management Plan	Shire of Christmas Island
Road Pavement Construction Materials Study	Shire of Christmas Island
Engineering Drawings for water supply and sewerage	Shire of Christmas Island
Engineering Drawings for earthworks, roads and footpaths	Shire of Christmas Island
Engineering Drawings for power supply and street lighting	Indian Ocean Territory Power Services

STRUCTURE PLAN MAP

Figure 1 Silver City Structure Plan Map



PART 2 – Explanatory Section

1. INTRODUCTION AND PURPOSE

The Silver City Structure Plan has been prepared for the SOCI under the Australian Government's Housing Support Program (HSP) designed to help achieve the National Housing Accord target of building 1.2 million new, well-located homes over 5 years. The HSP supports the delivery of increased housing supply by funding projects that seek to deliver enabling infrastructure, provide amenities to facilitate new housing development or improve building planning capability.

The Structure Plan represents the first Stream of the HSP that provided funding to State, Territory and Local governments for projects which could advance and improve planning capability and land subdivision readiness ahead of the construction of new affordable homes on the island.

The Structure Plan represents the guiding planning instrument to facilitate future residential and Mixed use development on the northern edge of the Silver City settlement with dual access from Murray Road. It provides the long-term planning rationale and mechanisms to inform the detailed planning and design arrangements including implementation, staging and expected character of development.

This 'Greenfield' Structure Plan targets the development of vacant Unallocated Crown Land (UCL) adjacent to the Silver City existing settlement. It is intended to ultimately develop as a residential and Mixed use area by expanding freehold land offerings at an affordable price to support the expansion and diversification the island economy post mining and immigration.

The LPS 2015 identified the need to ensure that the Christmas Island economy achieves greater diversification and moves away from its traditional dependency on phosphate mining. The consensus of opinion, at the time and pertinent ten years later, is *“that the relevant economic drivers for Christmas Island include population growth, local food production, tourism opportunities, construction material supply, future economic activities, private investment, accommodation supply and home business/.”*

Section 4.1.1 of the LPS 2015 deals with population growth and illustrates a determinant challenge for the island:

“Current Issue; The lack of accurate information defining the extent of freshwater resources prevents the establishment of definite population targets.

Strategic Response; Mapping of the basalt layer. Plan for a total population of 5000 permanent people as per community-endorsed 2018 Plan.

Current Issue: There is an acute shortage of accommodation on the Island and a need for more accommodation.

Response: Identify suitable areas for future urban expansion, encourage the development of a Crown land release plan to facilitate the development of identified new urban areas.”

2. SITE AND CONTEXT ANALYSIS

2.1 Physical context

The location and broad context of the Structure Plan site is shown at [figure 3 p.26](#). The Structure Plan site is situated immediately north of the Silver City and Poon Saan residential areas and sits within an undeveloped area bounded by Murray Road on three sides. The Silver City residential area is characterised by single dwellings (R17.5) of single or two stories and accommodates small public park areas.

The Poon Saan residential neighbourhood is characterised by higher density 3 storey apartment buildings, that reflect the historic British Phosphate Commission architecture of the area. Poon Saan also includes some light industrial uses, commercial developments (offices, mini supermarket, café & restaurant) as well as community infrastructure (outdoor cinema, playgrounds and sports courts). The Poon Saan retail area accessibility is approximately 500m from Stage 3 and 900m from Stage 2.

The eastern portion of the Structure Plan area is situated on relatively gentle slopes that is conducive to the continuation of the existing residential pattern of Silver City. The western portion has a series of more gently sloped plateaus, separated by steep cliff areas, that provide opportunities for larger lots and more intensive development to take advantage of ocean views to the northwest and west.

The steepest portions of the site on the northern and western edges adjacent to Murray Road are well located to supplement the creation of an environmental conservation area functioning mainly as an ecological buffer to the National Park north of Murray Road.

Details of the local environment, including climate, soils, vegetation, topography, total water cycle, landscape features, key views, and local character (where relevant) are provided in the Environmental Assessment Report at [Appendix 2](#).

North of the Structure Plan area, but separated by remnant vegetation and a road, is a colony of the Christmas Island Frigatebird (*Fregata andrewsi*) which is currently protected within the Christmas Island National Park and is Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Numerous threats place the Christmas Island Frigatebird at risk, with local threats including encroachment of weeds into breeding colonies.

Figure **3** Location Plan and Broad Context



2.1.1 Land tenure

Almost all of the Structure Plan area is within the Crown Land portfolio. The location and land status are depicted at **figure 4 p.28**. Approximately 67.41% of the 28.33Ha Structure Plan area is a portion of Unallocated Crown Land Lot 606 on Deposited Plan 74724 and 31.81% is a portion of Unallocated Crown Land Lot 3019 on Deposited Plan 43321. The remaining 0.78% is made up of an unconstructed portion of the Lower Poon Saan Drive Road reserve.

2010 Outline Development Plan

The SOCI endorsed 2010 Outline Development Plan provides an additional 15 R17.5 lots within a portion of Lot 606 (refer to **figure 4 p.28**). Whilst not forming part of this Structure Plan, the ODP area has been included in the HSP Stream 1 scope of work to obtain land clearing permit and finalise the subdivision.

The ODP area is identified in LPS No.2 Scheme map and is located within an existing serviced residential area. Therefore, it is ideally placed to provide early relief to the housing supply on the island.

Part of Lot 116 Sunset Place

The proposed new road link between Murray Road and Sunset Place will require the excision of part of private lot 116 on Diagram 218117 (refer to **Appendix 1 – Sheet 2**). The owner has provided agreement in principle for the required excision.

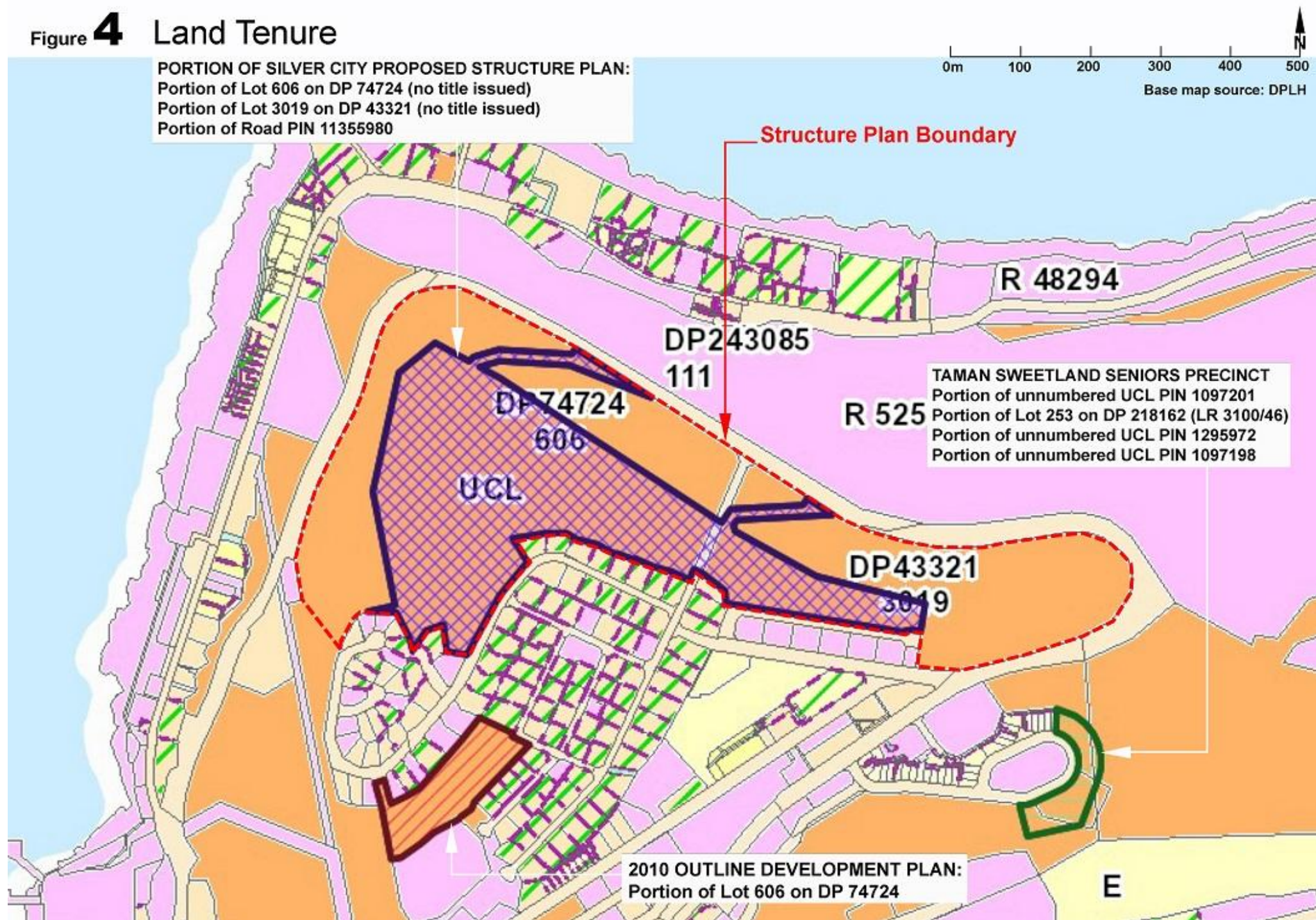
Lots 48, 50 and 59 Seaview Drive

Whilst the cadastral boundary of these lots will remain unchanged, the northern extension of Sunset place will require alteration of existing stormwater arrangements. The civil engineering detail design phase will need to ensure the protection of these lots against stormwater flooding.

Land ownership rationalisation

Developments on existing lots 274, 275, 58 and 59 facing Seaview Drive have historically encroached beyond the lots northern cadastral boundary (refer to **Appendix 1 – Sheet 4**) The Structure Plan process allows for the tentative enlargement of these lot northward subject to future land acquisition arrangement to be supported by the DPLH.

Figure 4 Land Tenure



2.2 Community context

Like many isolated small communities, Christmas Island is experiencing the challenging correlation between population levels, job opportunities and housing capacity. The permanent resident population, at its highest at the 2011 Census with 2,072, came down to 1,692 at the 2021 Census and was estimated at 1,250 at the end of 2024. A renewed economic output, supported by improved air accessibility and driven by Crown land release and investment in new economic drivers (mainly targeting Singapore) such as urban food export, higher education, research and tourism continues to coincide with community expectations.

The cultural diversity of Christmas Island originates from the late nineteenth and early twentieth century with the import of thousands of indentured Cocos (Keeling) Islanders, Mainland Chinese, Malays and Sikhs workers to service the phosphate mine and other island operations. The island experienced further diversification in the 1950s when it was administered by the Colony of Singapore. New labourers were recruited from Singapore, Malaya, the Cocos (Keeling) Islands whilst mine supervisors were brought in from Australia.

In 1958 the sovereignty over the island was transferred from the United Kingdom to Australia and that year Christmas Island became an Australian Territory.

The unique historic ethnic diversity of the island has somewhat endured and remains a noticeable component of the overall cultural fabric of the island population to this day. At the 2021 census the CI population exhibited an ancestry makeup of 22.3% Chinese, 17% Australian, 16.1% Malay, 12.5% English and 3.8% Indonesian.

2.3 Planning and governance context

This Structure Plan, consistent with the orderly and proper planning and essential for the future growth and prosperity of the island community, is designed having due regard to the objectives of a number of Western Australian planning documents, including:

- Schedule 2, Part 4 of the Planning and Development (Local Planning Scheme) Regulations 2015;
- State Planning Policy 2.6 State Coastal Planning Policy;
- State Planning Policy 7.0 Design of the Built Environment;
- State Planning Policy 7.2 Precinct Design;
- State Planning Policy 7.3 Residential Design Codes Volumes 1 & 2;
- Liveable Neighbourhoods; and
- Operational Policy 1.1 Subdivision of land general principles 2020.

The relationship between the Structure Plan area and the LPS No.2 is shown at **figure 5 p.30**.

Figure 5 2016 Local Planning Scheme No.2

Shire of Christmas Island

Local Planning Scheme No. 2

(District Scheme)



LEGEND

LOCAL SCHEME RESERVES

[Green]	Crown Reserve
[Dark Green]	National Park
[Light Green]	Public Open Space
[Yellow]	Public Purposes
[A]	Public Purposes : Airport
[C]	Public Purposes : Cemetery
[CG]	Public Purposes : Commonwealth
[CO]	Public Purposes : Community Purposes
[F]	Public Purposes : Fire Station
[FS]	Public Purposes : Fuel Storage
[H]	Public Purposes : Hospital
[P]	Public Purposes : Port
[PS]	Public Purposes : Power Station
[R]	Public Purposes : Religious
[RT]	Public Purposes : Rubbish Tip
[SC]	Public Purposes : School
[SE]	Public Purposes : Sewerage
[S]	Public Purposes : Shire
[T]	Public Purposes : Telecommunications
[W]	Public Purposes : Water

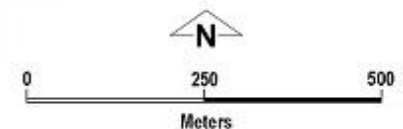
LOCAL SCHEME ZONES

[Blue]	Commercial	[Light Green]	Rural
[Purple]	Industrial	[Red]	Tourism
[Pink]	Mixed Use	[Yellow]	Urban Development
[Orange]	Residential		

OTHER CATEGORIES

(see scheme text for additional information)

[Dashed Line]	Scheme Area Boundary
[Solid Line]	Local Government Boundary
[Dotted Line]	R20 R Codes
[Dashed Line]	A1 Additional uses
[Dotted Line]	Groundwater Protection
[Dotted Line]	Wastewater Treatment Plant Buffer
[White]	No Zone
[Blue]	Waterbodies



2.3.1 Shire of Christmas Island 2015 Local Planning Strategy (LPS)

The SOCI LPS was endorsed by the Western Australian Planning Commission (WAPC) in May 2015. The LPS identified the need to ensure that the Christmas Island economy achieves greater diversification and moves away from its traditional dependency on phosphate mining. The relationship between the Structure Plan envelope and the LPS is shown at **figure 6 p.33**.

The consensus of opinion, at the time and pertinent ten years later, is *“that the relevant economic drivers for Christmas Island include population growth, local food production, tourism opportunities, construction material supply, future economic activities, private investment, accommodation supply and home business/.”*

Section 4.1.1 of the 2015 LPS deals with population growth and illustrates a determinant challenge for the island:

“Current Issue; The lack of accurate information defining the extent of fresh water resources prevents the establishment of definite population targets.

Strategic Response; Mapping of the basalt layer. Plan for a total population of 5000 permanent people as per community-endorsed 2018 Plan.”

The Strategic Directions of the 2015 LPS pertinent to the Silver City Precinct are:

“Current Issue: Fly in-fly out workforce not well integrated with the community and appropriate accommodation in short supply impacting on tourism facilities.

Response: Create quality accommodation for fly in-fly out workforce that can also be used for tourism and local needs (youth)

Current Issue: Lack of tourist facilities

Response: Identification of sites suitable for tourism within the existing settlement

Current Issue: There is an acute shortage of accommodation on the Island and a need for more accommodation.

Response: Identify suitable areas for future urban expansion, encourage the development of a Crown land release plan to facilitate the development of identified new urban areas

Current Issue: Potential fragmentation of communities across the Island

Response: Identification of appropriate areas for urban development in close proximity to public amenities and existing settlements

Current Issue: The cost of urban development on the Island (i.e. infrastructure and construction)

Response: Consolidation of urban development within the infrastructure rich existing settlement area

Current Issue: Increased risk of rock fall in Kampong due to slope instability

Response: Develop a long-term residential transition plan (20-30 years) for Kampong towards safer existing and new residential areas”

In terms of land Use Priorities for the Silver City precinct at section 5.4.2 the 2015 LPS also stipulates:

There are few development opportunities within the precinct for new urban development, and these should be developed primarily for residential uses, with ancillary aged care, short stay, tourism and commercial activities. developments should be encouraged to make more efficient use of land as well as attract additional small businesses.

The area could be developed in stages to meet housing needs on the Island as they evolve. In order to ensure the orderly future development of the area, further detailed structure planning will be required to identify the appropriate land uses and spatial layout. The structure plan will also

need to investigate and address any environmental impacts, including vegetation clearing. A vegetation buffer should be maintained along Murray Road to screen any new development.

and set aside land reserved for the establishment of vertical axis wind turbines as well as community batteries.

This 28.33Ha Structure Plan adheres to the LPS strategic directions and land use priorities by providing:

- 3.49Ha of in the most elevated area with multiple road frontage providing employment opportunities with 3,500m² of commercial floor space to cater for local neighbourhood shops and the possible establishment of facilities for visitors;
- Some 190 dwellings on single lots or grouped format to address the immediate need for social and affordable housing and contribute to the long-term objective of achieving the 5000-population target; and
- 2.55Ha reserved for the establishment of the road network.

From an environmental and public open space perspective the Structure Plan provides:

- The establishment of a permanent Environmental Conservation zone representing 14.85Ha or 52.42% of the total area to mitigate the impact of the area to be urbanised, acting as buffer with Murray Road to the west and north and forming a continuous ecological supplement to the National Park north of Murray Road; and
- The additional allocation of 1.73Ha of Public Open Space accommodating two neighbourhood parks and dedicated drainage infrastructure and enhanced ecological features.

The Structure Plan also provides the SOCI with the opportunity to implement a near zero carbon emission policy for the built form expected to take advantage of the natural breezes prevalent in this part of the Island, maximise the capture solar energy on roofs and well exposed walls

Figure 6 Local Planning Strategy 2015 (Active)

5.4 Poon Saan & Silver City

5.4.1 Objective

To maintain the precinct as the main residential area on the Island through the consolidation of existing developed areas and the identification of appropriate new urban expansion areas.

5.4.2 Land Use Priorities

This precinct has been developed previously with a mixture of high density apartments, concentrated in Poon Saan, and low density single residential lots in Silver City. These two housing types reflect the two different cultures that predominate in the two suburbs. This area will remain as the central residential area on the Island in the short to medium term, with accompanying commercial uses on Lower Poon Saan Road.

There are few development opportunities within the precinct for new urban development, and these should be developed primarily for residential uses, with ancillary aged care, short stay, tourism and commercial activities. Mixed use developments should be encouraged to make more efficient use of land as well as attract additional small businesses. These areas provide short term opportunities to increase the housing stock on the Island and encourage local private investment.

5.4.3 Key Opportunities & Initiatives

Urban Expansion Opportunities

The northern side of Arenga Close represents one of the future urban areas within the precinct that should be utilised for additional residential land uses. This land in the bend of Murray Road is relatively flat compared to other possible development sites and could potentially have views northwards to the ocean. Given the existing road network and service provision,

the area could be developed in stages to meet housing needs on the Island as they evolve.

In order to ensure the orderly future development of the area, further detailed structure planning will be required to identify the appropriate land uses and spatial layout. The structure plan will also need to investigate and address any environmental impacts, including vegetation clearing. A vegetation buffer should be maintained along Murray Road to screen any new development.

This precinct also includes Taman Sweetland, which consists broadly of the area between Murray Road and the LIA. There is a large area of Unallocated Crown Land between Plant Hill Road and Murray Road that should be developed for residential and commercial uses.

Tourism Opportunities

Further west of the Arenga Close site is a second site that is suitable for development for residential and tourism uses. This site is at the bottom of Seaview Drive and has elevated views of the ocean and lower terrace. The site is ideal for a tourism development to take advantage of these views, nestled within the jungle vegetation. There may also be an opportunity for a pedestrian link down to a redeveloped Cocos Padang site and the Gaze Road Tourism and Commercial Precinct to encourage the direct movement of visitors and residents from Silver City down to the main tourism and commercial precinct. The site is quite steep and has areas of Priority 2 vegetation, so detailed site planning would be required to mitigate these constraints.

5.4.4 Priority Actions

- Detailed structure planning for urban development and hospital expansion.

2025 Proposed Silver City Structure Plan Envelope



2015 Poon Saan & Silver City Precinct Envelope

LEGEND

- Poon Saan and Silver City Precinct
- National Park
- Environmental Corridor
- Urban
- Light Industrial
- Development subject to further Structure Planning

2.3.2 Christmas Island Strategic Assessment (CISA) – 2019/2023

A whole of island Strategic Assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) was initiated in February 2019 through an Agreement between the Federal Ministers for the External Territories and the Environment. From the CISA's outset the SOCI and the then Department of Infrastructure Regional Development and Communications came to the understanding that the CISA Land Use Plan would be best to coincide with the land uses regulated under the statutory local planning instruments. In effect the CISA Land Use Plan would match the land uses depicted in a new draft LPS already under preparation at the time. As part of that process, it was agreed the life of the CISA Plan was to be set at 30 years.

The CISA was paused in June 2023 by the Australian Government "while significant policy and law reforms are ongoing". This change of direction has delayed the possibility for an early release of Crown land and has increased the need to prepare the structure plan at Silver City to enable the potential introduction of new social and affordable housing on the island.

2.3.3 Attorney-General's Department Indian Ocean Territory Climate Change Risk Assessment - 2010

The specific risks and vulnerabilities for the Kampong at Flying Fish Cove are:

- Sea level rise expected to exacerbate inundation, storm and tidal surge, erosion and other coastal hazards potentially threatening Flying Cove jetty, wharf and boat ramp as well as the Kampong sea wall and buildings beyond and

- Increase intensity in cyclonic rain inducing land slide and associated rock fall around Flying Fish Cove with potential impact to the structural integrity of buildings and amenities.

In terms of adaptation to the effects of climate change the risk assessment report makes at page vi the following recommendation:

"Adapting to climate change involves preparing for, responding to and coping with climate induced changes. This can be best achieved through government and community working together to improve the ability of island communities to cope with or respond to the impacts of climate change. Hence, it is strongly recommended that a community-based approach be implemented to dealing with climate change over the long term. Of course, there are also a number of immediate short-term issues, such as the protection of coastal infrastructure, life and property, and emergency preparedness that need to be addressed as a matter of urgency, and again it is imperative that community be given the opportunity to be involved in the adaptation planning and decision-making process associated with these activities."

The report makes this specific recommendation:

"Develop a Climate Change overlay for planning development in Christmas Island including a longer-term transition plan for the Kampong".

2.3.4 Land Use Planning for Disaster Resilient Communities – 2020 Handbook

Another purpose of the Structure plan is to provide, when the time comes, land use choices at Silver City to assist with the orderly relocation of the Flying Fish Cove Kampong community at risk from sea level rise, storm surges and rock falls.

The vulnerability of the Kampong area is identified in the SoCI 2015 LPS that specifically advocates at page 46: *“Develop a long-term residential transition plan (20-30 years) for the Kampong towards safer existing and new urban areas”*.

Published by the Australian Institute for Disaster Resilience and the Commonwealth Department of Home Affairs, the *2020 Land Use Planning Handbook* provides guidance on national principles and practices relevant to communities at risk and the role land use planning can play for promoting disaster resilient communities.

The SOCI, following the Handbook process, has facilitated workshops with the Kampong Community in 2020 and 2021.

The SOCI resolved at its 22 September 2020 Ordinary Council Meeting to initiate a formal dialogue with the Kampong residents to collaboratively explore a future sustainable planning and social approach in response to on-going climate change induced risks at Flying Fish Cove.

The SOCI subsequently facilitated two workshops where relocation possibilities at Phosphate Hill, Silver City and Taman Sweetland were explored with sustained interest from the community.

As part of the HSP-S1 program, the SOCI has presented the Phosphate Hill and Silver City proposed structure plans (ref. following maps) at public meetings at the Kampong on the 7 and 14 November 2024 to further gauge the community’s sentiments and expectations associated with these more detailed plans. It was subsequently agreed the SOCI would prepare a questionnaire to be issued to each household to refine aspirations in terms of future relocation to either Silver City or Phosphate Hill and the desirable housing type being on single 900m² lots or apartment format.

As of November 2024, the Kampong population is 427 of which 147 are children. In 2021 the average Australian household size was 2.5. This indicates that the orderly relocation of the residents could require the identification and protection of suitably zoned land to accommodate up to 170 dwellings on freehold lots or strata apartments.

2.3.5 Accommodation Needs Assessment - 2011

The need for new affordable housing on CI is not new and on-going. It was comprehensively documented in the *2011 Accommodation Needs Assessment Christmas Island & Cocos (Keeling) Islands* commissioned by the then Department of Regional Australia, Regional Development & Local Government.

The key matters identified in the report were:

1. immediate need for housing with the 20 to 35 age group;
2. unmet demand for old age group;
3. peaks and troughs prices reflecting fluctuations of the local economy;
4. significant pressure on tourism accommodation;
5. low affordability preventing residents to access home ownership;
6. loan accessibility considerably higher than the main land;
7. absence of housing support funding assistance available in WA or the mainland generally;
8. difficulty in attracting private investment on island and
9. flexibility of housing types needed to respond to changing demand.

The pandemic, the cessation of immigration activities, the increased proportion of non-permanent residents amongst mining staff, the specific increased cost of construction material and logistics, estimated to be 2.4 times Perth prices, and the general effects of rising costs within the mainland economy have all contributed to exacerbate the pressure on the island housing market and its ageing building stock.

3. OPPORTUNITIES AND CONSTRAINTS ANALYSIS

3.1 Precinct boundary and surrounding land uses

The boundary of the Structure Plan is defined generally by the boundary of the Urban Development zone identified in LPS No.2. The boundaries are described in detail as follows (shown at **figure 7 p.38**):

Segments	Definition
A-B	Water Corporation Reserve boundary
B-C	Segment joining Water Corporation reserve to Seaview Drive
C-D	Rear boundary of existing Seaview Drive residential lots
D-E	Rear boundary of existing Seaview Drive residential lots
E-F	Seaview Drive road reserve boundary
F-G	Rear boundary of existing Seaview Drive residential lots
G-H	Arenga Close road reserve and POS boundary
H-J	Silver City Road reserve boundary
J-A	Murray Road reserve boundary

3.2 Physical parameters

The Structure Plan site physical attributes, constraints, opportunities and major vehicular movements are depicted at **figure 7 p.38**.

CISA

There is a need to setback urban development 110m from the boundary of the National Park north of Murray Road. This self-imposed arrangement stems from an approach considered appropriate when establishing the CISA Land Use Plan. The purpose of the setback is to minimise impact on the Frigate Bird habitat and act as a buffer between the future urbanised areas and the National Park. This buffer is to be dedicated to

environmental conservation. In this context the proposed environmental conservation zoning will represent over 50% of the Structure Plan total area.

Topography

Topography with 10% gradient or less are suitable for development. There are two cliffs approximately 14m in height traversing the site from north to south. Their footprint is unsuitable for development and are proposed to be included in the POS zone whilst the lower cliff separates Stage 1 from Stage 2. The upper terrace adjacent to Seaview Drive with commanding views onto Flying Fish Cove is purposely assigned to Stage 4 with a Mixed use zoning that could provide retail convenience locally and attract R80 residential and or hospitality function.

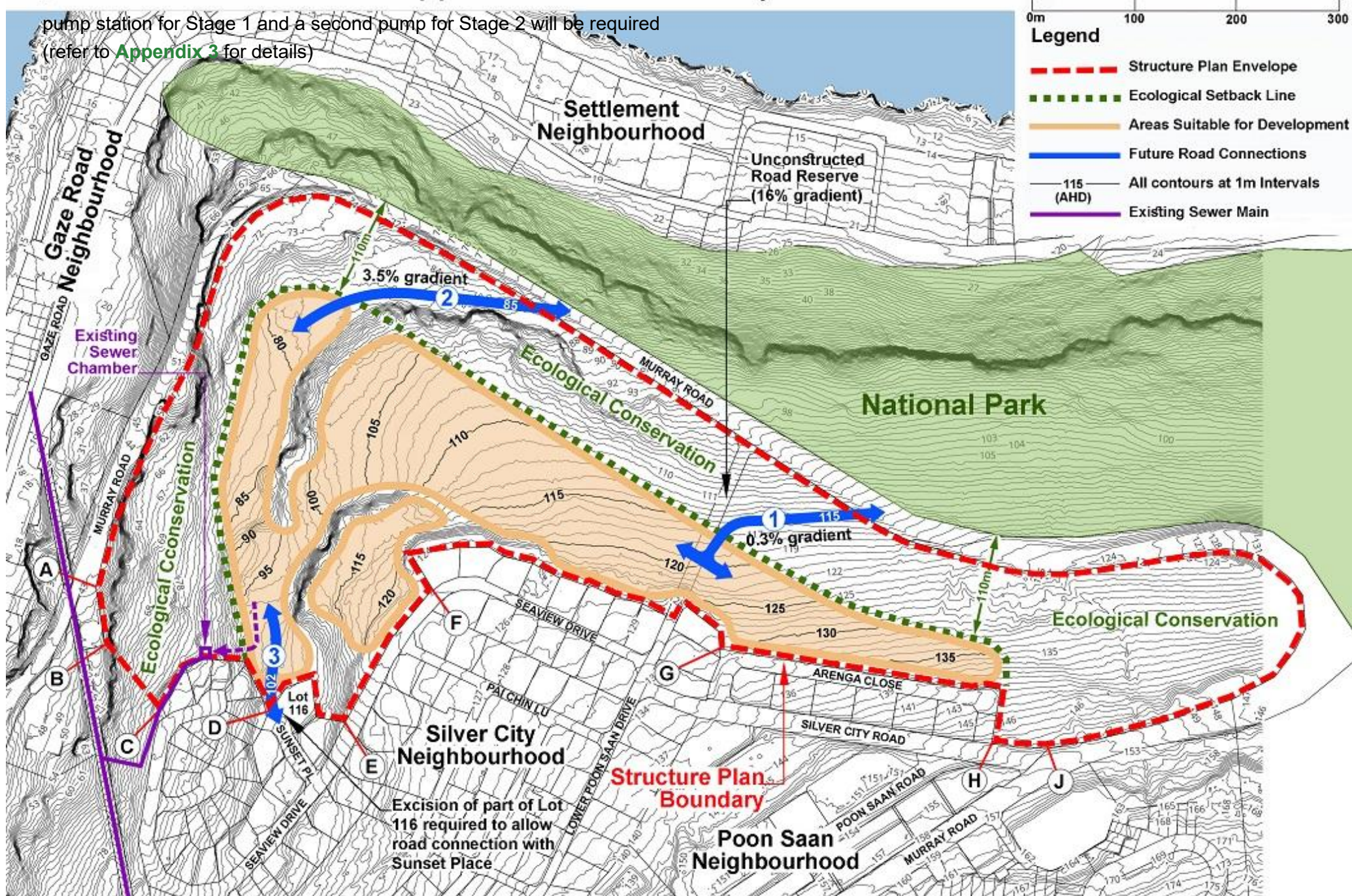
Vehicle Access

There are limited options to provide vehicular accessibility. LPS No.2 shows an unconstructed Road Reserve linking Murray Road to Lower Poon Saan Drive. The construction of this section of road is not considered feasible given the prohibitive 16% gradient of the Reserve. Consequently, and in replacement, it is proposed to create two vehicular access from Murray Road. An eastern access at 115m AHD with a 0.3% gradient and a northern access at 85m AHD with a 3.5% gradient. A third access from Sunset Place at 102m AHD is to provide interconnectivity with the Silver City neighbourhood.

Sewer

The ability to connect to the existing sewer network is dependent on the topography. The lowest outlet is located in proximity to Sunset Close in the form of an inspection chamber ultimately linked to the sewer main running down the incline. The lower terrace is below the chamber and a

Figure 7 Constraints and Opportunities - Boundary Definition



3.2 Environment

The summary of constraints and opportunities relating to climate, topography, vegetation, fauna flora and heritage are as follows:

Climate

The Christmas Island near equatorial monsoon climate requires special consideration of peak flow conditions and 1:100-year rainfall average return intervals (ARI).

Topography

The proposed environmental conservation area includes steep slopes which limits space available for development and constrains for road and infrastructure locations. The hilltop position provides greater security against rising sea levels and the risks of rockfalls whilst it provides residents with ocean in almost all locations.

Fauna

When the CISA process was active the SOCI agreed that urban development should be setback 110m from the National Park boundary to ensure better protection of the Christmas Island Frigate Bird habitat and fly path. The Structure Plan's proposed Environmental Conservation Area will preserve in perpetuity a buffer to critical habitat for the Frigate Bird.

Several faunas which are listed as Matters of National Environmental Significance occur within the Structure Plan Area, which may require management. Red crabs are abundant in the Structure Plan Area and provision needs to be made for their annual migration. Culverts are proposed at strategic locations to facilitate red-crab movements during their annual migration. Robber crabs are common on the island and are protected. They are at risk from vehicle traffic and clearing activities.

Installation of nest boxes for Golden Bosun birds throughout the Structure Plan area would be worthwhile.

At the road detail design and or construction stage, the SOCI will consult with the National Park staff to ensure the design, and location of impact mitigation infrastructure for red crab migration is adequately provided.

Flora/Vegetation

The rainforest includes tall trees to 50m height which may present a tree-fall risk during high winds or when the soil is saturated during high rainfall events. Where possible taller retained trees will be separated from housing by roads. The rapid regrowth rate of tropical vegetation requires continual management of vegetation boundaries and trails.

Heritage

Possibilities exist to provide plantings of mango and avocado within the POS and Drainage corridor areas, to reflect the Island's history of food insecurity and the added opportunity to bolster the survival of the critically endangered Christmas Island Flying Fox species.

3.3 Pathway to land subdivision

The implementation of the Structure Plan relies on the ability to subdivide the land and create freehold titles to accommodate residential and commercial land uses. The SOCI is willing to facilitate this process for the clearing of land and the creation of titles to occur.

Following advice from the DITRDCSA, the SOCI has lodged with the DPLH a Crown Land Enquiry Form (CLEF) on the 12 December 2024. to obtain in freehold from the Commonwealth the northern portion of the Structure Plan that can be physically urbanised as depicted at **figure 4 p.28**. This will provide sufficient land to accommodate residential and commercial demand on the island for at least the next decade.

The SOCI seeks to be granted ownership of the referenced Crown Land parcels to facilitate the construction of social and affordable housing projects, reduce youth housing stress, advance the resilience of its at-risk Kampong community at Flying Fish Cove by securing land and housing opportunities away from the coastal area and ultimately prepare the transition of the island economy beyond immigration and mining.

The transfer of Crown Land is governed by the Commonwealth Department of Finance's *Guide to Commonwealth Property Disposals - June 2024* (the Guide). The Shire is considering the Off-Market Concessional Sale pathway to obtain Crown Land in freehold thus allowing the subdivision of the land it controls and oversee the construction and management of new social and affordable housing.

The community benefits identified by the SOCI in order to obtain a Concessional Sale are:

- The construction of new public housing to replace the current stock earmarked for demolition;
- The construction of social and affordable housing to relieve housing stress experienced by the island's 18 to 40 age group;
- Following the requirements of the Minister for Home Affairs 2020 *Australian Disaster Resilience Handbook*, to reserve land and facilitate the ultimate relocation and resilience of the Flying Fish Cove Kampong community (427 adults of which 147 are children) at risk from sea level rises, cyclonic storm surge induced inundations and landslides/rockfalls caused by heavy monsoon rains;
- To cater for the housing needs of its growing senior citizens population; and
- To prepare the transition of the island economy beyond immigration and mining.

The adherence to the land uses depicted in the Structure Plans and the provision for a quota of affordable housing to be provided in the residential zones of the Structure Plans could be included as a component of the security of purpose conditions and enforced through mandatory requirements under the Shire Local Planning Scheme.

The SOCI seeks the early security of tenure for all land parcels depicted at **figure 4 p.28** given the SOCI's willingness to facilitate the process of land clearing and the creation of titles to progressively implement the Structure Plan.

4. STAKEHOLDER AND COMMUNITY ENGAGEMENT

Stakeholder and community engagement at the initiative of the SOCI and or the DITRDCSA dealing with matters having direct association with the Structure Plan area has been on-going since 2019.

This sustained engagement was conducted through a range of activities including but not limited to:

- Debates at public meeting;
- Regular presentations and dialogue with Shire Councillors;
- Regular briefings and feedback from DITRDCSA staff on island and in Canberra;
- Presentations to CIP staff on island and PRL staff in Perth;
- One on one consultation with independent local businesses;
- Neighbourhood workshops with residents for each settlement;
- Issuing of questionnaires;
- Consultation with water and power providers; and
- Briefing sessions with the Administrator.

4.1 Christmas Island Strategic Assessment (CISA) – 2019/2023

A whole of island Strategic Assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) was initiated in February 2019 through and Agreement between the Federal Minister for the External Territories and the Minister for the Environment.

From the outset the SOCI sought to ensure the CISA land use plan was to coincide with future land use planning associated with the review of the Shire LPS and capable of accommodating a permanent population of 5000 residents in order to maintain a sustainable economic output on the

Island post-mining and be aligned with the population target of the SOCI 2015 LPS in force.

In effect the CISA Land Use Plan would match the land uses depicted in a new draft Local Planning Strategy then already under preparation.

As part of that process, it was agreed the life of the CISA Plan was to be set at 30 years and capable of accommodating a permanent population of 5000 residents in order to maintain consistency with the SOCI active LPS 2015. The CISA was paused in June 2023 by the Australian Government “*while significant policy and law reforms are ongoing*”.

This change of direction has highlighted three matters:

- a) the delayed possibility for an early release of Crown land which was a core purpose of the CISA
- b) the need for the SOCI, moving forward, to capture acceptable elements of the CISA land use plan to minimise environmental impacts and
- c) the merit to prepare the Structure Plans at Phosphate Hill and Silver City to facilitate new developments whilst reactivating Crown land release as catalyst to attract investment and pivot the island economy.

4.2 Land Use Planning for Disaster Resilient Communities – 2020 Handbook

Another purpose of the Structure Plan is to provide, when the time comes, land use choices at Phosphate Hill to assist with the orderly relocation of the Flying Fish Cove Kampong community at risk from sea level rise, storm surges and rock falls. Published by the Australian Institute for Disaster Resilience and the Commonwealth Department of Home Affairs, the *2020 Land Use Planning Handbook* provides guidance on national principles and practices relevant to communities at risk and the role land use planning can play for promoting disaster resilient communities. The SOCI, following the Handbook process, has facilitated workshops with the Kampong Community in 2020 and 2021.

The vulnerability of the Kampong area is identified in the SoCI 2015 Local Planning Strategy that specifically advocates at page 46: *“Develop a long-term residential transition plan (20-30 years) for the Kampong towards safer existing and new urban areas”*

The SOCI resolved at its 22 September 2020 Ordinary Council Meeting to initiate a formal dialogue with the Kampong residents to collaboratively explore a future sustainable planning and social approach in response to on-going climate change induced risks at Flying Fish Cove. The SOCI subsequently facilitate two workshops where relocation possibilities at Phosphate Hill, Silver City and Taman Sweetland were explored with sustained interest from the community (refer to **figure 8 p.44**).

As part of the HSP-S1 program, the SOCI has presented the Phosphate Hill and Silver City proposed Structure Plans at public meetings at the Kampong on the 7 and 14 November 2024 to further gauge the community’s sentiments and expectations associated with these more

detailed plans noting that as of November 2024, the Kampong population was 427 of which 147 were children.

Considering the 2021 average Australian household size of 2.5 indicates that the orderly relocation of the residents could require the identification and protection of suitably zoned land to accommodate up to 170 dwellings on freehold lots, in strata apartments or social housing apartments.

The main issues raised during these sessions were:

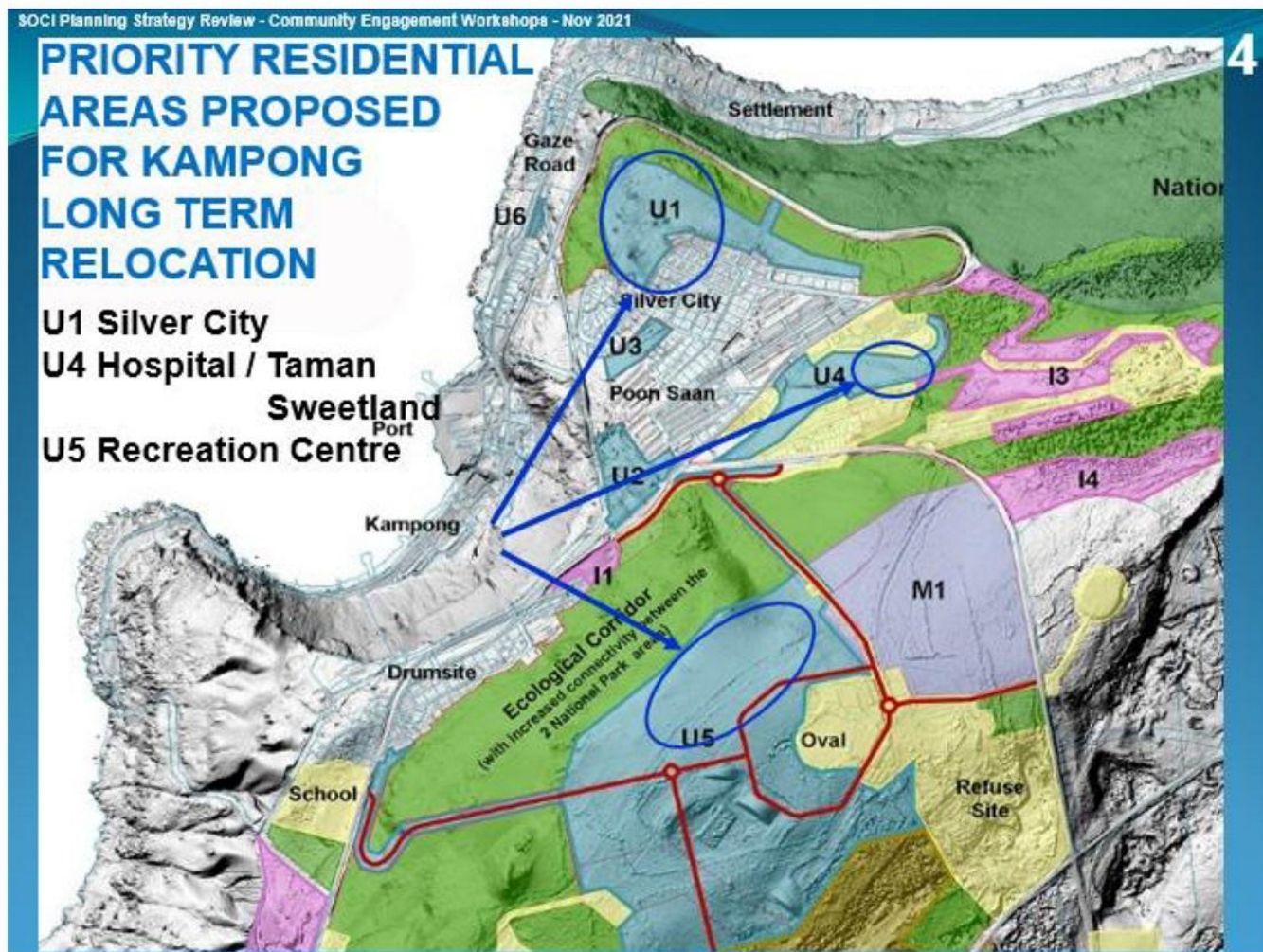
- confirmation of SOCI’s role to assist the community in identifying, reserving and or allocating land for future relocation;
- expectation that a formal process involving collaboration between the SOCI and the DITRDSCA to release land be sustained;
- the SOCI and the DITRDSCA agree that a formal community owned evacuation plan need be establish rapidly and not wait for catastrophic event to occur without it;
- residents may only move when they have to, some may take the opportunity to do it early;
- the need to identified quantitative aspirations in terms of future relocation to either Silver City or Phosphate Hill;
- preference for housing on large single 900m2 lots to cater for children, boat, veggie garden and ancillary dwelling for ageing family members;
- apartment format should also be considered to address generational circumstance, affordability and like for like in terms of relocation;
- expectation that, beyond relocation, land use at Flying Fish Cove would not allow hospitality or residential accommodation;
- future land development and housing projects should provide employ local people in priority;

- expectation the relocation of prayer facilities to be considered and land be identified for it at Phosphate Hill;
- realisation that relocation cannot provide same views and access to the beach whilst Silver City can offer views;
- the Phosphate Hill and Silver City Structure Plans, once endorsed, represent the immediate necessary first step to concretely advance the ultimate resilience of the Flying Fish Cove community; and
- that the Commonwealth needed to play a significant role in any relocation planning concerning the welfare of residents, with their informed consent.

Figure 8 Kampong Relocation Priority Areas

1.2 Confirmation of proposed relocation areas

The following drawing was presented for discussion at the Kampong 17 November 2021 Community Engagement Workshop



2020 SOCI proposed CI Strategic Assessment (CISA) Land Use Plan

Three future residential areas deemed suitable for the orderly and progressive relocation of the Kampong residents have been identified by the Shire for the following reasons:

Area **U1** - North of Silver City can provide built form density similar to the Kampong with equal/superior sweeping ocean views.

Area **U4** – Between Taman Sweetland and the Hospital could accommodate Independent Living Units and Age Care.

Area **U5** – In close proximity to the Recreation Centre, outside the mining lease and on flat land. This area can accommodate low density residential on large blocks.

The representatives of the Kampong community support the Shire in securing part of these 3 Unallocated Crown Land assets for the exclusive purpose of the progressive relocation of the Kampong Residents over time.

4.3 Phosphate Resources Limited

Meetings and presentations to PRL and CIP staff have been conducted from November 2024 onward to gauge the effect the Structure Planning may have from a strategic perspective regarding the future of the island economy or the potential impact on mine operations.

PRL's main comments about the Structure Plan are as follows:

- support the SOCI having secured funding HSP Stream 1 funding;
- consider the creation of the Structure Plan as long overdue;
- acknowledge the importance of the initiative to reduce housing shortage and improve island amenity in the near future; and
- emphasise the longer-term benefit of encouraging investment into the island.

In addition, PRL has provided pro bono valuable geophysical information to the DWA engineering team in the form of known location of major fractures in the limestone formation within the Structure Plan area.

4.4 Christmas Island Housing Needs Assessment

The SOCI engaged the Christmas Island Women's Association (CIWA) to lead community consultation efforts and provide insight in assessing the most suitable mix of housing and tenure types to meet the island's housing needs. It was also tasked with reviewing and consolidating the literature on housing stress and housing demand on island.

This noticeably complex assessment (refer to **Appendix 5**) focused on the housing journey of Christmas Island families from the perspective of women, the suitability of housing designs for new developments and options for construction. On this basis the CIWA consulted its 150-person membership from September to December 2024 and conducted a further

20 in-person interviews with women of between 60 to 90 minutes each in the language of the interviewee's choice.

The exercise uncovered lived experiences of women across different generations, cultural backgrounds, time periods and household sizes thus reinforcing this anecdotal common thread: *"If you solve women's problems, you solve societies' problems. If you solve men's problems, women still have problems"*.

Terms frequently used in the findings are:

- **Underhoused Household** being long term current Christmas Island residents who are unable to meet the criteria for a home loan and are currently excluded from public housing eligibility;
- **Public Housing** owned and managed on Christmas Island by the DITRDCSA with guidance for eligibility criteria from the WA Dept. of Communities;
- **Social Housing** or rental housing that is owned and/or managed by not-for-profit organisations and generally allocated to lower income households on either income-linked or "affordable" rents in accordance with eligibility and prioritisation policies of each State/Territory or Community Housing Provider;
- **Community Housing Provider** (CHP) is a registered organisation under their State or Territory legislation that delivers affordable housing options for the community through either creating rentals within affordability limits or disposal of homes at below market prices to a select demographic and
- **Affordable Housing** is offered for sale at below the market price in the area, typically by a CHP although historically the Commonwealth as well.

The key findings/recommendations identified by the CIWA with direct and or indirect influence in the Structure Planning process are:

- a) reaffirmation the SOCI's March 2022 Christmas Island Housing Stress Survey and subsequent community groups and individuals feedback that the WA benchmarks for entry onto the Christmas Island public housing waitlist have resulted in the creation of an 'underhoused' demographic given the requirement to have 30% of the purchase price in cash to be considered for a loan through the island's sole banking provider;
- b) there are sufficient 'underhoused' persons on the island of varying ages to fill at least 24 homes if it were to be made available for them to enter social housing through a CHP, or through amendment to the existing public housing criteria;
- c) Islanders do not have access to programs and schemes available through the Housing Australia organisation where tenure to approved land may allow CHPs and other stakeholders to build housing stock on Christmas Island;
- d) Housing Australia's six support vehicles are the Affordable Bond Housing Aggregator, the National Housing Infrastructure Facility, the Housing Australia Future Fund, National Housing Accord Facility, Capacity Building and Home Guarantee Scheme;
- e) noting the Commonwealth's successful mirroring of the WA Government's 2024 Short Term Rental Accommodation Initiatives which has seen short-stay accommodation stock move back into the long-term market;
- f) the proposed Phosphate Hill and Silver City Structure Plan locations as being equally desirable for social and affordable housing developments and noted that Silver City had in-fill potential;
- g) the total residential needs for the 2026 to 2030 period are 62 homes representing 16 underhoused single, 12 underhoused couple, 16 incoming young adults (18-24), 12 incoming households (25-39) and 6 seniors (65+);
- h) recommending the 24-unit public housing Kampong block set for retirement be replaced with 16 two-bedroom units and 8 three-bedroom units in the Structure Plan areas;
- i) using the waitlist for public housing to gauge housing demand presents a distorted view because the benchmarks to enter public housing stock does not permit the working 'underhoused' to register to apply for housing;
- j) noting that Flying Fish Cove is a foot-friendly environment with proximity to grocery retail and a significant place of worship. New residential areas in the Structure Plans should incorporate public and social space to encourage interaction between neighbours and especially the elderly;
- k) it is essential that pathways be capable of wheelchair and pram access and the design of new social housing areas need not contain fencing security lighting and cameras as a priority;

- l) ensure the aging population has access to housing stock that is suitable for elderly to be able to live independently with features such as ramp access and wider door frame should their current homes not continue to be suitable;
- m) SOCI and DITRDCSA to research and resolve banking, insurance and geographic limitations in order to assist people seeking to participate in the Christmas Island residential housing market;
- n) the CIWA membership and the wider community note the unlikelihood of raising 30% cash deposit whilst paying rent and where the 'bank of mum and dad' phenomena in assisting children to secure accommodation is also mirroring the mainland trend;
- o) 20% of CIWA women interviewees had either drained their superannuation completely or sold their own homes to provide one child or several children the means to make up a deposit to enter the private housing market thus resulting for some to living in public housing in their advanced age;
- p) the SOCI to seek clarification from the DITRDCSA as to which WA State Government funding could be mirrored from the WA Community Housing Provider sector and applied the IOTs and to subsequently seek to fund a CHP to create a feasibility study on service delivery for Christmas Island;
- q) CHPs can provide the governance structure to deliver social/affordable housing programs to residents should they be able to access the according funds to do so from the Commonwealth; and
- r) women could not obtain viably a home without a partner or significant family assistance in the private market. A non-private market housing pool which allowed women to pursue career development on island was essential to retain unmarried women on the island pursuing a career and also play a role in providing long-term tenure for families and retired elderly.

5. DESIGN RESPONSE

The Structure Plan design outcomes are consistent with *Liveable Neighbourhoods* taking into account the intent and objectives of the relevant elements, namely Community Design, Movement Network, Lot Layout, Public Parkland, Urban Water Management, Utilities.

5.1 Community design

The Structure Plan design assignment is to connect a new urban area, heavily constraint by topography to the existing Silver City urban matrix. As such the proposed zoning densities and the built form reflects the densities and building typology found in the Silver City and Poon Saan neighbourhoods. The Structure Plan is also responsive to the environmental significance of the National Park to the immediate north with the creation of an environmental conservation buffer to minimise the impact of the new urban area on the National Park itself.

Given the relative remoteness of the Poon Saan retail node, the Structure Plan provides a zone to ensure that the new residents will ultimately have walkable access to shops and commercial outlets. This in turn will benefit the existing residents of Silver City to maximise synergies of land uses.

5.2 Movement network

The vehicular connectivity of the Structure Plan is heavily constrained by the topography that offers a single point of entry into the Silver City neighbourhood at Sunset Place thus ensuring some permeability of movements. By contrast the two connectors to Murray Road offer direct access to the Gaze Road and Flying Fish Cove areas as well as the upper part of the Island. The road configuration for the two connectors can accommodate 19m semi articulated trucks. This will allow the school bus

to provide service to the residents with safe pick-up points within the Structure Plan area.

Movement issues are island specific with no real comparison to mainland circumstances. The movement network is designed to accommodate the 5000 permanent residents target and the Road Reserve hierarchy is responsive to that objective. The Structure Plan movement network is designed to feed seamlessly with this overall vision, through the provision of two new main connections from the Silver City and Poon Saan neighbourhoods into the proposed development areas, and ultimately Murray Road.

Public transport on Christmas Island is limited to a handful of buses driving children on school days from each neighbourhood to and from the CIDHS. These buses are also used from time-to-time for special events, community groups or tourism. The Structure Plan provides new road connections into Silver City that can accommodate buses if required, to allow the school bus to service the new residential areas.

The usage of private vehicles, once the privilege of a few in the past, is now the common mode of transport on the island with most adults driving their own car. The carpark demand in the residential areas is expected to be relatively high. The large proposed R17.5 lots provide space for parking of vehicles as well as boats, which is a common requirement on the island.

The use of electric bikes and electric mountain bikes is a fast-growing mode of transport for tourist visitors and locals alike. The Structure Plan provides space in proposed road reserves for dual pedestrian and cycling paths to connect into neighbouring residential and commercial precincts.

Like with all settled areas on the island a 50km/h speed limit is expected to apply within the Structure Plan area.

5.3 Lot layout

The pattern of lots and large blocks have been calibrated taking into consideration the topography to ensure maximum road gradients are appropriate, the establishment of buildings to run parallel to the contours and the ability to retain portions of remnant vegetation within the POS structure.

The supply of large R17.5 lots averaging 821m² reflects the community preference for housing on large lots to cater for children's needs, allow the parking of boats as a frequent and common requirement for islanders, provide opportunity for veggie gardens and fruit trees, and build ancillary dwelling for ageing family members and maintain family cohesiveness.

The R60 lots are purposely located at the western edge of the Structure Plan to provide ocean views to the maximum number of residents, in particular offer increased choices to the Kampong residents that may be willing to relocate at Silver City at some stage in the future.

5.4 Public parkland

The public realm is characterised by a leafy environment due to the street tree allowances combined with the intended retention of existing trees within the POS network. This is designed to maintain a strong urban tree canopy as a feature of local identity, promote community health and wellbeing and ultimately generate a cooler environment throughout the area. Public open space is divided into three functions being neighbourhood parks, landscaped drainage corridors, and the cliff area between Stage 1 and Stage 2.

Given topographic constraints and the proximity to the existing Silver City residential area, it is anticipated that existing public open space will also be utilised by nearby residents within the Structure Plan area. In addition to the public open space, 52% of the Structure Plan area is dedicated to an environmental conservation corridor. The three neighbourhood parks distributed throughout the Structure Plan area to provide suitable gathering spaces for the community. These parks are also connected, either directly or visually, to surrounding natural vegetation areas.

There are a further 9 landscaped corridors (or ecological connectors), also disbursed throughout the Structure Plan area, that provide drainage corridors for stormwater management as well as additional landscaped areas as community spaces. These areas also directly connect to surrounding natural vegetation areas. The ecological connectors may also act as red crab migration corridors when they seek to reach the ocean to spawn at the start of the monsoon cycle.

5.5 Urban water management

Christmas Island receives approximately 2,000mm of rain per year, and stormwater drainage systems need to accommodate frequent and high intensity rainfall events. The geology of the Structure Plan area is highly permeable limestone resulting in stormwater draining relatively quickly after rainfall events. On Christmas Island, the use of infiltration basins and channels offers a viable and sustainable approach to water management. They require minimal maintenance and deliver multiple benefits, including reducing surface runoff, improving water quality, and enhancing groundwater recharge. Their integration into local infrastructure planning supports nature-based solutions tailored to the island's unique ecological and geological conditions.

In these geological conditions, sinkholes can form where water is allowed to enter the subsurface at one location. Because of the connected nature of limestone bedding and fracturing, infiltrating water can lead to solutioning and sinkhole formation well downstream of the point of entry. Therefore, control of both surface and stormwater at the site is important.

The development will be served with interconnected channels or pits and pipes, which will direct stormwater to either a stormwater basin, or a controlled outflow channel drain, depending on the site topography (refer **Appendix 3**). Locations of basins and channel drains are directly dictated to by the sloping topography of the area. The drainage infrastructure is located within POS areas distributed throughout the Structure Plan area. In addition, the proposed road reserves have been designed with sufficient width to accommodate the required drainage infrastructure.

Stormwater drainage will be designed to convey a 1 in 5-year storm event and ultimately discharge into a controlled outflow channel drain. The controlled outflow channel drain will be designed to reduce the velocity of the stormwater and ultimately discharge into a basin or channel drain which can retain stormwater runoff from a 1 in 100-year storm event. Pollution from road runoff is to be treated with a vegetated filtered layer installed within the channels and basins.

5.6 Utilities

The proposed servicing strategy (refer **Appendix 3**) has been developed to take into account the existing Water Corporation assets on the island and the topography of the Structure Plan area. Sewer provision will be a majority of gravity sewer, complimented by two short pressure mains, to reduce costs where possible and minimise additional infrastructure by connecting into suitable existing Water Corporation services. This has

necessitated three sewer pump stations, strategically located in POS or road reserves. One of the pump stations is envisaged to be a private pump station, to be developed as required to service the northern R40 lot in Stage 2.

Water services will be provided through the installation of a new 100mm PVC pipe to connect with the existing water supply at the northern end of Sunset Place. A maximum head loss of less than 3m throughout the proposed system is anticipated, which complies with Water Corporation requirements.

5.6.1 Staging

The servicing strategy has been designed to be able to be implemented in line with the Structure Plan staging (refer **figure 2 p.14**). Servicing infrastructure can be installed in a staged manner in accordance with the proposed development stages for the Structure plan. Stage 1 will be serviced by Pump Station 1 and Pump Station 2, connecting into the existing sewer at the rear of the adjacent Seaview Drive residential lots utilising the new road connection to also be constructed in Stage 1. Stages 2 & 3 will be serviced by gravity sewer, located either within road reserves to be constructed in those stages or at the rear of the residential lots, which will connect into Pump Station 2.

5.6.2 Funding

The SOCI lodged a Crown Land Enquiry Form (CLEF) with the WA Department of Planning Land and Heritage (DPLH) on the 12 December 2024 in order to obtain in freehold from the Commonwealth the required land area (refer **figure 4 p.28**). This step is considered necessary to facilitate the facilitate and achieve the early construction of affordable and social housing projects.

The implementation of the Structure Plan will be a public endeavour. The financial participation to clear vegetation, initiate land and geotechnical surveys, produce deposited plans and register titles, conduct earthworks, construct roads and install the infrastructure to provide essential services for each lot and build housing is expected to be achieved with Commonwealth assistance.

The *National Housing Accord 2022* designed to facilitate collaboration and improve financing for new social and affordable housing projects intends to “*Provide availability payments and other innovative financing techniques through the Housing Australia Future Fund (HAFF) and/or National Housing Infrastructure Facility (NHIF) that will seek to facilitate superannuation and institutional capital investment in social and affordable housing, alongside established state and territory programs*”. The SOCI is committed to explore with the DITRDCSA the most appropriate avenues to obtain funding for the implementation of the Structure Plan.

Notwithstanding and without ignoring the standard infrastructure contribution requirements associated with the *WA State Planning Policy 3.6* and the outcome of the CLEF process, the SOCI will establish a development contribution framework that could reflect the unique circumstances of Christmas Island displaying close market characteristics.

These negotiations, affecting development contributions, include but are not limited to the following actions and or intentions:

- the SOCI to redirect rates towards infrastructure and maintenance;
- land allocation for affordable housing through Government affordable housing schemes and funding programs with rates

and sale processes to be allocated to the infrastructure and maintenance for the new housing areas; and

- allocation of free hold land blocks where the income for sale processes and rates to also be allocated to the infrastructure and maintenance with the new housing area.

The reservation of land to specifically assist with the relocation of the Flying Fish Cove residents is likely to require the design and creation of an agreed funding scheme allowing freehold owners to access, on a like for like basis, developed freehold titles in the new allocated areas.

5.7 Built form

Whilst built form aspects are guided by the *State Planning Policy 7.2* rather than *Liveable Neighbourhoods*, the HSP Stream1 focus on the early delivery of affordable housing expects that a coherent approach to the built form can be achieved. The Structure Plan built form responds to the physical and cultural characteristics of the site as follows:

- the capture of ocean views is a dominant aspect to the layout of the built form in particular in the R60 zone;
- efficient solar energy capture to contribute to CO2 emission reduction is facilitated with the mandatory skillion roof required on all buildings;
- apartment buildings are to not exceed 30 m in length to maximise the capture of the prevailing breeze and reduce air conditioning demand; and

The single detached houses of the R17.5 lots, the group or multiple dwellings of the R40 lots, the multiple dwellings of the R60 lots, and the components of the mixed-use lot will all contribute to the diversity of the built form as illustrated at **figures 9 p.53** and **figure 10 p.54**.

The building height control for the precinct and more generally the Structure Plan area is set at a maximum 4 storeys including the ground floor. Buildings above 4 floors, expected to be provided with lift infrastructure under the Building Code of Australia, are not considered suitable given the island has only a twice a week air service and the reliance on mainland entities to provide emergency assistance and maintenance services.

The SOCI, who will have front end responsibility for the development of Stage 1, will only consider a maximum of 3 storeys to align with the rest

of the island and deliver cost effectiveness and ultimately housing affordability.

Requiring buildings to be established at the street set back line with frequent separation between buildings is designed to improve solar access and create movement permeability for pedestrians and vehicles.

The skillion roof requirement applicable to every building is essential to achieve greater solar energy capture. This approach is supplemented by requiring that a minimum of 1/3 of east, north and west façade area to be utilised for the capture of solar energy.

The expectation of establishing multiple dwellings in the R60 zone will provide sufficient landscape area to provide play area for toddlers, space to grow fruit trees and vegetables. Carpark areas are to be paved with green prefabricated pavers to reduce ambient heat around the buildings, accelerate natural drainage and minimise cost associated with the import of gravel and asphalt.

Figure 9 Indicative Built Form Layout

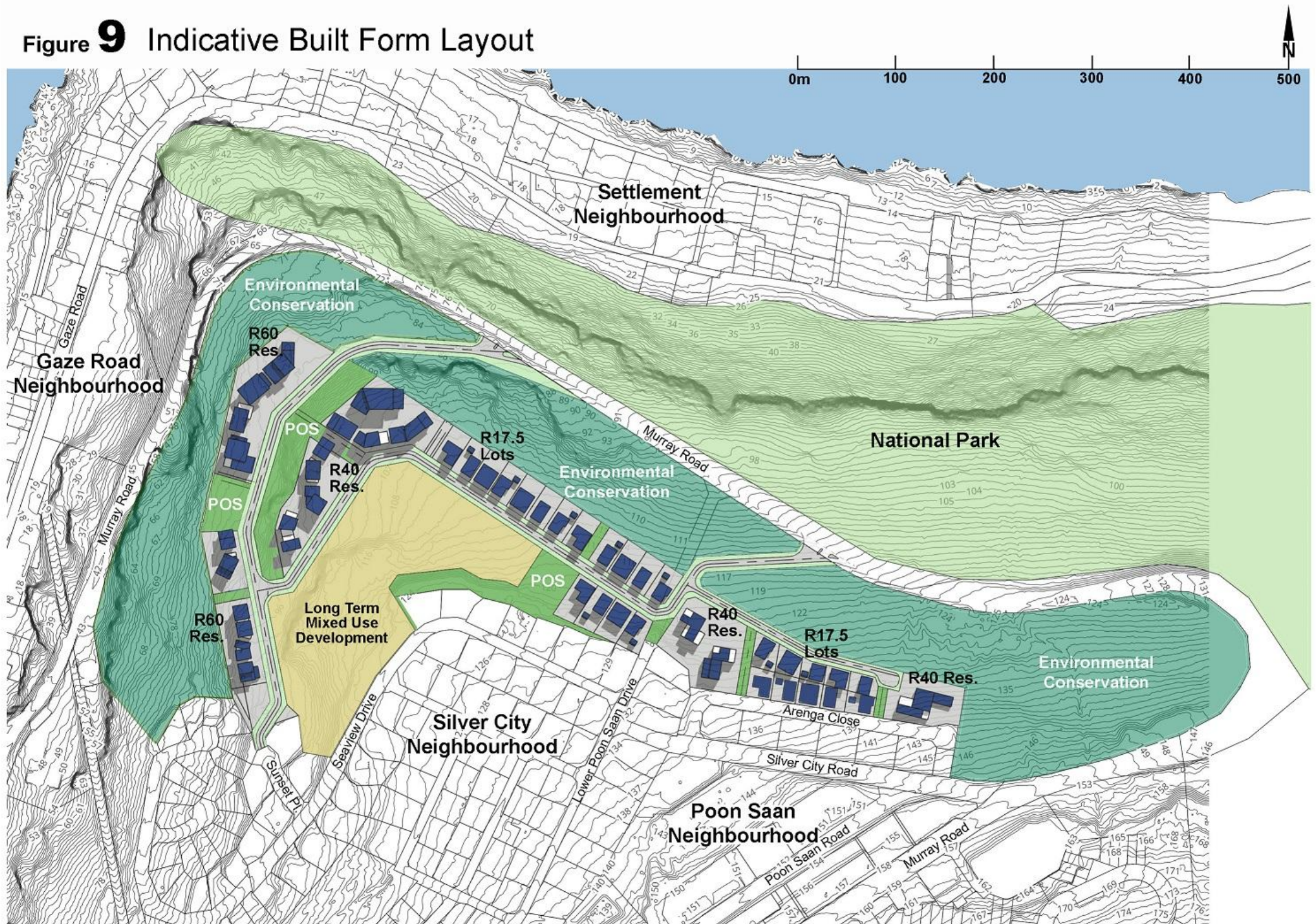
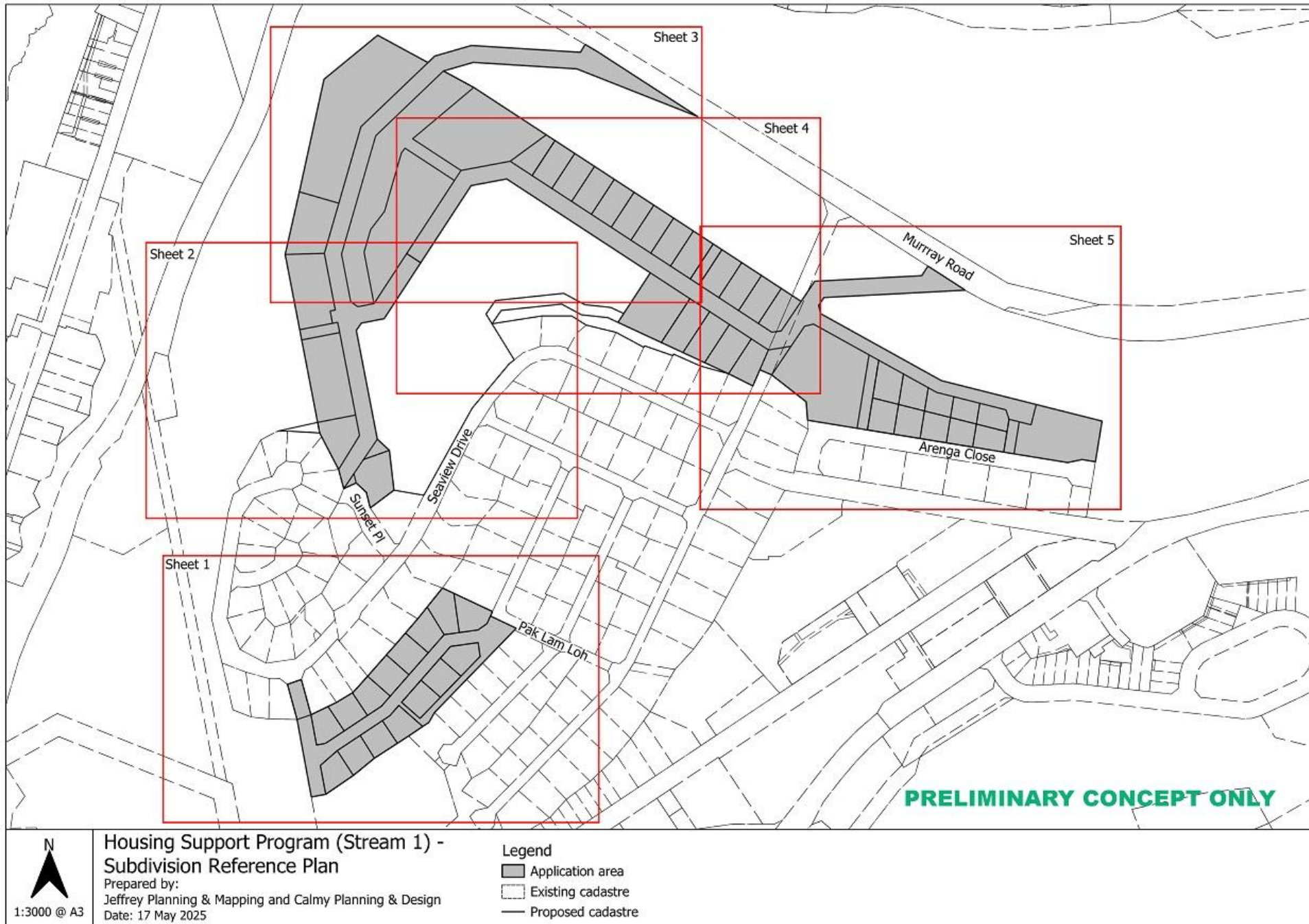


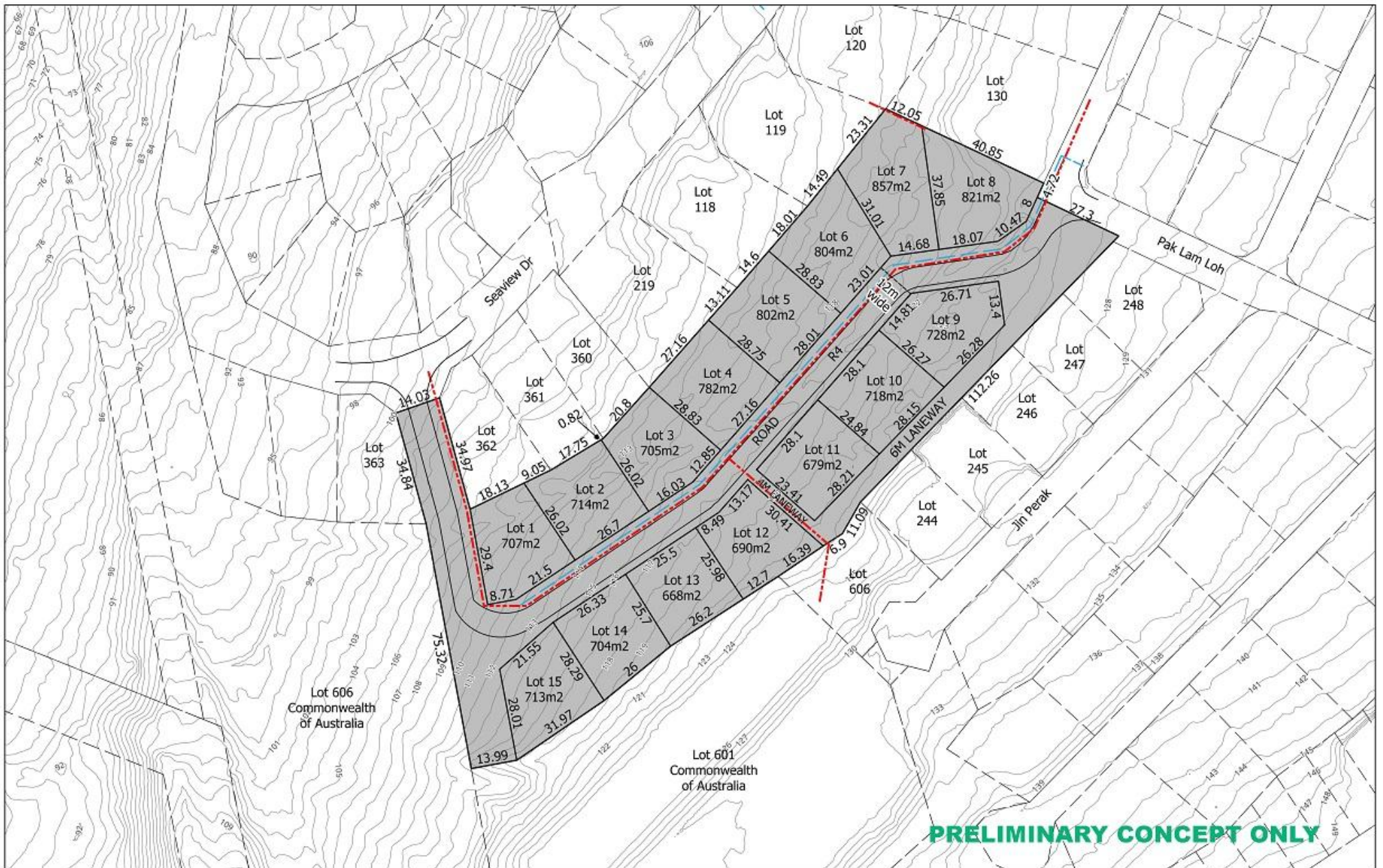
Figure **10** Indicative Built Form model



TECHNICAL APPENDICES

APPENDIX 1 – Preliminary Concept Subdivision





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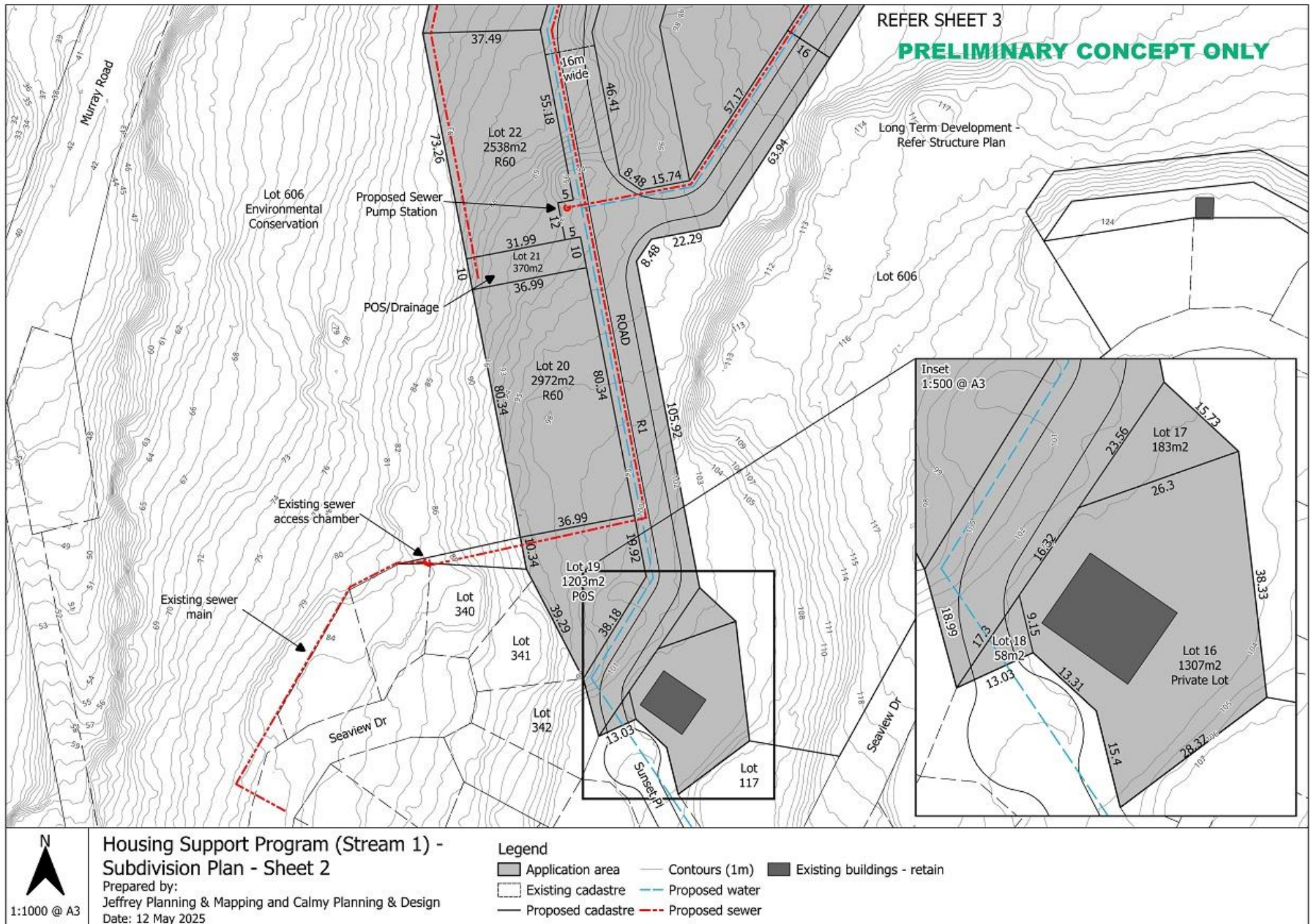
Housing Support Program (Stream 1) - Subdivision Plan - Sheet 1

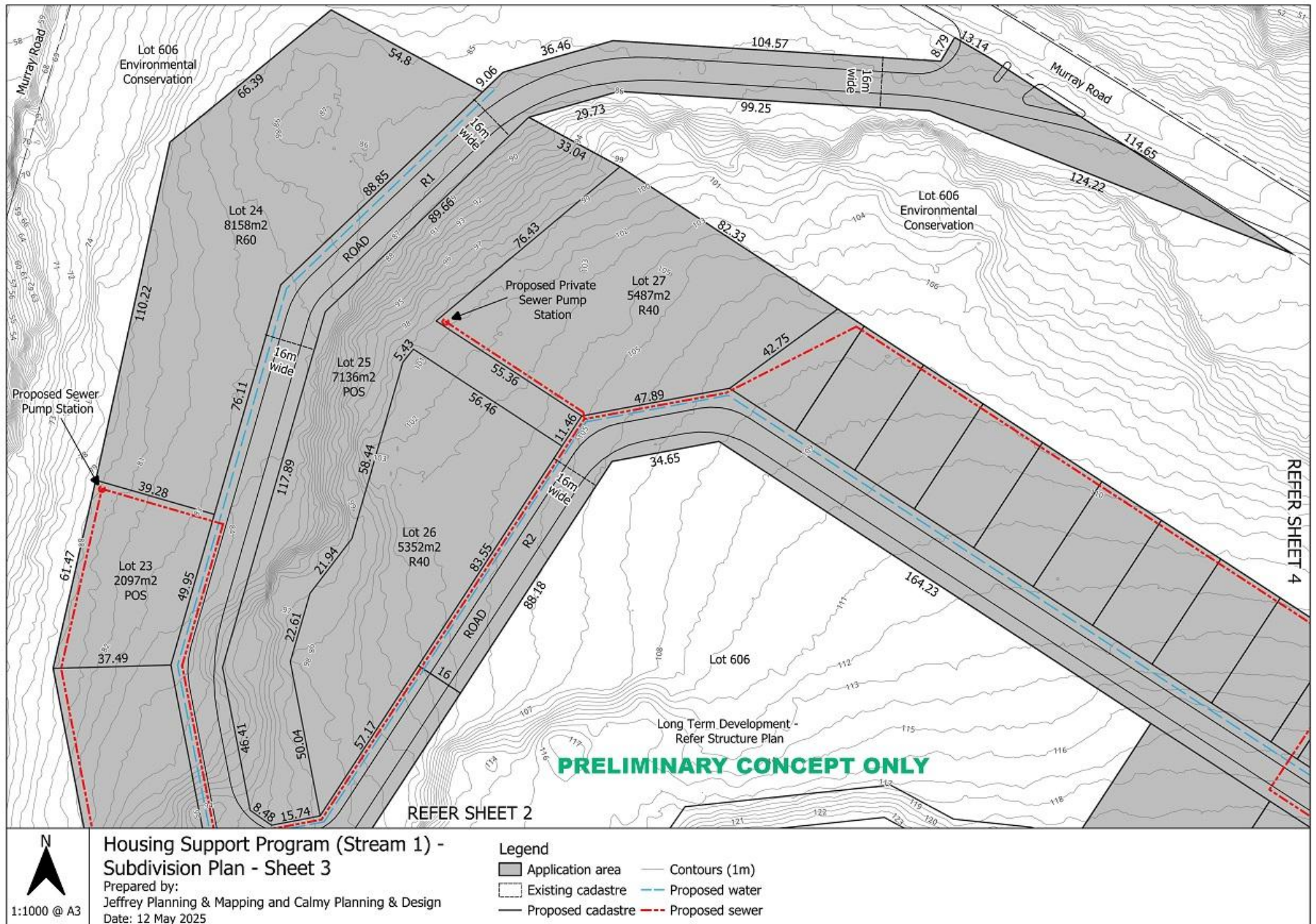
Prepared by:
Jeffrey Planning & Mapping and Calmy Planning & Design

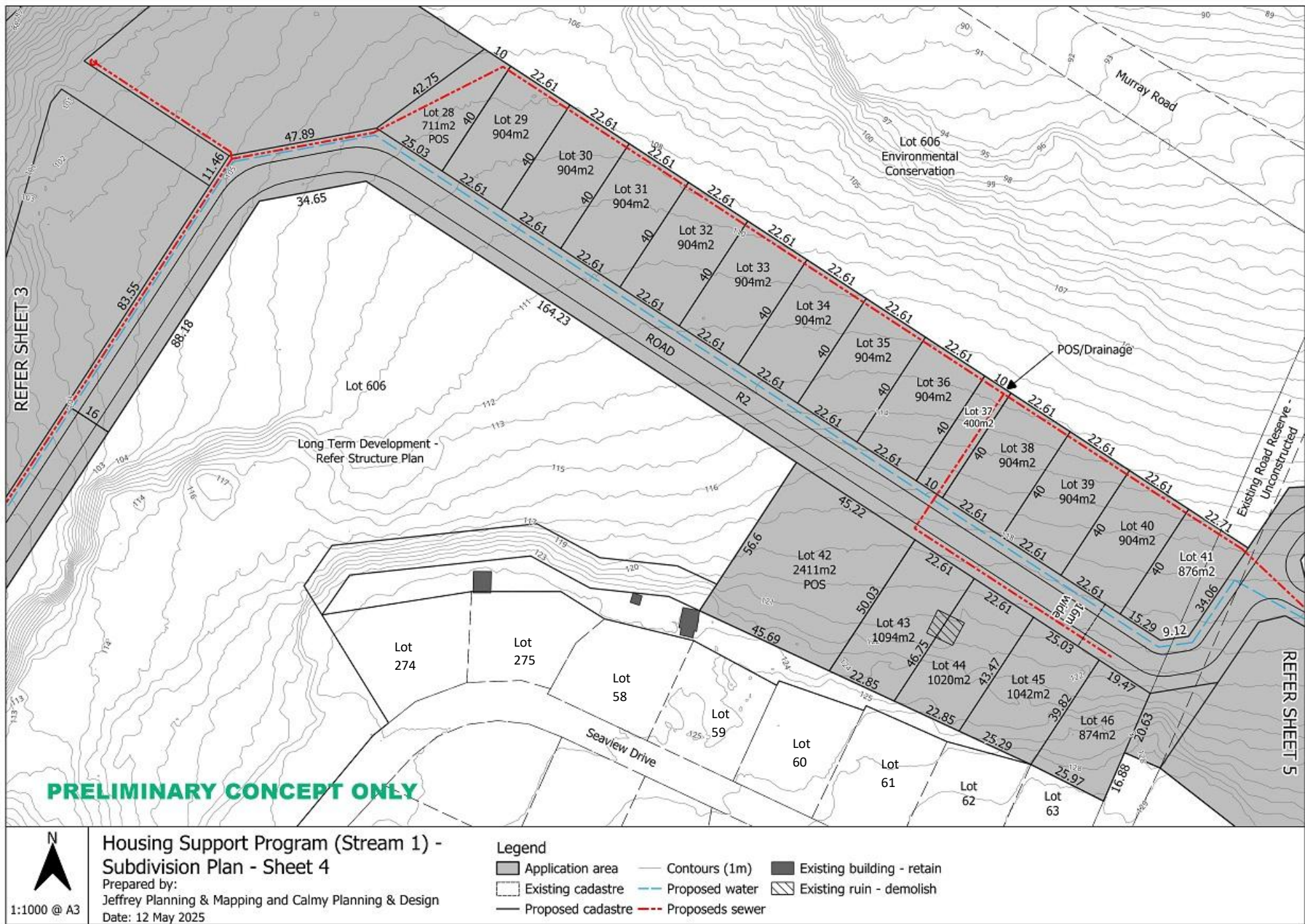
Date: 17 May 2025

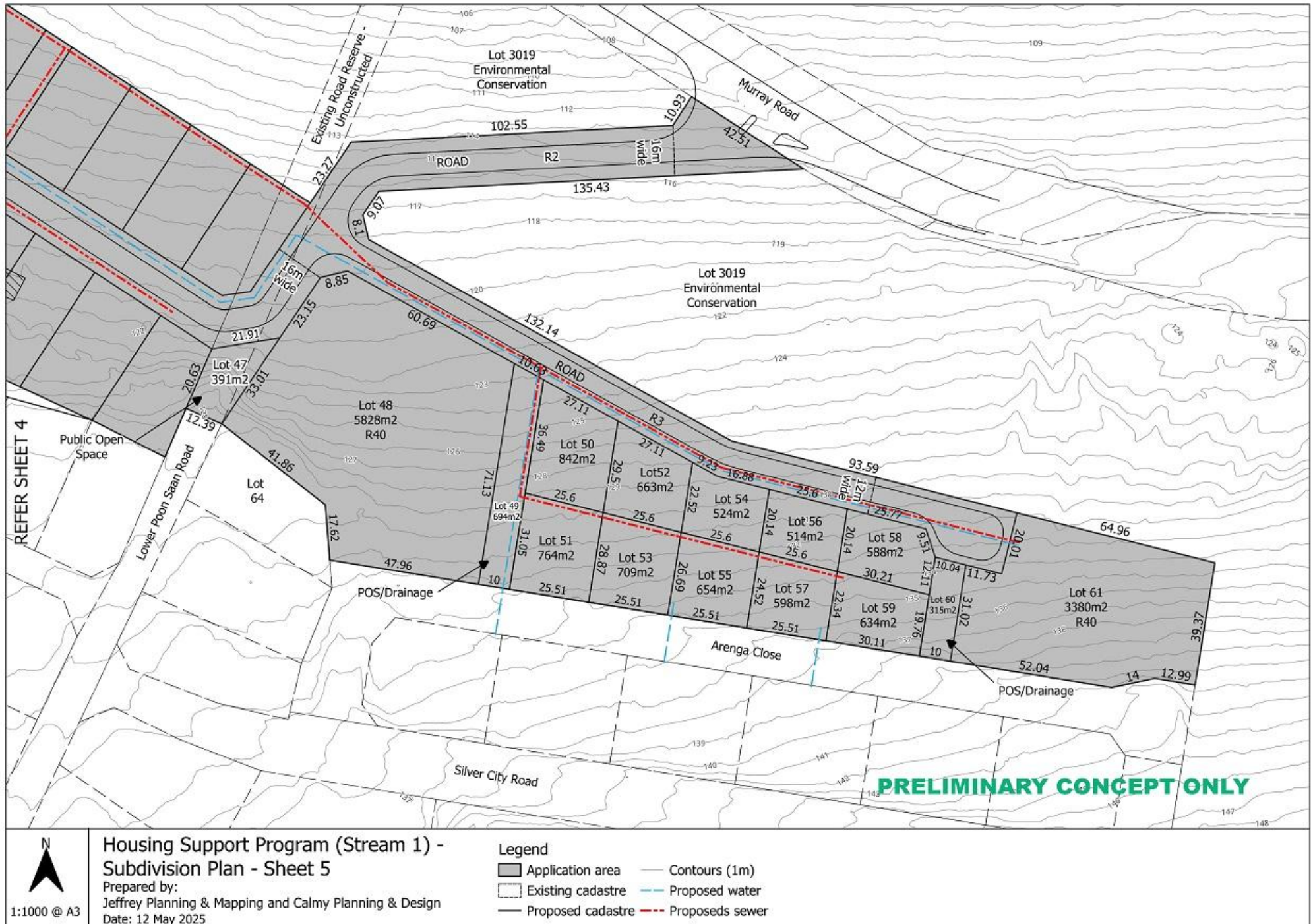
Legend

 Application area	 Contours (1m)
 Existing cadastre	 Proposed water
 Proposed cadastre	 Proposed sewer









APPENDIX 2 – JSB&G Environmental Assessment Report



Christmas Island Housing Support – Silver City - Environmental Assessment Report (EAR)

Shire of Christmas Island

Report

JBS&G 67277 | 167,617

20 May 2025





We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte

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Appendices

Appendix A Christmas Island Housing Support Flora, Fauna and Vegetation Assessment

1. Introduction

1.1 Background

The Shire of Christmas Island, through the Australian Government's Housing Support Program Stream 1 have received funds to implement preliminary works to support the development of its Christmas Island Housing Futures Masterplan. The proposed works are to safeguard the future of Christmas Islanders, by providing social housing, affordable housing and alternative housing locations to facilitate the ultimate relocation of the Kampong community, which is currently at risk from sea level rises, cyclonic storm surge induced inundations and landslides/rockfalls caused by heavy monsoon rains. This approach requires the formation of a Structure Plan at Silver City as per the requirements of the Western Australian Planning Commission (WAPC) and aligns with the Commonwealth Department of Home Affairs (2020) *Land Use Planning for Disaster Resilient Communities*.

1.2 Purpose, scope and structure of this document

This Environmental Assessment Report (EAR) has been prepared to support the Local Structure Plan for the Silver City proposed development.

The purpose of this EAR is to demonstrate that all environmental considerations associated with the future land use and development scenarios can be managed in accordance with policy requirements. As such the EAR addresses:

- applicable legislation, policy, and guidance;
- the environmental, bushfire, and heritage values of the site;
- potential impacts to the above characteristics associated with the proposed development; and
- the spatial and management response of the development to ensure that any identified potential impacts can be mitigated or managed to avoid 'significant' impacts.



Legend Survey Area Cadastral boundary (LGATE-002) Mining Lease (DMIRS-003) Ramsar site Christmas Island National Park Roads (LGATE-195) Minor road Track			0200metres		Silver City, Christmas Island SURVEY AREA AND REGIONAL LOCATION FIGURE: 1.1
			Scale 1:8,000 at A3		
	Job Number: 67277		Coord. Sys. GDA2020 MGA Zone 48		
	Client: Shire of Christmas Island		Date: 20-May-2025		
	Drawn By: bsunderland	Checked By: BH	Version: Rev A		

2. Legislation, policies, and guidelines

The legislative framework for Christmas Island is complex. The *Christmas Island Act 1958* outlines the governance arrangements for the island. Section 8E of the Act makes provision for all laws of Western Australia and the Commonwealth to apply in Christmas Island. The Minister lists selected Western Australian laws to be excluded or amended in the *Applied Laws (Implementation) Ordinance 1992*. The island is governed under Commonwealth legislation and administered by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA). Applied Western Australian laws are administered by the relevant Commonwealth Minister, by Commonwealth officers acting under ministerial delegations, or by State officers exercising delegated power and acting pursuant to inter-government service agreements under Section 8h of the Act. The community is represented in the Federal Parliament by the Member for Lingiari in the House of Representatives and the two Senators for the Northern Territory in the Senate with local Government (i.e. Shire of Christmas Island) utilising Western Australia legislation.

2.1 Federal Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act aims to protect and manage nine Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties;
- National Heritage Places;
- wetlands of international importance (listed under the Ramsar Convention);
- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- Commonwealth Marine Areas;
- Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and
- a water resource, in relation to coal seam gas development and large coal mining development.

2.2 State Legislation

The key environmental legislation in Western Australia is detailed below:

- *Environmental Protection Act 1986* (EP Act) and Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations);
- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- *Rights in Water and Irrigation Act 1914* (RIWI Act);
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (MWSSD Act);
- *Aboriginal Heritage Act 1972* (AH Act);
- *Contaminated Sites Act 2003* (CS Act) and Regulations (2006); and
- *Planning and Development Act 2005* (PD Act).

2.2.1 Environmental Protection Act 1986

The EP Act is the primary environmental legislation in Western Australia and is administered by the Environmental Protection Authority (EPA) and the Department of Water and Environmental Regulation (DWER). The Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.

Part IV of the EP Act makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes. The EPA uses environmental principles, factors and associated objectives as the basis for assessing whether a proposal or land use planning scheme's impact on the environment is acceptable.

2.2.2 Biodiversity Conservation Act 2016

The BC Act has replaced the *Wildlife Conservation Act 1950*. On 3 December 2016, several parts of the new Act were enacted by the State Governor. The remaining parts of the Act and the associated Regulations came into effect on 1 January 2019.

In addition to providing for the protection of flora and fauna, the *Biodiversity Conservation Act 2016* includes provisions for threatened ecological communities, threatening processes, critical habitats and environmental pests.

2.3 Environmental Protection Authority (EPA) guidance

EPA regulatory guidance that is given consideration during the assessment process is listed below:

- *Environmental Factor Guideline - Social Surroundings (2023);*
- *Environmental Factor Guideline - Human Health (2016);*
- *Environmental Factor Guideline - Inland Waters (2018);*
- *Environmental Factor Guideline - Terrestrial Fauna (2016);*
- *Environmental Factor Guideline - Terrestrial Environmental Quality (2016);*
- *Environmental Factor Guideline – Landforms (2018);*
- *Environmental Factor Guideline - Flora and Vegetation (2016);*
- *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (2020);*
- *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (2016);*
- *EPA Guidance Statement No. 33 Environmental Guidance for Planning and Development (2008); and Guidance for planning and development: Protection of naturally vegetated areas in urban and peri-urban areas (2021).*

2.3.1 State Planning Policies

The WAPC prepares and adopts state planning policies under statutory procedures set out in Part 3 of the *Planning and Development Act 2005* (WAPC, 2005). State planning policies relevant to the project are listed below:

- State Planning Policy 2.0: *Environment and natural resources policy* (SPP 2.0);
- Draft State Planning Policy 2.9 *Planning for Water* (SPP 2.9) and *Planning for Water Guidelines*; and

- State Planning Policy 3.0 *Urban Growth and Settlement* (SPP 3.0).

2.4 Local government policies, strategies and guidance

The Shire of Christmas Island has developed numerous policies, strategies and guidelines relevant to planning and the environment, as listed below. Reference to these documents has been made throughout the report where applicable to a specific environmental factor.

- Shire of Christmas Island Local Planning Strategy 2015; and
- Shire of Christmas Island Local Planning Scheme No. 2.

The Shire of Christmas Island Local Planning Strategy was endorsed in May 2015. Local Planning Scheme No. 2 received approval in accordance with the requirements of the *Planning and Development Act 2005* (WA) (CI) in February 2016. The new scheme includes a stated objective “to enhance and diversify the island’s economic base through the provision of land for a range of economic activities,” (Shire of Christmas Island, 2016) which also included urban development and possible new tourism opportunities.

3. Overview of existing environmental attributes

3.1 Land use

The current land use for the development area is “unimproved”. The site is zoned “Residential” and “Urban development”. Road reserve connection through the proposed Future Environmental Conservation area is also planned to provide connection through to the existing road network.

3.2 Climate

Christmas Island lies on the southern edge of the inter-tropical convergence zone and the climate is dominated by a low-pressure trough that seasonally circles the equator. The Island has a tropical monsoonal climate with distinct wet and dry seasons and little seasonal variation in temperature. The dry season (May to November) is dominated by low and sporadic rainfall (see Figure 3-1) with consistent south-east trade winds (BOM, 2024). The wet season generally occurs from December to April with the Island receiving most of its rainfall during this period.

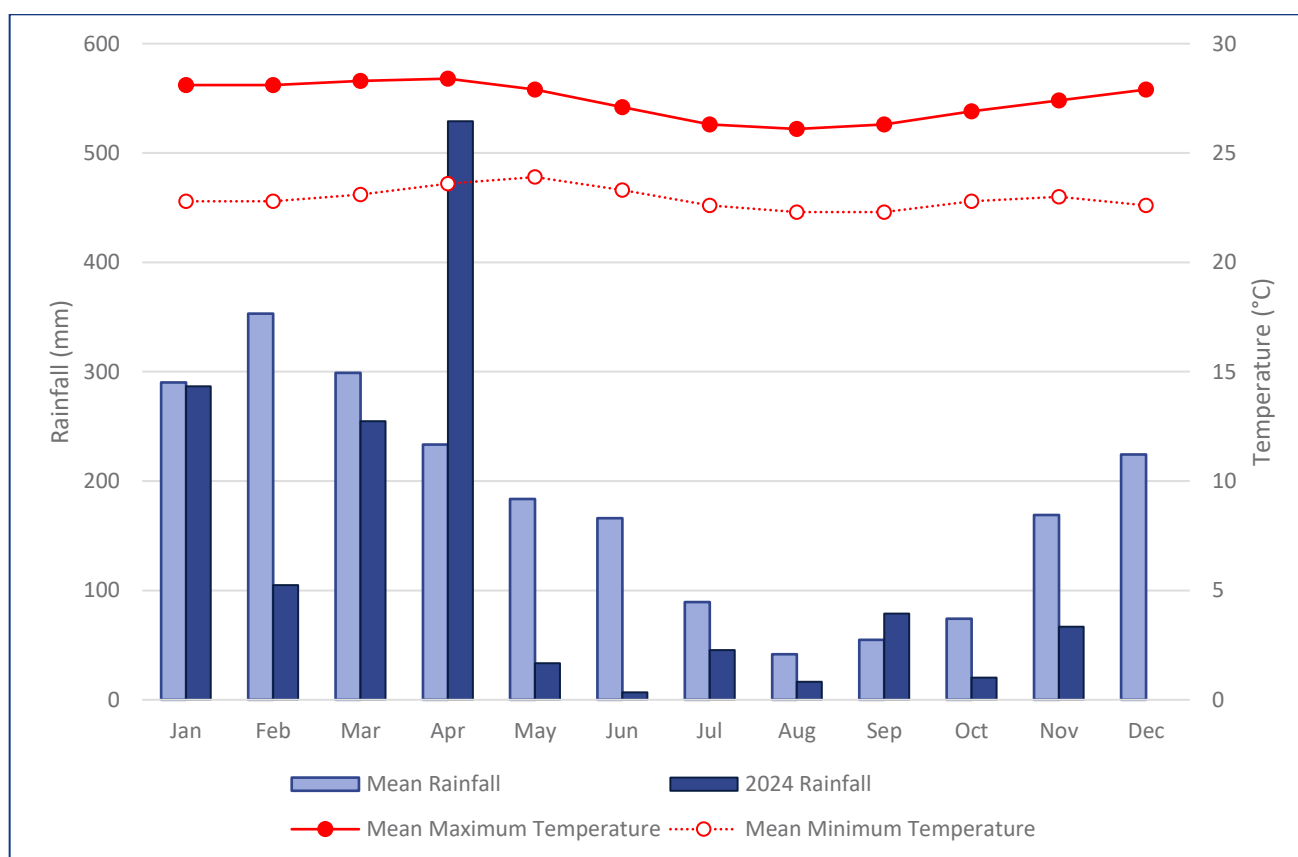


Figure 3-1 Climate data from Christmas Island Aero weather station (200790)

3.3 Soils and Landforms

Christmas Island is one of a series of submarine seamounts that rise above the 5,500 m deep abyssal areas of the West Australian Basin. The topography of the Survey Area is shown in Figure 3-3. At the core of the Island are volcanic rocks, mainly composed of basalt with a layer of limestone generally covering these volcanic rocks (Figure 3-2) which occasionally outcrops, particularly along the present coastline (Grimes, 2001).

The Island is characterised by sea cliffs that rise via a series of terraces to a central plateau (Figure 3-2) which peaks at approximately 361 m above sea level (Grimes, 2001). The shoreline is dominated by cliffs and

extensive shore platforms with a few small beaches and Flying Fish Cove, which has a relatively large beach and shallow platform, being the only safe harbour for much of the year. The Island's natural landscape is dominated by karstic surface landforms and cave systems (Grimes, 2001).

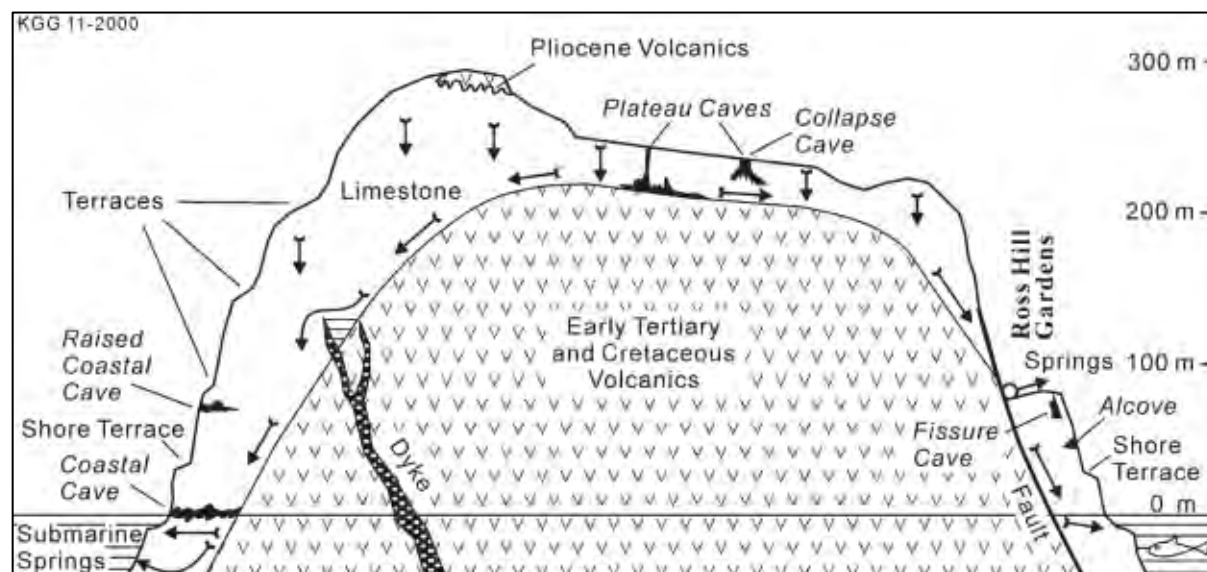


Figure 3-2 Diagrammatic cross-section of Christmas Island

Terrace areas on the Island reflect the height above sea level in different geologic periods. Renewed vulcanism and a series of geological uplifts at different periods have resulted in a tiered effect. The oldest limestones near the peak of the Island formed during the Eocene period (Grimes, 2001). Most the Island's limestone deposits were formed during the Tertiary (late Oligocene to mid Miocene age), with the youngest limestones deposited on the lowest terrace in the late Quaternary (Grimes, 2001).

The limestone is mixed with dolomite sediments, basalts and tuffs. A layer of phosphate-rich soil material covers the limestone over about half of the Island. Marine sediments and guano deposition have formed the Island's phosphatic soils.

The red crab (*Gecarcoidea natalis*) is the principle agent of organic matter turnover and incorporation into the soil, with consequent low levels of leaf litter on the island. Crab activity is a key feature of water and nutrient availability in the subsoil, with burrows also providing a preferred pathway for water drainage into the soil (Hollingsworth, 2003).

The proposed clearing areas range from the island's older terraces to the plateau. These areas contain a combination of exposed limestone and deeper phosphatic soils. Geoscience Australia has mapped the Survey Areas as being dominated by limestone pinnacles with varying amounts of soil (Table 3.1 and Figure 3-4).

Table 3.1 Geological units within the Survey Area (Geoscience Australia, 2003)

Geological Unit	Silver City
Tz: Limestone - undifferentiated	4.26 ha
Tzp: Pinnacles of limestone with variable amounts of unconsolidated material (Czp)	7.06 ha
Total	11.32 ha

Christmas island is not included in Western Australian soil-landscape mapping.



Legend Survey Area Cadastral boundary (LGATE - 002) Topographic contours in m AHD (DataWA-2011) Minor road Track	JBS&G		0200 metres		Silver City, Christmas Island
			TOPOGRAPHY		
	Job Number: 67277		Scale 1:6,000 at A3		
	Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: bsunderland	Checked By: BH	Version: Rev A	Date: 20-May-2025	FIGURE: 3.3	



Legend Survey Area Czl,Pellet limestone, contains pellets and pebbles of phosphate rock Czp,Unconsolidated material - mostly phosphatic soil containing >20% P2O5 Limestone/Talus,Limestone/Talus Tb,Volcanics - mostly basalt, some tuff, scoria - undifferentiated Tz,Limestone - undifferentiated Tzp,Pinnacles of limestone with variable amounts of unconsolidated material (Czp)	 Job Number: 67277 Client: Shire of Christmas Island Drawn By: bsunderland Checked By: BH	0200metres Scale 1:6,000 at A3 Coord. Sys. GDA2020 MGA Zone 48 Version: Rev A Date: 13-May-2025	Silver City, Christmas Island SOILS AND LANDFORMS FIGURE: 3.4
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3.4 Hydrology

A major feature of the Christmas Island geomorphology is the lack of surface drainage. Rainfall mostly infiltrates the land surface and is utilised by plants, contributes to soil water stores or recharges to groundwater. There is therefore no significant surface drainage network except down gradient of springs that arise at the interface between limestone and basalt formations.

Christmas Island's soils are generally highly permeable and there is consequently little runoff or erosion (Hollingsworth, 2003). In the Wet Season when the soils are saturated, runoff can occur during heavy rainfall providing some risk of erosion and sedimentation. However, given the high natural infiltration rates the risk of erosion and sedimentation is generally localised to compacted areas such as roads and stockpile pads. Infiltration tests by Puhlovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities.

There are three key hydrogeological units on the Island; shallow, residual soils, which overlie fractured, unconfined – semi-confined aquifers within the karstic limestone rocks, which in turn overlie relatively impermeable volcanic basement rocks (Puhlovich et al., 2003). Groundwater levels on the Island are reflected by the location of the unconfined water table within the karst limestone aquifers. Limestone aquifers can be recharged when rainfall permeates through the soil zone into the underlying aquifers or by direct runoff of rainfall into karst features such as dolines and sinkholes that occur across the Island (Puhlovich et al., 2003). Assessments suggest that approximately half of all incident rainfall passes through the soil zone and recharges the underlying limestone aquifers (Hollingsworth, 2003; Falkland, 1999). Groundwater discharge occurs at surface springs such as Hosnie's Spring and offshore springs such as those found at Flying Fish Cove (Puhlovich et al., 2003). The complex behaviour and extent of weathered/fractured rock aquifers on the Island are not well understood.

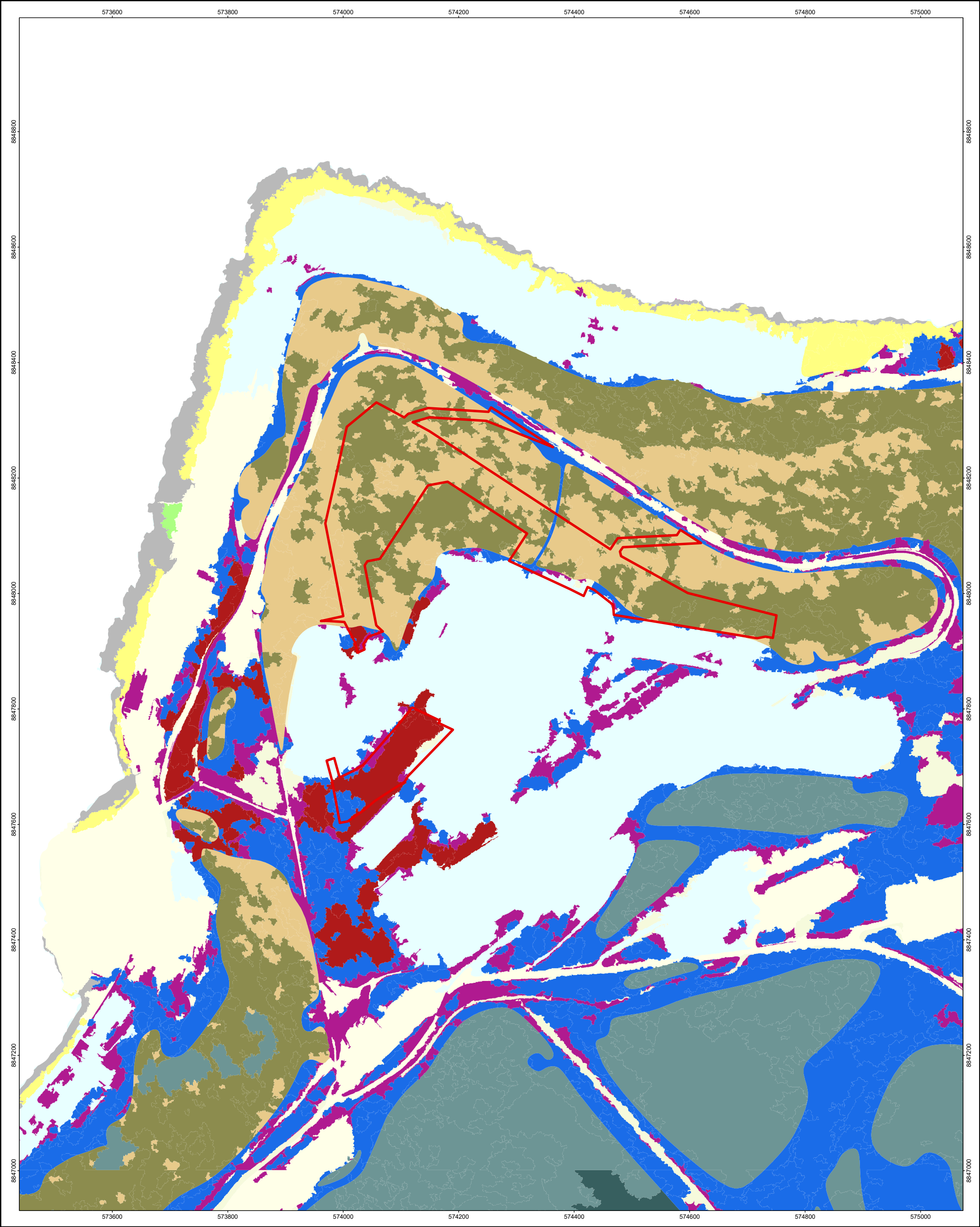
Perennial (permanent) surface aquatic habitats (freshwater) on Christmas Island are limited to a number of spring-fed streams found along coastal or sloping areas of the Island. Hosnie's Spring and The Dales are both listed as a Wetland of International Importance under the Convention on Wetlands of International Importance, Water Fowl Habitat 1971 (known as the 'Ramsar Convention') and are listed in the Directory of Important Wetlands in Australia. These two sites are approximately 6.3 km and 14.1 km respectively from the Silver City proposal area at closest point. Neither wetland is expected to be impacted due to any potential surface flow from the development area, which is likely to flow away from Hosnie's Spring, and the distance to The Dales.

3.5 Regional Vegetation

JBS&G (2025) prepared a *Christmas Island Housing Support Flora, Fauna and Vegetation Assessment*. The report identified that three features of the ecology of the Island's native vegetation are notable (Environment Australia, 2014):

- The occurrence of many of the widespread Indo-Malesian species in habitats that would be considered extremely atypical elsewhere in their natural ranges, and associated with this, the exceptionally large stature of some of these species;
- The low diversity of canopy and sub-canopy species and the lack of structural complexity (e.g. relatively poor development of robust woody vines and rattans, the absence of aroids and of gingers in the understorey) in the Island's rainforests; and
- The very low diversity and lack of speciation amongst plant genera that elsewhere in the region is characteristic of early successional, and frequently disturbed, rainforest environments (e.g. *Macaranga*, *Claoxylon* and *Pipturus*).

In contrast to mainland vegetation, plant species occurring on Christmas Island are not sclerophyllous, have a high moisture content, larger leaves and fewer volatile organic compounds.



Legend							Silver City, Christmas Island	
 Survey Area	 Regrowth	 Bare ground					GEOSCIENCE AUSTRALIA VEGETATION MAPPING	
 Closed canopy evergreen forest (tall)	 Coastal shrubland	 Residential						
 Closed canopy evergreen forest (moderate)	 Coastal herbland	 Infrastructure						
 Semi-deciduous forest	 Leaucanea leucocephala dominant	 Mixed weed and pioneer species	Job Number: 67277		Scale 1:6,000 at A3		FIGURE: 3.5	
 Semi-deciduous scrub	 Coastal pinnacles/sand		Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48			
			Drawn By: bsunderland	Checked By: BH	Version: Rev A	Date: 13-May-2025		

The geology, geomorphology and climate on Christmas Island create the biophysical environment and constraints for the vegetation communities. These factors determine the soil nutrient status, the seasonal availability of moisture and the degree of exposure to wind, which in turn control the distribution, structure and functioning of the natural vegetation (Director of National Parks, 2014a).

Vegetation mapping of the Island was initially undertaken by Mitchell (1985) for the Australian Nature Conservation Agency. This mapping had limited use due to its broad scale and spatial inaccuracy. Flora of Australia Volume 50 (Du Puy, 1993a) listed eight vegetation types for the Island.

A vegetation mapping project was undertaken from 2011 to 2014 to attempt to map vegetation with better spatial accuracy, to determine height categories and to apply these consistently across the Island. The process included a Light Detection and Ranging (LiDAR) survey, review of historic aerial photography which captured past clearing, and ground truthing. Additional categories were added to include wetland vegetation and regrowth in cleared areas. The Christmas Island Vegetation and Clearing Map was developed through a collaborative project by Geoscience Australia, Christmas Island Phosphates, Christmas Island National Park and the Commonwealth Department of the Environment (Geoscience Australia, 2014). The map classified the full extent of Christmas Island into vegetation and land cover classes (Table 3.2 and Figure 3-5) though boundaries are not always perfectly geographically accurate. Flora of Australia's vegetation types, which are still referred to in some documents, were recategorized thus:

- 'Primary rainforest' became closed canopy evergreen forest;
- 'Marginal rainforest' became semi-deciduous forest;
- 'Areas with surface water' became perennial wetland forest;
- 'Open forest, scrubby forest and vine forest' and 'inland cliffs' became semi-deciduous scrub;
- 'Coastal fringe' and 'shore cliffs and spray zone' became coastal fringe vegetation; and
- 'Mined areas' became rehabilitation, regrowth and weed dominated veg and pioneer regrowth.

Some 25% of the Island's original vegetation has been cleared for mining and infrastructure (Director of National Parks, 2014a).

Table 3.2 Vegetation of Christmas Island

Level 1	Level 2	Description
Closed canopy evergreen forest	Closed canopy evergreen forest (tall or moderate)	Generally found on the plateau and terraces, with a closed uneven canopy up to 40 m in height. Some trees emerge up to 10 m above the canopy. Often supports ferns and orchids, young palms and lilies in the understorey. Indicator species: <i>Bolbitis heteroclita</i> , <i>Syzygium nervosum</i> , <i>Hernandia ovigera</i> , <i>Planchonella nitida</i> , <i>Pisonia umbellifera</i> , <i>Corymborkis veratrifolia</i> , <i>Ehretia javanica</i>
Semi-deciduous forest	Semi-deciduous forest	Generally found on the slopes and terraces down to the coast - and some plateau areas. Higher occurrence of semi-deciduous trees compared to Closed Canopy Evergreen, which lose a portion of leaves during the dry season. Tree height generally 10-25 m. Indicator species: <i>Terminalia</i> , <i>Gyrocarpus</i> , <i>Erythrina variegata</i> , <i>Premna serratifolia</i> , <i>Pisonia grandis</i> , <i>Ochrosia ackeringae</i>
Semi-deciduous scrub	Semi-deciduous scrub	Found on the terraces, steep slopes and inland cliffs. Semi-deciduous canopy with vines and shrub understorey Tree height generally <10 m. Indicator species: <i>Colubrina pedunculata</i> , <i>Canavalia cathartica</i> , <i>Carmona retusa</i> , Cycads

Level 1	Level 2	Description
Perennial wetland forest	<i>Inocarpus fagifer</i> dominant	Areas of fresh water runoff on the lower terraces dominated by <i>Inocarpus fagifer</i> . Indicator species: <i>Inocarpus fagifer</i>
	<i>Hibiscus tiliaceus</i> dominant	Areas of fresh water runoff on the shore terrace dominated by <i>Hibiscus tiliaceus</i> . Indicator species: <i>Hibiscus tiliaceus</i>
	<i>Bruguiera</i> dominant	A single patch of vegetation dominated by <i>Bruguiera</i> at Hosnie's Spring. Occurring in an area of fresh water runoff on the shore terrace. Indicator species: <i>Bruguiera gymnorhiza</i>
Coastal fringe vegetation	Coastal herbland	Found between the coastal scrub and coastal cliffs in exposed areas. Class is dominated by low-lying herbs, sedges and grasses. Indicator species: <i>Portulaca tuberosa</i> , <i>Ischaemum nativitatis</i> , <i>Oplismenus compositus</i> , <i>Sporobolus virginicus</i>
	Coastal shrubland	Dense salt-tolerant vegetation growing between the coastal herbland and the terrace cliffs. Indicator species: <i>Pandanus christmatensis</i> , <i>Scaevola</i> , <i>Pemphis</i> , <i>Argusia argentea</i> , <i>Cordia cordata</i> , <i>Guettarda</i>
Rehabilitation	Rehabilitation	Areas where forest rehabilitation has taken place. The standard of forest varies depending on the type of rehabilitation completed, species planted and management regime. Indicator species: A mix of up to 30 native tree species when initially planted, dependent on characteristic of the site and year of rehabilitation. <i>Macaranga</i> , <i>Dysoxylum</i> , <i>Calophyllum</i> , <i>Tristiropsis</i>
Regrowth	Regrowth	Generally well-developed regrowth vegetation over 5 m mean tree height. May include some introduced or weed species. Indicator species: Various species – dependent on adjacent vegetation
Weed dominated veg and pioneer regrowth	<i>*Leucaena leucocephala</i>	Monoculture of <i>*Leucaena leucocephala</i> . Often occurring as regrowth in previously cleared areas. Indicator species: <i>*Leucaena leucocephala</i>
	Fern field	Expanse of low-lying ferns often growing on limestone pinnacles. Indicator species: <i>Nephrolepis biserrata</i> , <i>Microsorium scolopendria</i> , <i>Psilotum nudum</i>
	Mixed weed and pioneer regrowth	Regrowth vegetation with a mean tree height of <5 m. Can vary between native and introduced species depending on the location and time since clearing. Tends to have a higher occurrence of weed species compared to the 'Regrowth' category. Indicator species: <i>*Muntingia calabura</i> , <i>*Psidium</i> sp. (guava), <i>*Mimosa</i> , Passionfruit, <i>Macaranga</i>

Sources: Du Puy, 1993a and Geoscience Australia (2014)

3.6 Significant Communities, Flora and Fauna

3.6.1 Ecological Communities

There are no Threatened Ecological Communities (TEC's) listed under the EPBC Act or BC Act occurring on Christmas Island.

3.6.2 Significant Flora

Three conservation-significant vascular terrestrial flora taxa were identified by PMST searches (DBCA does not maintain records of significant flora on Christmas Island) as potentially occurring within the Survey Area (refer to Figure 2.8 of Appendix 1). The likelihood of these taxa occurring within the Survey Area was assessed against

their habitat preferences and regional distribution. Of the three, two were considered as possibly occurring within the Survey Area (refer to Table 3-3).

Table 3.3 Significant flora likelihood of occurrence

Genus (& Family)	Conservation Status		Description	Likelihood of Occurrence
	EPBC Act	BC Act		
<i>Asplenium listeri</i> (Aspleniaceae)	CR	Not listed	A lithophytic fern with short erect fronds, 3.5–9 cm long, which grow in a crown. Occurs in Limestone rock crevices in dry, exposed areas.	Possible – preferred habitat occurs within the Survey Area
<i>Tectaria devexa</i> var. <i>minor</i> (Dryopteridaceae)	EN	Not listed	A small, tufted, terrestrial fern with pale green fronds. Occurs in Primary rainforest (tall and largely undisturbed), above 80 metres elevation; both in deeper soils and as a lithophyte (on mossy pinnacles at the base of a slope, a wet site).	Possible – preferred habitat occurs within the Survey Area
<i>Pneumatopteris truncata</i> (Thelypteridaceae)	CR	Not listed	A large terrestrial fern with an erect rhizome and fronds growing in a crown to 120 cm long. The fronds have aerophores (respiratory structures) at the base of the pinnae. Occurs in permanently moist sites in semi-deciduous closed forest.	Unlikely – preferred habitat occurs within the Survey Area but known occurrences are distant.

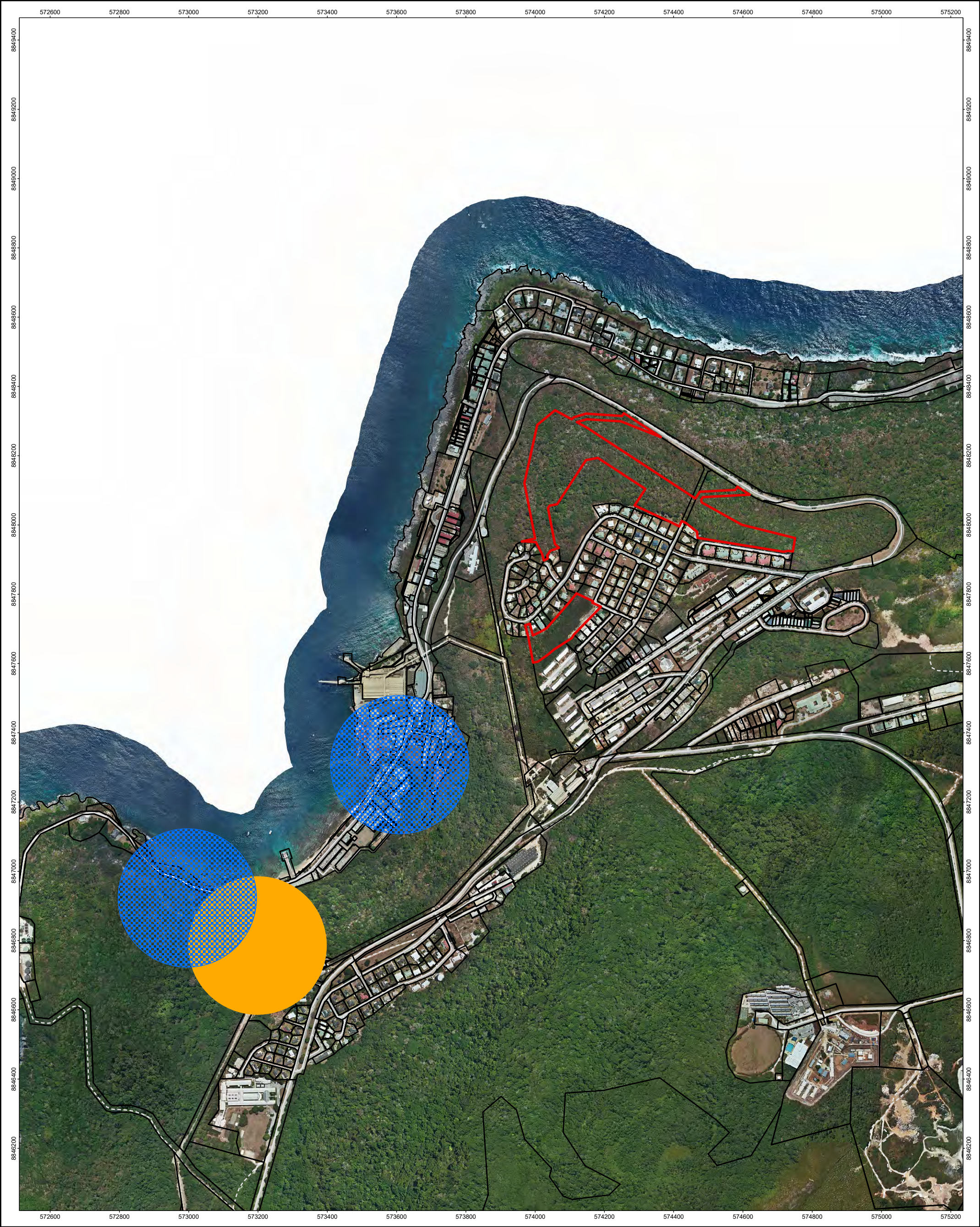
Asplenium listeri is listed as Critically Endangered under the EPBC Act and is endemic to Christmas Island. *Tectaria devexa* var. *minor* is listed as Endangered under the EPBC Act and occurs in Sri Lanka as well as Christmas Island. *Pneumatopteris truncata*, which is listed as Critically Endangered under the EPBC Act, has a fragmented distribution over Asia and Malaysia as well as being known from two sites on Christmas Island.



Plate 1 *Asplenium listeri*, *Tectaria devexa* var. *minor* and *Pneumatopteris truncata* (from left to right)¹

Records of these are maintained by Christmas Island Phosphates and Parks Australia.

¹ Sources: Khaliesha Amin, Butz (2004), <http://www.phytoimages.siu.edu/>



Legend Survey Area Cadastral boundary (LGATE-002) Significant Flora (Source: Phosphate Resources) <i>Asplenium listeri</i> <i>Tectaria devexa</i> var. <i>minor</i> Roads (LGATE-195) Minor road Track		Job Number: 67277 Client: Shire of Christmas Island Drawn By: bsunderland Checked By: BH Scale 1:10,000 at A3 Coord. Sys. GDA2020 MGA Zone 48 Version: Rev A Date: 13-May-2025		Silver City, Christmas Island DESKTOP SIGNIFICANT FLORA FIGURE: 3.6
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3.6.3 Significant Fauna

JBS&G (2025) identified twenty-nine significant fauna species were listed in the Protected Matters Search Tool as occurring or having potential to occur at Christmas Island. Of these, 12 taxa were marine fauna, including sharks, whales and turtles. These were excluded from the assessment. The remaining 17 taxa and their likelihood of occurrence in the Survey Area are listed in Table 3.4. The taxa most likely to occur in the Survey Area are:

- Christmas Island Goshawk;
- Christmas Island Emerald Dove;
- Christmas Island Hawk Owl;
- Golden Bosunbird;
- Red-tailed Tropicbird;
- Christmas Island Thrush;
- Christmas Island Flying Fox; and
- Christmas Island Giant Gecko.

Eight taxa were considered likely to occur in the Survey Area and a further four were considered to possibly occur in the Survey Area.

Fauna records on the Island are predominantly maintained by Parks Australia, although previous surveys undertaken for Phosphate Resources have also resulted in some records of significant fauna. Known locations of significant fauna species are provided by permission of Phosphate Resources in Figure 3-7.



Legend Survey Area Cadastral boundary (LGATE-002) Source: Christmas Island Biodiversity Conservation Plan - DRAFT 2014 <i>Pteropus natalis</i> Frigatebird colonies	Source: Range to Reef Environmental - various surveys up to 2018 <i>Accipiter hiogaster natalis</i> <i>Cyrtodactylus sadleiri</i> <i>Ninox natalis</i>	Roads (LGATE-195) Minor road Track	Job Number: 67277 Client: Shire of Christmas Island Drawn By: bsunderland Checked By: RP	0 500 metres Scale 1:12,000 at A3 Coord. Sys. GDA2020 MGA Zone 48 Version: Rev A Date: 13-May-2025	Silver City, Christmas Island DESKTOP SIGNIFICANT FAUNA FIGURE: 3.7
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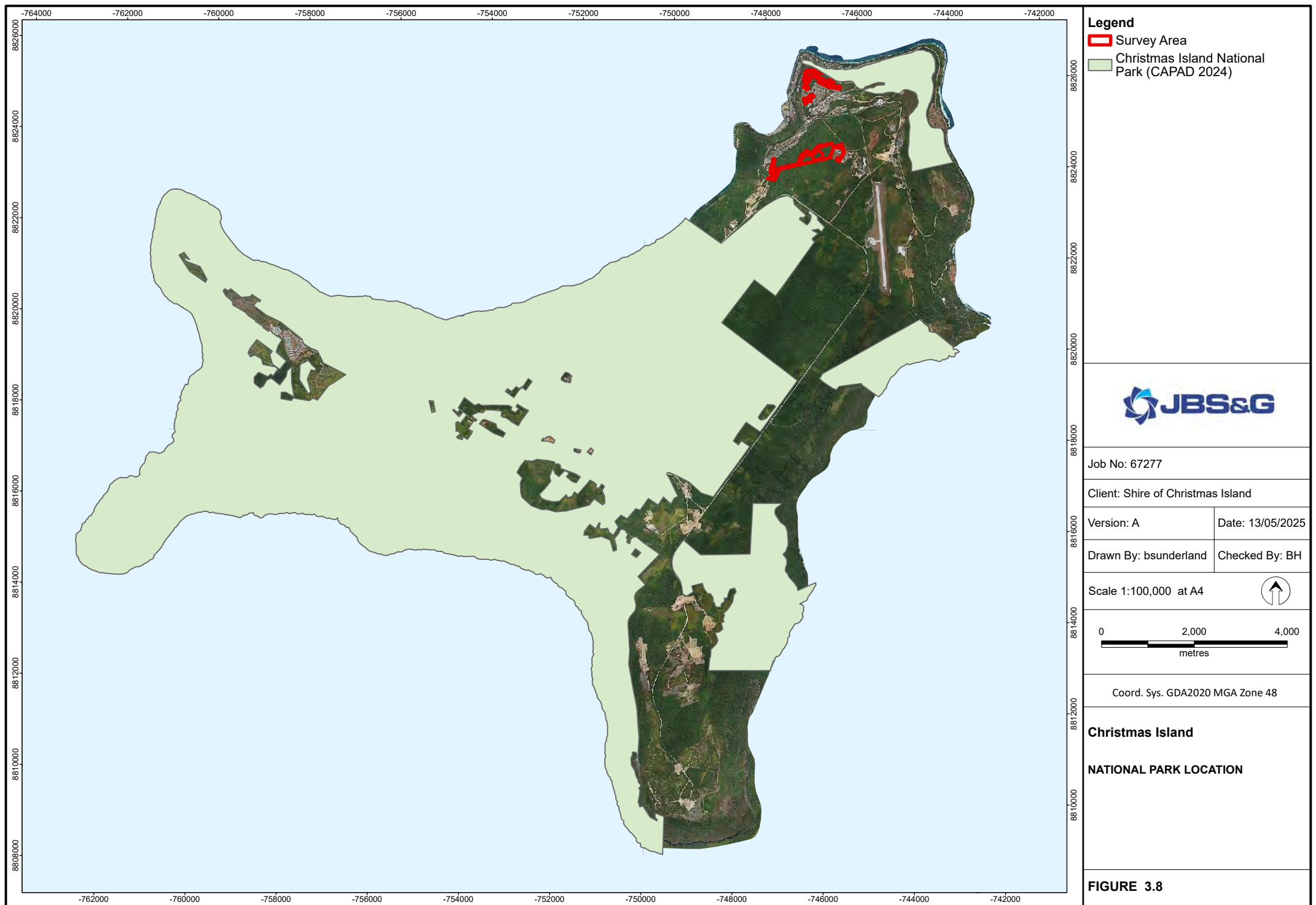
Table 3.4 Database search results

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
<i>BIRDS</i>			
<i>Accipiter hiogaster natalis</i> Christmas Island Goshawk	EN	Endemic to Christmas Island. Nests in forks of forest trees. Widespread but uncommon on the island. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	VU/MI	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields.	Unlikely – no preferred habitat occurs in the Survey Area
<i>Calidris canutus</i> Red Knot, Knot	VU/MI	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures and ploughed lands.	Unlikely – no preferred habitat occurs in the Survey Area
<i>Calidris ferruginea</i> Curlew Sandpiper	CR/MI	Tidal mudflats, saltmarsh, saltfields; fresh, brackish or saline wetlands and sewage ponds.	Unlikely – no preferred habitat occurs in the Survey Area
<i>Chalcophaps indica natalis</i> Christmas Island Emerald Dove	EN	Endemic to Christmas Island. Nests in trees, shrubs and vines. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
<i>Fregata andrewsi</i> Christmas Island Frigatebird	EN/MI	Confined to island cliffs and shore terraces where it breeds in the canopy.	Possible – preferred habitat occurs in the Survey Area
<i>Ninox natalis</i> Christmas Island Hawk-Owl	VU	Nests in hollows in large, mature trees. Nocturnal.	Likely – preferred habitat occurs in the Survey Area
<i>Papasaundersia abbotti</i> Abbott's Booby	EN	A sea bird, which does not utilise the understory as habitat. The only known extant nesting colony of this species is on Christmas Island. Nest sites for Abbott's booby have been mapped in island wide surveys. Mature, usually emergent, trees are essential for nesting.	Unlikely – no preferred habitat occurs in the Survey Area
<i>Phaethon lepturus fulvus</i> Golden Boobynbird	EN	Nests in large mature trees and limestone cliffs.	Likely – preferred habitat occurs in the Survey Area
<i>Phaethon rubricauda westralis</i> Indian Ocean Red-tailed Tropicbird	EN	Tropical pelagic waters, rarely near land unless breeding. Large numbers breed on Christmas Island, with nests commonly located on the Island's rocky terraces under shrubs.	Likely – preferred habitat occurs in the Survey Area
<i>Turdus poliocephalus erythropleurus</i> Christmas Island Thrush	EN	Widespread and common species on the Island and is a habitat generalist being prolific in disturbed areas. Little information on breeding	Likely – preferred habitat occurs in the Survey Area

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
		ecology is available. Highly mobile species.	
MAMMALS			
<i>Crocidura trichura</i> Christmas Island Shrew	CR	Considered extinct	Absent
<i>Pteropus natalis</i> Christmas Island Flying-fox	CR	Endemic to Christmas Island. All recorded roosts have been located on the coastal terrace or around the first land cliff and semi-deciduous forest. Highly mobile and forages through the forest canopy so is unlikely to be impacted by understorey vegetation clearing.	Likely – preferred habitat occurs in the Survey Area
REPTILES			
<i>Cryptoblepharus egeriae</i> Christmas Island Blue-tailed Skink	CR	Considered extinct in the wild prior to recent releases of captive-bred individuals.	Possible – preferred habitat occurs in the Survey Area but this taxon has only been released in select locations
<i>Cyrtodactylus sadleiri</i> Christmas Island Giant Gecko	EN	Endemic to Christmas Island. Found in all island habitats, except areas lacking trees and shrubs. Evergreen tall, closed forest is considered critical habitat for this species (Director of National Parks, 2014b).	Likely – preferred habitat occurs in the Survey Area
<i>Lepidodactylus listeri</i> Christmas Island Gecko, Lister's Gecko	CR	Considered extinct in the wild.	Absent
<i>Ramphotyphlops exocoeti</i> Christmas Island Blind Snake	VU	A cryptic, fossorial species. No specimen has been found since 2009.	Possible – preferred habitat occurs in the Survey Area

3.7 Conservation Areas

The Christmas Island National Park, which covers 63% of the Island, is assigned to IUCN reserve category II, most of which is uncleared primary rainforest (Director of National Parks, 2014a) as shown in Figure 3-8.



3.8 Contamination

The CS Act defines contamination as having a substance present in land or water above background concentrations that presents a risk of harm to human health or the environment. The act also provides for the identification, recording, management and remediation of contaminated sites. Contamination commonly occurs through accidental leakage and spillage, or poor site management practices.

No contaminated sites are identified on the Contaminated Sites Database for the whole of Christmas Island (DWER, 2025).

3.9 Heritage

3.9.1 Indigenous heritage

The AH Act aims to protect Aboriginal heritage by registering Aboriginal sites (places and/or objects) that are of cultural importance to Aboriginal people. Any proposal to use or alter an area of land, for purposes such as research or development, must first determine if Aboriginal sites occur within the proposed area. If an Aboriginal site is found to occur, permission must be sought from the Minister for Aboriginal Affairs before that land can be used or altered in any way.

A search of the Department of Planning, Lands and Heritage – Aboriginal Heritage Places mapping tool found no registered Aboriginal heritage sites within or immediately adjacent to the site.

3.9.2 European heritage

A search of the Commonwealth Heritage Places (sites) identified one Place that will be impacted. Place ID 105187 Christmas Island Natural Areas covers the majority of the island and coastal area out to 500 m.

Council of Western Australia's *InHerit* database identified 88 Places on Christmas Island and no State Registered Places. No State Heritage Places will be impacted by the proposed development.

3.10 Landscape Features

Silver City is in the north west corner of the island between the existing Silver City community and the coastal settlement. It is on a gentle slope towards the ocean.

3.11 View Shed

The proposed Silver City development will be difficult to see from either community except where there is direct connection, due to the sloping nature of the site and the tall screening vegetation. Some areas of the development will have views out to the Indian Ocean.

4. Potential impacts and proposed management measures

The potential impacts of proposed development within the Structure Plan area have been assessed based on the applicable policy considerations, receiving environment, potential impacts, management measures to be implemented, and the predicted outcomes.

Based on the findings of the assessment, the following Key Environmental Factors are considered relevant to the proposal:

- Flora and Vegetation; and
- Fauna and Habitat.

4.1 Benthic communities and habitats

Due to the extensive forested areas, adjacent to the existing Silver City community and relatively small nature of development, no marine or coastal impacts are expected from this development.

4.2 Coastal processes

Due to the extensive forested areas, adjacent to the existing Silver City community and relatively small nature of development and separation distance from the coastline (Figure 4-1), no marine or coastal impacts are expected from this development.

4.3 Marine environmental quality

Due to the extensive forested areas, adjacent to the existing Silver City community and relatively small nature of development, no marine or coastal impacts are expected from this development.

4.4 Marine fauna

Due to the terrestrial nature of the proposal, and the separation distance from the marine environment (Figure 4-3) no marine or coastal impacts are expected from this development.

4.5 Flora and Vegetation

4.5.1 Potential impacts

The *Christmas Island Housing Support Flora, Fauna and Vegetation Assessment* (JBS&G, 2025) describes the flora and vegetation of the survey area as “generally unremarkable”. Within the survey area, 0.48 ha has previously been cleared and most of the vegetation is in Excellent Condition. An additional area of 1.28 ha is a *Leucaena* thicket that is not considered to have native vegetation values. (JBS&G 2025).

No conservation significant flora were identified (noting some limitations to the survey extent).

The proposal has the potential to affect flora and vegetation values through:

- Clearing of vegetation for the establishment of the proposed development, with the resultant permanent loss of vegetation;
- Introduction and spread of weeds due to edge effects and spread of propagules by machinery. Opening the forest up can cause germination from the soil seedbank, with many weed species already having abundant propagules in regrowth forest. Propagules of these can then spread into surrounding forest;
- Edge drying effects caused by microclimate changes. The risk of this is considered minimal as the terrace vegetation is drier than the plateau, as evidenced by the presence of semi-deciduous vegetation; and

- Fragmentation. The risk of increased fragmentation in this location is considered minimal risk, as the proposed site is already cleared and abuts cleared areas.

4.5.2 Policy and management objectives

Flora and vegetation on Christmas Island is protected formally and informally by various legislative measures as described in Section 2, which include:

- EPBC Act and Environment Protection and Biodiversity Conservation Regulations 2000;
- BC Act (WA), and Biodiversity Conservation Regulations 2018;
- EP Act (WA) and Clearing Regulations; and
- BAM Act (WA).

The Department of Infrastructure, Regional Development and Cities (DPIRC) is preparing a Strategic Assessment for Christmas Island to ensure the impact of development can be avoided, mitigated or offset where necessary (DIRDC, 2025).

4.5.3 Proposed Management

The following mitigation and management measures (Table 4.1) have been identified to ensure impacts to flora and vegetation are appropriately managed as development of the site progresses.

Table 4.1 Management measures for vegetation and flora

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Management of weed infestation	The introduction and/or spread of weeds could potentially impact on the values of the Christmas Island National Park. A Weed Management Plan should be prepared to mitigate the potential risks from weed introduction or spread.	Prior to ground disturbing activities to the satisfaction of the Shire of Christmas Island.

4.5.4 Predicted Environmental Outcomes

Clearing will remove up to 11.32 ha of native vegetation, refer to Figure 4-1 and Figure 4-2. No flora species of conservation significance are known to occur in the proposed clearing area and all species identified within the proposal area are well represented within the Christmas Island National Park.

The Island's rainforest is remarkably resistant to weed invasion (Green, et al., 2004) so minimal impacts are anticipated as a consequence of the proposal, impacting only the immediate edge of surrounding vegetation, with little likelihood of weeds spreading further into the forest or pushing back the edge of the forest.

The clearing of any native vegetation will require a permit under the under the Clearing Regulations (WA). There are no applicable exemptions under the EP Act or the Clearing Regulations that apply to this proposal.



Legend Survey Area Vegetation Unit Cleared Garden Leucaena thicket Semi-deciduous Forest/Scrub/Regrowth Cadastral boundary (LGATE-002) Roads (LGATE-195) Minor road Track	 <table><tr><td>Job Number: 67277</td><td>Scale 1:3,500 at A3</td></tr><tr><td>Client: Shire of Christmas Island</td><td>Coord. Sys. GDA2020 MGA Zone 48</td></tr><tr><td>Drawn By: bsunderland</td><td>Checked By: RP</td></tr><tr><td>Version: Rev A</td><td>Date: 13-May-2025</td></tr></table>	Job Number: 67277	Scale 1:3,500 at A3	Client: Shire of Christmas Island	Coord. Sys. GDA2020 MGA Zone 48	Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025	0100metres  Christmas Island VEGETATION - SILVER CITY - CLEARING PERMIT AREA FIGURE: 4.1B
Job Number: 67277	Scale 1:3,500 at A3									
Client: Shire of Christmas Island	Coord. Sys. GDA2020 MGA Zone 48									
Drawn By: bsunderland	Checked By: RP									
Version: Rev A	Date: 13-May-2025									



Legend Survey Area Vegetation Condition Excellent Very Good Good Degraded Completely Degraded	Cadastral boundary (LGATE-002) Roads (LGATE-195) Minor road Track	Job Number: 67277 Client: Shire of Christmas Island Drawn By: bsunderland Checked By: RP	0100 metres Scale 1:3,500 at A3 Coord. Sys. GDA2020 MGA Zone 48 Version: Rev A Date: 13-May-2025	Christmas Island VEGETATION CONDITION - SILVER CITY - CLEARING PERMIT AREA FIGURE: 4.2B
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4.6 Terrestrial Fauna

4.6.1 Potential impacts

A fauna survey was undertaken by JBS&G in 2024 and the results are provided in *Christmas Island Housing Support Flora, Fauna and Vegetation Assessment* (JBS&G, 2025). The Protected Matter Search Tool (PMST) identified 29 significant species as potentially occurring on the Island and 8 considered likely to occur. Seven Threatened Fauna species were identified during the survey of which one was located within the survey area for Silver City, and 3 fauna habitats occur, refer to Figure 4-3 and Figure 4-4

This project will potentially see the loss of 9.04 ha of “Semi-deciduous Forest / Scrub”, compared to the overall area of Christmas Island (approximately 13,500 ha) of which approximately 8,505 ha is protected within Christmas Island National Park.

4.6.2 Policy and management objectives

Fauna on Christmas Island is protected formally and informally by various legislative measures as described in Section 2, which include:

- EPBC Act and Environment Protection and Biodiversity Conservation Regulations 2000;
- BC Act (WA), and Biodiversity Conservation Regulations 2018;
- EP Act (WA) and Clearing Regulations; and
- BAM Act (WA).

The Department of Infrastructure, Regional Development and Cities (DPIRC) is preparing a Strategic Assessment for Christmas Island to ensure the impact of development can be avoided, mitigated or offset where necessary (DIRDC, 2025).



Legend Survey Area Cadastral boundary (LGATE-002) Conservation Significant Fauna EN,<i>Phaethon lepturus fulvus</i> EN/MI,<i>Fregata andrewsi</i> MI,<i>Hemidactylus frenatus</i> Roads (LGATE-195) Minor road Track Job Number: 67277 Client: Shire of Christmas Island Drawn By: bsunderland Checked By: RP 0 100 metres Scale 1:3,500 at A3 Coord. Sys. GDA2020 MGA Zone 48 Version: Rev A Date: 13-May-2025 Christmas Island SIGNIFICANT FAUNA - SILVER CITY - CLEARING PERMIT AREA FIGURE: 4.3B	
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Legend Survey Area Leucaena thicket Semi-deciduous Forest/Scrub/Regrowth Cleared Cadastral boundary (LGATE-002) Large fig Large tree Roads (LGATE-195) Minor road Track	JBS&G		0 100 metres		Christmas Island FAUNA HABITATS - SILVER CITY - CLEARING PERMIT AREA
	Job Number: 67277		Scale 1:3,500 at A3		
	Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
		Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

4.6.3 Proposed Management

The Structure Plan will set aside 14.86 ha of areas zoned Urban Development under LPS2 for a Future Environmental Conservation area to ensure visual amenity is maintained, to act as a buffer to the nearby Christmas Island Frigatebird colony and to increase the size of the Christmas Island National Park.

The following management measures have been identified to ensure potential impacts to terrestrial fauna are appropriately managed as development progresses.

Table 4.2 Management requirements for terrestrial fauna

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Fauna	Preparation of a Fauna Management Plan including the following elements: • inductions and pre-start meetings to include fauna management requirements • pre-clearing fauna inspections, as well as trapping and relocation of fauna, if required, • staged fencing of site	Prior to site works. Developer in consultation with Shire of Christmas Island
Habitat retention	Retention of corridors and culverts to facilitate red-crab movements during their annual migration.	Prior to construction. Developer in consultation with Shire of Christmas Island.
	Installation of nesting boxes for Golden Bosunbirds within the Structure Plan area.	Prior to clearing. Developer in consultation with Shire of Christmas Island.

4.6.4 Predicted Environmental Outcomes

There were 7 EPBC Act Threatened fauna species identified within the survey area. This will trigger the need to refer the proposal to DCCEEW for consideration of the proposal as a controlled action, under the EPBC Act. It is anticipated that the implementation of the management measures specified in Table 4.2, the reservation of an area for Future Environmental Conservation which includes an extensive areas of excellent quality, protected vegetation; the potential impact to terrestrial fauna can be managed such that the biological diversity and ecological integrity of the terrestrial fauna assemblage can be maintained.

4.7 Landforms

4.7.1 Potential impacts

Inappropriate development could potentially impact on the distinctive physical landforms of Christmas Island described in Section 3.3, through the loss of land if excessive bulk earthworks are required during construction or by exposing cleared areas to erosion.

4.7.2 Policy and management objectives

The Shire of Christmas Island *Local Planning Strategy* was endorsed in May 2015. The new scheme includes a stated objective “to enhance and diversify the island’s economic base through the provision of land for a range of economic activities,” (Shire of Christmas Island, 2016) which also included urban development and possible new tourism opportunities. Any new proposed development should not compromise long term opportunities across the island.

The EPA environmental objective for the Landform factor is “To maintain the variety and integrity of significant physical landforms so that environmental values are protected.”

4.7.3 Proposed Management

The proposed Structure Plan will see significant areas of land incorporated into an environmental conservation reserve to maintain the natural rain forest values of the island with managed drainage and minimal earthworks in accordance with the LPS and consistent with the EPA objective for Landforms.

4.7.4 Predicted Environmental Outcomes

The development can be undertaken so that final landforms will be visually consistent with the current undisturbed landforms of the Island in this location, in order to maintain the current integrity of the Christmas Island landforms and associated environmental values.

4.8 Terrestrial environmental quality

4.8.1 Potential impacts

The key risk to land and soil quality arising from the proposal, in particular land clearing activities, is erosion. Erosion may result in loss of soil through water and/or wind.

4.8.2 Policy and management objectives

The Shire of Christmas Island *Local Planning Strategy* was endorsed in May 2015. The LPS has controls to ensure best practice design and construction techniques can be used in development proposals, and will include the requirement for a drainage and stormwater management plan (refer to Table 4.3).

4.8.3 Proposed Management

Management conditions to control drainage, footprint delineation, vehicle and pedestrian access, management of streetscapes and Public Open Space areas will be incorporated into the proposal design and can be required via standard subdivision conditions.

4.8.4 Predicted Environmental Outcomes

Land clearing and construction activities can be planned and managed to minimise the risk of erosion through stormwater and drainage management and adequate prevention of wind blown soil from cleared area.

4.9 Inland Waters

4.9.1 Potential impacts

Christmas Island is characterised by a lack of surface water drainage (Puhlovich et al. 2003). There are no surface water features in the proposed clearing area. The proposed development will not intercept groundwater, and drainage design will be close to source infiltration such that is unlikely to cause changes to groundwater levels or quality.

There are two notable wetlands on the island, Hosnie's Spring on the east coast or The Dales on the west coast. The proposed development does not intersect either of these wetlands.

4.9.2 Policy and management objectives

In addition to the legislative protection afforded by the WA EP Act and the Commonwealth EPBC Act, the two wetland features identified above are protected the provisions of the Ramsar Convention and therefore the EPBC Regulations 2000.

4.9.3 Proposed Management

These two sites are approximately 6.3 km and 14.1 km respectively from the Silver City proposal area at closest point. Neither wetland is expected to be impacted due to any potential surface flow from the development area as surface flow will be away from Hosnie's Spring and separated by distance to The Dales.

Drainage associated with development at Silver City can be managed through the development and implementation of a Drainage and Stormwater Management Plan.

Table 4.3 Management requirements for inland waters.

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Site drainage	Prepare and implement a Drainage and Stormwater Management Plan.	Prior to finalisation of subdivision design. Developer in consultation with Shire of Christmas Island

4.9.4 Predicted Environmental Outcomes

The environmental values of the Dales and Hosnie's Spring wetlands will not be impacted by the proposed development.

4.10 Subterranean fauna

4.10.1 Potential impacts

Christmas Island has a diverse subterranean environment with freshwater, marine, anchialine and terrestrial habitats. Subterranean animals are found in air-filled (troglifauna) and water-filled (stygo fauna) voids. With at least 12 endemic species, Christmas Island's cave fauna are internationally significant (DCCEEW, 2025). From the mapping work prepared by Humphries (2014), no on-shore karst features have been identified in the vicinity of the Silver City development proposal with the closest approximately 2km to the south west.

4.10.2 Policy and management objectives

Fauna on Christmas Island are protected formally and informally by various legislative measures, which are as follows:

- EPBC Act and Regulations (2000) ; and
- BC Act (WA) and associated Regulations (2018).

A Management Plan for the Christmas Island National Park is currently in development to ensure the protection of the Island's unique natural values.

The EPA's objective for the environmental factor of Subterranean Fauna is "To protect subterranean fauna so that biological diversity and ecological integrity are maintained".

In the context of this objective ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.

4.10.3 Proposed Management

Management for the potential impacts from development to the values of the National Park, including subterranean fauna, can be managed through existing Planning and Environmental approval processes, which protect the habitat for subterranean fauna (including groundwater quality):

- Management of drainage;
- Management of potentially polluting activities to prevent contamination of groundwater; and
- Ensuring adequate separation from high value areas of the National Park.

On-going operation and protection of the Park will be detailed in the Christmas Island National Park Management Plan that is currently in development.

4.10.4 Predicted Environmental Outcomes

The implementation of management strategies to prevent loss of habitat through physical loss or contamination of groundwater associated with project activities during construction and operations, will

ensure the ongoing protection of subterranean fauna so that their biological diversity and ecological integrity are maintained.

4.11 Air quality

4.11.1 Potential impacts

The air quality during construction activities and clearing in particular may be temporarily impacted due to nuisance dust. Dust from unsealed road surfaces, particularly crushed limestone on Christmas Island, have been observed to result in minor dust impacts to vegetation adjacent to the roads.

4.11.2 Policy and management objectives

The EP Act (WA) provides for the consideration and protection of the social surroundings of a proposal, which includes protection of 'amenity'. Noise, odour and dust all have the potential to unreasonably interfere with the health, welfare and convenience and comfort of sensitive receptors.

Amenity of users of the nearby communities should be maintained to an acceptable level during clearing and construction.

4.11.3 Proposed Management

Dust emissions are considered to be temporary in nature and limited to the immediate vicinity of construction and clearing activities.

Nuisance dust can be adequately managed through existing mechanisms available to the Shire such as the requirement for use of water based dust suppression (e.g. use of a water cart) and prompt complaint resolution process.

4.11.4 Predicted Environmental Outcomes

The maintenance of local amenity and protection of adjacent vegetation can be adequately managed to an acceptable level through standard dust management measures used on construction sites, primarily being water based dust suppression.

4.12 Greenhouse gas emissions

This proposal is not expected to exceed the 100,00 tonnes CO₂-e of Scope 1 emissions or 100,000 tonnes of CO₂-e of Scope 2 emissions in any year and is not considered to be a significant factor.

4.13 Social surroundings

The key risk to social surroundings at this location :

- Natural or historical heritage – the Christmas Island natural areas is located within the site (that is, the rainforest); up to 11.32 ha will be lost as a result of clearing;
- Amenity – arising from construction noise and dust (see section 4.11 for air quality). Noise is required to be managed in accordance with the Environment Protection (Noise) Regulations 1997, which may required a Construction Noise Management Plan; and
- Other - Christmas Island is not considered a Bushfire Prone Area. The development will improve human health by moving people away from flood prone areas along the coast.

4.14 Human health

The EPA (WA) guideline for the human health environmental factor provides the specific framework for considering the possible impacts to human health arising from the emission of radiation.

There are no known radiation risks to human health arising from this proposal.

5. Conclusion

This Environmental Assessment Report (EAR) has been prepared to support the Local Structure Plan for the Silver City precinct.

All environmental considerations associated with the proposed Structure Plan can be managed in accordance with applicable regulatory and policy requirements subject to the additional management provisions. The management provisions are summarised in Table 5.1 below.

Table 5.1 Proposed management provisions

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Management of weed infestation	The introduction and/or spread of weeds could potentially impact on the values of the Christmas Island National Park. A Weed Management Plan should be prepared to mitigate the potential risks from weed introduction or spread.	Prior to ground disturbing activities to the satisfaction of the Shire of Christmas Island.
Fauna	- Preparation of a Fauna Management Plan including the following elements: - inductions and pre-start meetings to include fauna management requirements - pre-clearing fauna inspections, as well as trapping and relocation of fauna, if required, - staged fencing of site	Prior to site works. Developer in consultation with Shire of Christmas Island
Tree retention	Retention of corridors and culverts to facilitate red-crab movements during their annual migration.	Prior to construction. Developer in consultation with Shire of Christmas Island.
	Installation of nesting boxes for Golden Bosunbirds within the Structure Plan area.	Prior to clearing. Developer in consultation with Shire of Christmas Island.
Site drainage	Prepare and implement a Drainage and Stormwater Management Plan.	Prior to finalisation of subdivision design. Developer in consultation with Shire of Christmas Island

The proposed development will require referral to DWER for a permit under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

The proposed development will require referral to DCCEW under the EPBC Act as it has the potential to impact Matters of National Environmental Significance.

6. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

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APPENDIX A: Flora and Vegetation and Fauna Assessment

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APPENDIX 3 – DWA Civil Engineering and Services Report

SHIRE OF CHRISTMAS ISLAND

LOCAL INFRASTRUCTURE AND SERVICING STRATEGY

FOR THE PROPOSED STRUCTURE PLAN

SILVER CITY, CHRISTMAS ISLAND



DOCUMENT CONTROL DATA

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	Synopsis	This strategy outlines the planning, provision, and coordination of essential infrastructure to support the proposed Structure Plan.

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26/05/2025	D	Chris Su: Shire of Christmas Island Herve Calmy: Calmy Planning and Design

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1 INTRODUCTION

1.1 Commission

David Wills and Associates have been commissioned by the Shire of Christmas Island to provide a Local Infrastructure and Servicing Strategy for the proposed Structure Plan in Silver City, Christmas Island. The Structure Planning works are being provided under the Federal Government Housing Support Program (Stream 1).

This Servicing Strategy has been prepared to support the planning and delivery of essential infrastructure for the proposed development at Silver City. It provides a comprehensive overview of the services required to ensure the development is functional, efficient, and sustainable over the long term.

The strategy outlines the existing infrastructure, identifies servicing requirements for the proposed development, and provides concept design of the roads, stormwater drainage, water supply and sewer services.

In developing this strategy, careful consideration has been given to site-specific constraints, environmental values, and the broader planning framework. The approach ensures that infrastructure is delivered in a staged and cost-effective manner, aligned with the development timeline and responsive to community needs and regulatory standards.

1.2 Overview of Proposed Structure Plan

1.2.1 Ultimate Development

Silver City is currently a residential area. The Structure Plan proposes to develop an area of 12.5ha (excluding the Environmental Conservation area) into residential lots and a Mixed Use lot. Two connecting roads will be constructed to provide access to Murray Road to the north of Silver City. The extension of Poon Saan Drive to the north is not feasible due to the steep topography of the site.

The ultimate development will contain residential lots zoned R17.5, R40 and R60.

An overview of the proposed Structure Plan layout is provided below in Figure 1.

Figure 1 Silver City Structure Plan Map



Figure 1 –Overview of proposed Silver City Structure Plan (Jeffrey Planning & Mapping, Calmy Planning and Design)

The Estimated Residential Yield for the Silver City Structure Plan is provided in Appendix A.

2 INFRASTRUCTURE

2.1 Topography and Site Conditions

Christmas Island contains many unique geological features, including steep cliffs and exposed shore terraces in karstic environments and subterranean cave systems, which present challenging construction in roadworks and drainage.

The rainforest areas do not have significant runoff and are highly permeable, with the majority of the stormwater infiltrates the surface and enters the karst system.

Christmas Island is part of the Indian Oceans Territories, and the roads and stormwater drainage assets are owned by a number of Authorities including the Shire of Christmas Island and the Australian Government. The Shire of Christmas Island generally manage and maintain the public roads and stormwater drainage on the island.

2.1.1 Geospatial survey findings

MNG SubSpatial (MNG) conducted a geophysical investigation using Ground Penetrating Radar (GPR) at Silver City on Christmas Island. This method was employed to generate 2D radar-grams (cross-sections) of the subsurface, reaching an uncalibrated maximum depth of 10 meters below ground level (BGL).

MNG found that the site primarily consists of fractured limestone, predominantly found at depths of less than two meters. Fractured limestone is limestone that contains natural joints or faults. These fractures can reduce the strength of the limestone and increase its permeability, but makes it susceptible to long term erosion as the limestone is dissolved by the rainwater. This process is called carbonation, and occurs from the rainwater absorbing carbon dioxide from the atmosphere, turning mildly acidic, which dissolves the limestone. This occurs at a very slow rate.

MNG defined the limestone subsurface into two different types:

1. Karst features: limestone containing large dissolution-related voids or large solution-widened fractures.
2. Heavily fractured rock: intense fracturing that, while structurally weak, may not necessarily exhibit true karstic development. This rock is believed to be structurally sound for single storey residential buildings.

The MNG report is provided in Appendix B. A total of 20 karstic features were identified within the scanned area, with some shown in the following Figure 2. The values provided in below figure indicate the range of depths at which the voids exist.



Figure 2 – MNG interpreted karst/voids indicating depth below ground level

2.1.2 Indicative Terrace Fault Lines

Indicative terrace fault lines were provided by Christmas Island Phosphates, which were modelled based on changes in topography. Indicative terrace fault lines are located within the development, along the limestone cliffs. These fault line indicates potential fracture zones which should be investigated further at detailed design stage.

This information is provided in the Roads and Stormwater Drainage Layout Plan in Appendix C.

2.2 Earthworks

Before undertaking the detailed design, a site investigation shall be performed, which includes scanning with a GPR to identify any large voids, and identify areas

within the site that may have existing solution features or containing a higher risk of developing solution features. This investigation will require the clearing of the areas to be developed to enable a ground penetrating radar to scan the site, unless technologies have advanced and a drone radar can be used.

If solution features are encountered, then detailed design can be undertaken to address the issues, including:

1. Installation of piled foundations for the buildings
2. Pressure grouting within the fractures
3. Plug repair of solution features.

Any excavation in the hard limestone will be required to be undertaken with the use of a large machine with a cutting tool attachment such as a double drum cutter head or rock breaker.

Fill materials are expected to comprise of chalk material from excavations or local quarries. Excavated chalk pavement materials are expected to be suitable for use as general fill, or may be able to be considered as an improved subgrade or sub-base material, although some processing to break down oversized particles and some delineation to avoid clayey areas may be required.

The earthworks for the lots are expected to be minimal, with building construction following existing ground levels, and levelled where required.

2.2.1 Retaining walls

Retaining walls between neighbouring properties shall be avoided where possible. However, where retaining walls are required, they are to consist of local materials.

For the proposed roads extending to Murray Road to the north, retaining walls may be required. It is recommended these retaining walls are constructed from Gabion walls, similar to the existing Gabion wall retaining Linkwater Road. The Gabion walls, which consist of wire cages, can be filled with limestone sourced locally.

2.3 Roads

2.3.1 Existing Road and Stormwater Drainage System

Throughout the developed areas of Silver City, the roads are kerbed and side entry pits have been installed along the roads.

Arenga Close contains numerous stormwater pits with outlets that discharge stormwater runoff into the rainforest area to the north.

Adjacent to the proposed location of the Mixed Use site, Seaview Drive is kerbed and contains stormwater pits which convey the stormwater runoff towards the lower western end of Seaview Drive, discharging into a Stormwater Disposal Borehole and the rainforest area to the west.

Sunset Place is a steeply graded cul de sac that extends north from Seaview Drive. There is a side entry pit located at the northern end of Sunset Place which discharges stormwater runoff generated from Seaview Drive and Sunset Place via a channel to the northern rainforest area.

Approximately 200m to the north of Arenga Close is Murray Road, which will be connected to the development with two proposed roads. This section of Murray Road is unkerbed and the stormwater drainage system consists of open channels along both sides of the road.

2.3.2 Geometry of Proposed Roads

The proposed roads are typically 6m wide with kerbing on one or both sides.

All roads and intersections have been designed to allow a 19m long articulated truck to access the roads.

The intersections of the two connecting roads to Murray Road have been designed with slip lanes provided for vehicles heading west on Murray Road. These slip lanes will enable vehicles to slow down after turning from Murray Road to access the development area. These two roads have grades of up to 6%, with the steepest grade at the exit from the development onto Murray Road with a maximum grade of 15%.

The proposed road extending from the northern end of Sunset Place is required to be located over steep limestone terrain, which is at approximately 27%. The limestone in this location is to be cut and retained where required so that the road gradient is reduced to a maximum of 15%.

The rest of the proposed roads are within typical gradients of less than 12%.

2.3.3 Typical Pavement Materials

Based on the availability and expense of importation of road pavement materials, it is recommended that local materials be used for road pavement where possible.

The road pavement areas are to be excavated to the base of pavement level as per the detailed design. If clayey/silty materials are present, an additional 150 mm thickness should be excavated and replaced with compacted granular material, such as Chalk Fill.

For roads with a longitudinal grade of less than 7%, limestone sealing aggregates can be used, subject to testing to achieve the following:

- **Adequate Strength:** As limestone can exhibit inconsistencies in particle strength, careful quality control is needed to confirm the material maintains consistently high strength and is resistant to particle degradation and surface polishing, which could increase surface slipperiness.

Generally, chalk exhibits low structural strength and can exhibit degradation and surface rutting with heavy traffic.

Given the chalk's properties, cement stabilisation is likely ineffective, and bitumen stabilisation may not be financially viable. The chalk must be processed to a specification that minimises degradation and enhances pavement stiffness.

- **Bitumen Compatibility and Absorption:** Limestone may not bond well with certain types of bitumen, particularly emulsions that rely on the aggregate's surface charge for adhesion. This may impact seal

performance unless compatibility is verified. The porosity of the limestone should be considered in the pavement design.

For roads with a longitudinal grade over 7%, measures such as speed control, the use of more durable aggregate materials (e.g. imported granite), or alternative surface treatments (like asphalt) may be necessary.

Geotechnical assessment of the available materials would be required at detailed design stage.

A minimum of 150mm of non-reactive subgrade material should be incorporated when determining the total pavement thickness.

Sprayed seals have a history of underperforming on Christmas Island. If sprayed seals are to be installed:

- Construction should take place during dry conditions by skilled contractors.
- Seal design must be completed by an experienced pavement engineer, considering the characteristics of both the pavement and aggregate (e.g. binder absorption).
- Early sections of the seal should be closely monitored by the engineer, with adjustments made in response to field conditions and observed performance.

2.4 Stormwater Drainage

2.4.1 Rainfall Data and Basis

Detailed Rainfall Intensity, Frequency and Duration (IFD) data is available for all of mainland Australia through the Australian Bureau of Meteorology. IFD data for other parts of the world may not be as readily available but can be found online and is more likely to be available for more highly populated locations.

IFD data was unavailable for Christmas Island. A theoretical IFD chart was produced by combining and averaging IFD data from the three following locations with similar geographic characteristics to Christmas Island:

1. Bali, Indonesia is 1,000km from Christmas Island, and it is also located near the equator where more rainfall evaporates and moves eastward. Both islands are affected by moist northeast trade winds blowing over the ocean, which bring similar weather patterns like increased rainfall and humidity. Since Bali is an island, its rainfall data (IFD) is generally consistent across the whole area and can be used as a valid reference.
2. Bogor, Indonesia, which is 450km from Christmas Island.
3. Cairns, Queensland has a similar latitude to Christmas Island, with a slight southern offset to the above Indonesian locations. Cairns is located on the east coast of Australia with a northeast approach over the sea, similar to Christmas Island.

The IFD Chart is provided below:

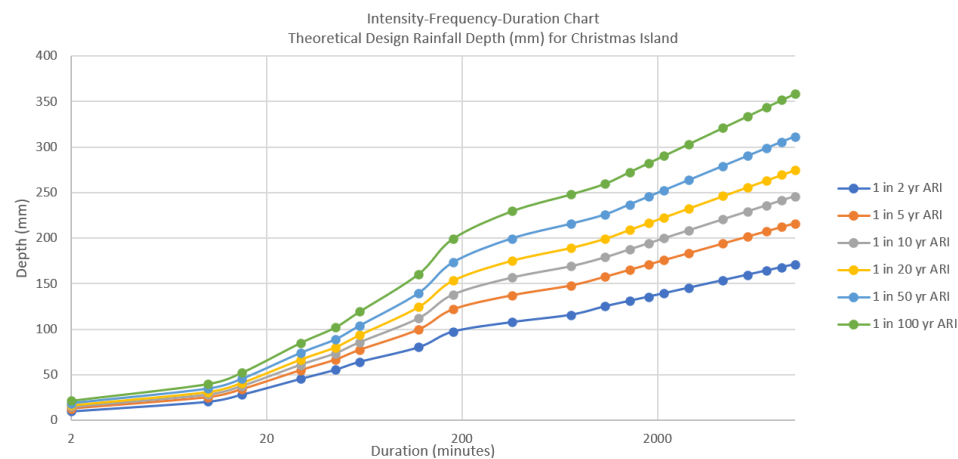


Figure 3 – IFD Chart for Christmas Island

A summary table of various storm events using different terminology is provided below.

A storm listed as ARI refers to the average or expected number of years between a specific rainfall event. It is implicit in this definition to note that any one time period between events is random. A storm listed as AEP refers to the probability

that a given rainfall event will be exceeded during the year. All storms in this report will be discussed as ARI storm events.

Table 1: Various Standard Storm Events

1 in x Storm Event	ARI (Annual Recurrence Interval)	AEP (%) Annual Exceedance Probability
1 in 1 year storm event*	1	63.2
1 in 2 year storm event	1.44	50
1 in 5 year storm event	4.48	20.0
1 in 10 year storm event	9.49	10
1 in 20 year storm event	20	5
1 in 50 year storm event	50	2
1 in 100 year storm event	100	1

2.4.2 Permeability

Due to the extremely high permeability of the limestone at the site, a permeability of 25 m/day has been used in the concept stormwater drainage design.

This permeability is expected to be much higher and should be confirmed with on site permeability testing at the detailed design stage.

2.4.3 Stormwater Drainage Layout

The development will be served with interconnected channels or pits and pipes, which will direct stormwater to either a stormwater basin, or a controlled outflow channel drain, depending on the site topography.

In these geological conditions, sinkholes can form where water is allowed to enter the subsurface at one location. Because of the connected nature of limestone bedding and fracturing, infiltrating water can lead to solutioning and sinkhole formation well downstream of the point of entry. Therefore, control of both surface and stormwater at the site is important.

Pollution from road runoff is to be treated with a vegetated filtered layer installed within the channels and basins.

2.4.4 Drainage Channels - Design Criteria

Stormwater drainage will be designed to convey a 1 in 5 year storm event and ultimately discharge into a controlled outflow channel drain.

The controlled outflow channel drain will be designed to reduce the velocity of the stormwater, and ultimately discharge into a basin or channel drain which can retain stormwater runoff from a 1 in 100 year storm event. The dimensions of these basins and channel drains are to be reviewed at detailed design stage.

The upstream end wall of the controlled outflow channel drain will be graded at 1V: 6H to allow someone to be able to get out of the channel if needed. The other three walls of the drain will be graded at 1V : 1.5H. This is an indicative grade and should be reviewed at detailed design stage.

It is assumed that proposed roads are designed with a one-way crossfall, and the crossfall of the road falls against the existing surface contours. This will allow for an open channel to be constructed on the uphill side of the road to convey the stormwater runoff. It is recommended that this cross section is adopted in the detailed design.

The figure below shows a typical cross section of the roads:

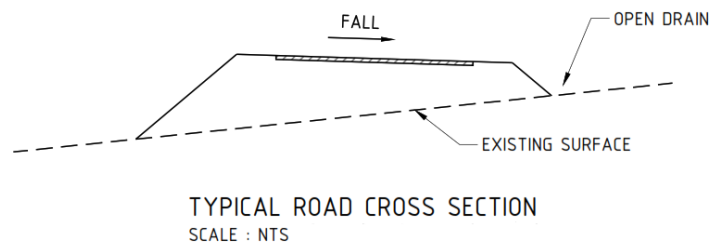


Figure 4 – Typical Road Cross Section

A trapezoidal channel has been designed with a minimum base width of 0.6m which will assist in controlling scour compared to a “V” shaped drain.

As the road reserves are generally 16-20m wide, the top width of the open drains constructed in the road reserve are limited to approximately 4m wide. Adjacent to the road, the side slopes of the open drains are indicatively graded at 1 Vertical

(V): 2 Horizontal (H) to 1 V: 1 H. The grade of the side slopes will be dependent upon the type of soil material encountered and is subject to review at detailed design stage. Side slopes of no steeper than 1 V: 1.5H should be installed. The design dimensions of each open drain are provided in Section 3 below.

The runoff coefficient for the developed site is 0.5 in areas where the Residential Code is less than R40, and 0.8 in areas with a Residential Code of equal to or greater than R40. This runoff coefficient is subject to review at detailed design stage.

In the detailed design stage, the channels are to be designed to be constructed in bare soil/limestone with a Manning’s “n” value of 0.018. The channels shall also be reviewed for freeboard with a Manning’s “n” value of 0.03 to allow for the drains to become vegetated over time.

The channels are to be designed to have a Froude Number less than 0.6 to minimise scour, with a longitudinal gradient no steeper than 1 in 500. Rock “riffle” structures are to be installed if the longitudinal gradient is steeper than 1 in 500. The height of these riffles are typically 200-300 and spaced according to the longitudinal grade of the drain.

Where indicated, in addition to the riffle structures, approximately 3m length of jute matting, or egg crates covered with rocks is recommended to be installed between the riffles as a temporary lining to minimise scour and protect the bare soil until the drain becomes vegetated.

The open drains have been designed to allow for 300 freeboard where the depth of water is greater than 400 deep. For the depth of water less than or equal to 400 deep, no freeboard shall be provided during a 1 in 100 year storm event and the open drain is fully vegetated.

Open drains are to be designed for the following criteria:

1. The open drains with no connecting upstream open drain or upstream infiltration basin, are to be designed for a 1 in 5 year ARI event from the catchment.

2. The open drains conveying the 1 in 100 year ARI overflow from upstream infiltration basins are to be sized accordingly with 300 freeboard. The design of these open drains also allows for the 1 in 100 year ARI runoff from the contributing catchment area.

2.4.5 Pipe Culverts - Design Criteria

The pipe culvert diameters have been designed assuming that the pipes are reinforced concrete pipes, conveying the 1 in 10 year ARI stormwater discharge from the upstream open drains and compensating basins with inlet control and 300 freeboard. As this is concept design only, the pipe sizes can be refined at detailed design stage.

The following design parameters should be followed at detailed design stage:

- The design Top Water Level on the upstream side of the culvert shall be between 1.2 to 1.5 times the diameter of the pipe above the upstream invert level of the culvert. i.e. a 600 diameter pipe should have a depth of water at the upstream inlet of 0.72 to 0.9 metres above the pipe invert.

This figure is selected as the general topography to the site is such that the inlet control of the culvert will usually be the controlling culvert design criteria.

- The upstream invert level of the culvert can be set with minimum cover to existing ground level. The outlet should have 0.3m cover below the ground level at the downstream end of the pipe. A dropped inlet is recommended to maximise the head on the culvert.
- In accordance with “good practice”, it is recommended that the design Top Water Level of the inlet at the culvert is set approximately 300 below the low sag point of the road to provide an overflow path for a major storm event. This low point may be off set to the centre line of the culvert and should be close to the existing ground level. This will create an emergency flow path which will not inundate the culvert and cause scour damage or erosion of the culvert. The overflow will travel overland at ground level

rather than cascade over the road formation. This will reduce scour significantly and provide a much greater degree of security of the culvert.

- The velocity of water within the pipes is to be limited to no greater than 8 m/s.

In some of the larger culverts, it may be prudent to place a low point either side of the culvert centreline. This will allow the road to rise at the culvert to provide approximately 0.5 metres of cover to ensure the traffic wheel loads do not exceed the load capacity of the pipe.

2.4.6 Proposed Stormwater Drainage in Public Open Space (POS) Areas

The POS areas will be used for the retention and storage of stormwater runoff.

It is assumed that the channels or basins provided in each of the POS areas will be adequate to store stormwater runoff generated from a 1 in 100 year 12 hour storm event with a freeboard of 300mm to ground level, with the total volume of stormwater runoff infiltrating from the basin within 36 hours.

An average of 6% of the POS areas should be used for stormwater drainage purposes. It is expected that a maximum of 10% of the POS area will be required for stormwater drainage purposes.

A schedule of the percentage used for stormwater drainage purposes is shown below in Table 2 and provided in Appendix C:

Table 2: Stormwater Drainage Areas in POS

<i>POS Area No.</i>	<i>Total Area of POS (m²)</i>	<i>POS Catchment Area (m²)</i>	<i>Runoff co-eff.t</i>	<i>Impervious Catchment Area</i>	<i>Area Required for Drainage Retention for 1 in 100 year storm event (m²)</i>	<i>% of POS used for Drainage (%)</i>	<i>Depth of Channel or Basin (m)</i>
100	1,202	11,208	0.8	962	60	5.0%	1.2
101	370	7,044	0.8	296	30	8.1%	0.8
102	2,096	1,156	0.8	1,677	60	2.9%	0.8
103	7,437	27,353	0.8	5,949	110	1.5%	0.8
104	400	7,950	0.8	320	30	7.5%	0.8
105	3,782	13,727	0.5	1,891	60	1.6%	0.8
106	400	8,776	0.8	320	30	7.5%	0.8
107	391	4,887	0.5	195	30	7.7%	0.8
108	693	14,786	0.5	347	30	4.3%	0.8
109	314	2,779	0.5	157	30	9.5%	0.8

2.5 Stormwater Drainage Feasibility

On Christmas Island, the use of infiltration basins and channels offers a viable and sustainable approach to water management. Given the island's porous limestone terrain, these systems are simple widely used and particularly well-suited to the environment. They require minimal maintenance and deliver multiple benefits, including reducing surface runoff, improving water quality, and enhancing groundwater recharge. Their integration into local infrastructure planning supports nature-based solutions tailored to the island's unique ecological and geological conditions.

2.6 Water and Sewer - Background

As Christmas Island is part of the Indian Oceans Territories, the Australian Government is responsible for the provision water and sewer services. The Water Corporation of Western Australia manage and maintain these services on behalf of the Australian Government.

The Water Corporation also undertake the water and sewer scheme planning for Christmas Island.

David Wills and Associates have been in consultation with Water Corporation regarding this Structure Plan.

On 6 September 2024, a meeting was held to seek guidance on design requirements with Jordan Hodge, Andrew Scott, Brett Coombes, Daniel Lawrence and Luke Doherty of the Water Corporation, Herve Calmy of Calmy Planning and Design, and Athena Rowcliffe of David Wills and Associates. The proposed Structure Plan layouts were presented. The need for a Conveyance Infrastructure Report and the existing water and sewer infrastructure was discussed, and the Water Corporation advised that they would obtain a cost for the Conveyance Infrastructure Report from GHD, which would be provided to the Department of Infrastructure, Transport, Regional Development, Communications and the Arts for review.

David Wills and Associates have also been in contact with Danielle Scott of the Water Corporation to discuss the proposed Structure Plans and the production of a Conveyance Infrastructure Report by the Water Corporation, which may be needed prior to undertaking the design of the water and sewer services for the developments.

The Department of Infrastructure, Transport, Regional Development, Communications and the Arts advised that funding has not been allocated for the required Conveyance Infrastructure Report.

Athena Rowcliffe of David Wills and Associates attended site on 11th to 16th September 2024 to verify the existing services. However, additional assistance was needed from the Water Corporation to access some infrastructure that was

located within easements. Due to staff unavailability, not all existing infrastructure could be validated.

Due to the lack of provision of a Conveyance Infrastructure Report, this report assumes that the existing water and sewer systems will be capable of serving the proposed developments at the initial development phase.

Information provided in this report is based on the available information on the Water Corporation Electronic Submissions Interface (ESInet) data. The Water Corporation have advised that the records of water and sewer provided in ESInet data may not be accurate. To confirm location and details of the services, the location of existing infrastructure will need to be confirmed prior to detailed design being undertaken.

Ground contour information is based on the contours provided in the Christmas Island Geographic Information System (GIS) dated 2011. Prior to detailed design being undertaken, the levels shall be verified with a feature survey once clearing has finished.

2.7 Sewer Reticulation

2.7.1 Existing sewer

The existing sewer in Silver City serves the residential area with a 150mm diameter PVC pipe. This 150mm diameter PVC pipe discharges to the northwest of Silver City at an average grade of approximately 1 in 6.

The existing sewer is provided in Appendix D.

2.7.2 Proposed Sewer

An existing 150mm diameter gravity sewer runs along the rear boundaries of House Numbers 55, 57 and 59 Seaview Drive, facing south onto Seaview Drive. This sewer main is the most accessible location to connect the sewer for the proposed lots within the ultimate development. There is a 9.5m long 150mm diameter gravity sewer main extending upstream of Access Chamber SC0004, located at the rear boundary of House Number 59 Seaview Drive. The upstream

end of this sewer main is the most suitable connection point for the proposed sewer.

Due to the steep topography of the site, the sewer from the ultimate development will need to be pumped along the proposed extension of Sunset Place.

Two pump stations will be required to serve the proposed lots. Pump Station 1 will be located at proposed Lot 9 (the most northern lot), and will capture sewerage from proposed Lots 9, 10 and 11. From there, the sewerage will be pumped with a 63mm diameter MDPE sewer pressure main up to the intersection of Sunset Place and the road running along the northern boundary of the Mixed Use lot site. At this intersection, Pump Station 2 will be installed, which will capture sewerage from Pump Station 1, as well as the proposed lots to the east. Pump Station 2 will pump the sewerage via a 63mm diameter MDPE pressure main approximately 100m south along Sunset Place to a discharge access chamber in Sunset Place, and then be fed by gravity sewer into the 150mm diameter sewer main at the rear boundary of 59 Seaview Drive.

The peak design flows for the pump stations are as follows:

- Pump Station 1 (serving Lots 9, 10 and 11 only) = 0.99 L/s
- Pump Station 2 (serving whole development) = 3.18 L/s

The sewer main serving the residential lots to the north of the proposed Mixed Use lot will be located within the rear boundary of the lots, as these lots fall towards the rear boundaries due to the steep topography of the site.

The proposed Structure Plan area will have a Peak Design Flow of 3.18 L/s. A summary of the detailed calculations is provided in Appendix D.

The proposed sewer main layout is provided in Appendix D.

2.8 Water Reticulation

2.8.1 Existing Water

The existing residential lots in Sunset Place are served with a 63mm diameter MDPE water main extending from a 150mm diameter PVC Class 12 main in Seaview Drive.

The houses along Seaview Drive (section running northwest to southeast) are served at the rear of the lots with a 100mm diameter Galvanised Wrought Iron (GWI) pipe.

The residential lots along Arenga Close are served with a 110mm diameter High Density Polyethylene (HDPE) water main.

The area is served with a water tank located along Hawks Road, approximately 1.2km south of the proposed development.

An overview of the existing water network is provided in Appendix E.

2.8.2 Proposed Water - Ultimate Development

The main water connection point will occur at the northern end of Sunset Place, which currently contains a 63mm diameter MDPE pipe. To meet Water Corporation design requirements, the 63mm diameter MDPE water main in Sunset Place will need to be upgraded to a 100mm diameter PVC water main. An additional connection will occur at the Arenga Close 110mm diameter HDPE water main.

Throughout the proposed development, a 100mm diameter PVC Class 12 will be installed to serve the lots.

To provide an adequate supply of water to the development, the existing water tank located along Hawks Road may need to be upgraded. The Water Corporation is to confirm the exact upgrade requirements.

Based on the demand from the lots matching the sewer flows, network modelling of the proposed water mains indicates a maximum head loss of less than 3m

throughout the system which meets Water Corporation design criteria. This is acceptable as the elevation difference over the site is greater than this and adequate pressures will be sustained at all times.

A plan of the proposed water to serve the development is provided in Appendix E.

3 CONCLUSION

This Local Infrastructure and Servicing Strategy has assessed the existing infrastructure and identified the necessary services to be provided to serve the proposed Structure Plan at Silver City, Christmas Island.

The earthworks, roads and stormwater drainage requirements have been addressed with proposed solutions that consider the unique geology of the island. Assuming that the existing infrastructure is adequate, the proposed development can be adequately serviced with water and sewer.

Prepared by:



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Associate Director

Authorised by:



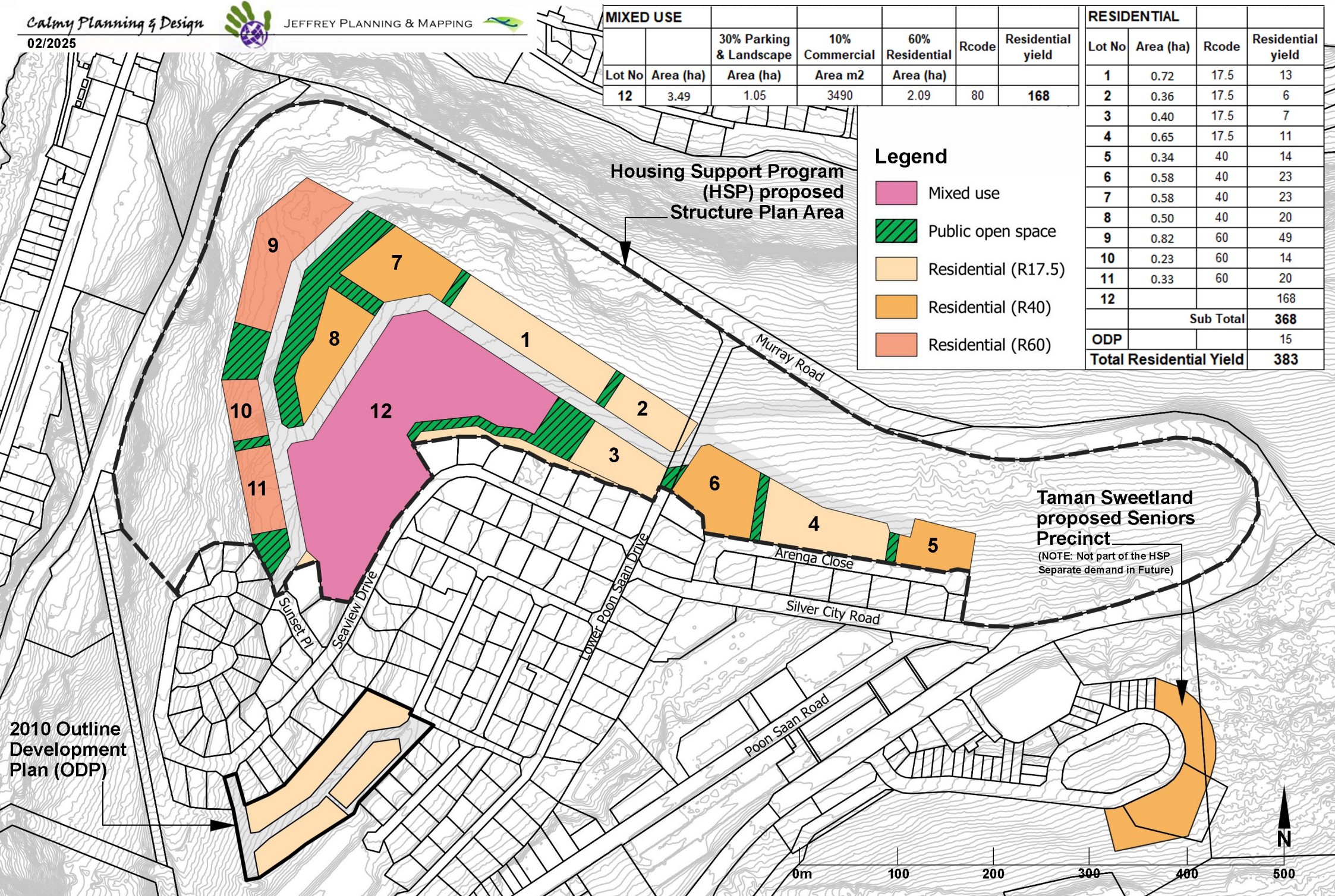
David Wills

AIT(Civil) GradDipB FIEAust CPEng EngExec NER
APEC RPEQ RBP IntPE (Aus)

Director

APPENDIX A – RESIDENTIAL YIELD ESTIMATES

HSP - S1 - SILVER CITY URBANISED AREA - NOMINAL RESIDENTIAL & COMMERCIAL YIELD ESTIMATE



APPENDIX B – MNG GEOSPATIAL REPORT



Document Information

Details

Project number	106764
Document Title	Ground Penetrating Radar Geophysical Investigation for Geological Profiling and Identification of Potential Karstic Features in Silver City, Christmas Island, Australia
Site Address	Silver City, Christmas Island, Australia
Report prepared for	David Wills and Associates

Status and Review

Revision	Prepared by	Reviewed by	Date issued
A	Brian Makone	Tavis Lavell	21/02/2025
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A	1	0	Athena Rowcliffe – David Wills and Associates
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REPORT:

GROUND PENETRATING RADAR GEOPHYSICAL INVESTIGATION FOR GEOLOGICAL PROFILING AND IDENTIFICATION OF POTENTIAL KARSTIC FEATURES IN SILVER CITY, CHRISTMAS ISLAND, AUSTRALIA.

Date: 28 February 2025

MNG Ref: 106764



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1. INTRODUCTION

David Wills and Associates (DWA) required a geophysical investigation in Silver City, Christmas Island to assist with delineation of subsurface geological strata. As part of a broader comprehensive site classification, DWA requested MNG SubSpatial (MNG) to conduct a geophysical investigation to determine the subsurface bedrock model within this area. MNG conducted a Ground Penetrating Radar (GPR) geophysical investigation to determine the limestone depth and delineation of potential karstic features to inform development planning before detailed design.

The GPR was used to obtain 2D radar-grams (cross-sections) of the subsurface to a maximum uncalibrated depth of 10m below ground level (BGL).

2. GEOPHYSICAL INVESTIGATION SITE

GPR data was acquired in the Silver City Area. Figure 1 displays the aerial imagery of the two investigation areas. The acquired geophysical transects are outlined in greater detail in *Drawing 106764-01 Site Plan* located in **Appendix A** of this report.



Figure 1: Aerial image of the Silver City geophysical investigation area.

The ground conditions are mainly flat grassland, concrete sidewalks, tarred roads and thick vegetation in places next to Arenge Close, Murray and Pak Kam Loh Roads.

3. SITE GEOLOGY

According to the Australian Government Department of Climate Change, Energy, the Environment and Water website

(<https://www.dcccew.gov.au/parks-heritage/national-parks/christmas-island-national-park/natural-environment/geology>):

Christmas Island is the peak of a basalt volcanic seamount which extruded steeply 5,000 metres from the ocean floor. Over a series of geological uplifts, coral reefs have built up over the basalt core leaving an almost continuous limestone cap. The soils of Christmas Island are derived from two sources – limestone (terra rossa soils) or basaltic extrusive rocks (krasnozem soils).

4. GEOPHYSICAL DATA ACQUISITION

4.1 INVESTIGATION LOGISTICS

The geophysical data acquisition was conducted between the 15th to the 18th and the 20th of January 2025. MNG supplied one Geophysicist to undertake the geophysical investigation. GPR data was acquired along a total of two hundred and forty-two (242) transects across Silver City and Phosphate Hill.

4.2 GROUND PENETRATING RADAR

GPR data was acquired using a GSSI SIR-4000 system with a 350MHz Hyper Stacking (HS) antennae. The GSSI 350HS is state-of-the-art digital antenna, it's HyperStacking© technology greatly improves the depth and data resolution performance over traditional RTS methods. Providing a greater degree of subsurface resolution at both shallow and increased depths. Acquisition parameters are provided in Table 1.

GPR data acquisition was achieved by pushing the antenna along transects (see Figure 2) at a slow and steady pace along the required profiles. Distances along the profiles were logged by a calibrated distance measuring device (odometer wheel) attached to the equipment.

Spatial positioning of the GPR data was obtained by using a Differential Global Positioning System (GPS), linked to the CORS Network.



Figure 2: GPR data acquisition using the GSSI 350HS system on site.

Table 1 – GPR Acquisition Parameters

Acquisition Parameter	Specification
Antenna centre frequency	350MHz HyperStacking©
Scans per metre	100
Two-way travel time	200ns
Uncalibrated radar wave velocity	0.12m/ns
Maximum apparent depth	8m

4.3 LOCATING AND POSITIONING

The GPS receiver was linked to the CORS Network to provide the following accuracies:

- $\pm 100\text{mm}$ Horizontal Accuracy

Horizontal positions are given in GDA1994 MGA Zone 48.

5. GEOPHYSICAL DATA PROCESSING

The acquired geophysical datasets were processed and analysed with current industry standard software by qualified geophysicists using MNG standard processing routines.

5.1 GROUND PENETRATING RADAR

The acquired GPR data was processed using Geolix, a cloud computing GPR processing software, which provides post-processing application data analysis. The following processing routine was used:

1. Correct Max Phase – Set GPR zero time to the first crossing of the reflection wavelet.
2. Profile Flip – Horizontally flip profiles that were acquired down chainage, so all profiles are presented in the up-chainage direction.
3. Manual Gain – Apply a gain curve function in the y-direction to account for GPR signal attenuation with depth.
4. 1D Bandpass Filtering – High-cut and low-cut frequency filter to improve signal to noise ratio.
5. 2D Filtering – Background removal and running average filters to suppress horizontally coherent energy, effectively emphasising signals which vary laterally.

Following the application of the above processing flow, the GPR data was predominately observed to be of good quality, with strong signal to noise ratio and expected penetration depth for the antenna frequency used. The processed GPR data was analysed to delineate high amplitude zones which were interpreted as bedrock. Analysis of the GPR data consisted of viewing and digitising the high amplitude areas along the profiles sequentially with consideration to the:

- **Signal travel time** which, combined with the material radar-wave velocity, defines the depth of the target ¹
- **Amplitude and phase of the signal** which defines the dielectric contrast between different materials ²
- **Continuity of the signal** which shows the general dimension, condition, and shape of the target

¹ With the GPR method, the depth to a given subsurface target is obtained by measuring the two-way travel time of the radar pulse from the antenna to that target and by multiplying this time by the radar wave velocity within the overlying layers. For this investigation, a bulk radar wave velocity of 0.1m/ns was used.

² The amplitude of the radar wave reflection signal is a function of the contrast in dielectric properties of the subsurface material. Near zero amplitude reflections occur where there is no or minimal change in the dielectric properties indicative of a homogeneous material. High amplitude reflections (either positive or negative) occur where there is a significant change in dielectric properties for example within an inhomogeneous material with multiple inclusions such as open voids or at the interface between differing geological layers.

6. RESULTS

The results of the GPR geophysical investigation carried out across Christmas Island are provided in Appendices A, B and C of this report as follows:

6.1 PRESENTATION OF RESULTS

Appendix A – Geophysical Investigation Site Plan

- **106764-02 Site Plan – Silver City:** Site overview with acquired GPR coverage

Appendix B – Silver City Results

- **106764-06 Depth to Interpreted Weathered Rock(m) – Silver City:** Interpreted Depth to Weathered Rock
- **106764-07 Depth to Interpreted Competent Rock(m) – Silver City:** Interpreted Depth to Competent Rock
- **106764-08 Identified Features- Silver City:** Identified GPR Features overlaid on Interpreted Depth to Weathered Limestone

Appendix C – Ground Penetrating Radargrams Identified Feature Data Examples

7. GEOPHYSICAL GPR INTERPRETATION

7.1 Depth to Bedrock

The collected radargrams were analysed for high-amplitude reflections, which are interpreted as indicative of the depth to the limestone rock surface. However, due to the site's geology, the upper layers exhibited multiple high-amplitude reflections within the top 3 meters below ground level (BGL). This suggests a complex subsurface environment characterised by a heavily fractured limestone formation with an irregular transition between soil, weathered limestone, and more competent rock.

The discontinuous and high-energy reflections indicate varying degrees of weathering and fracturing, complicating the delineation of a singular bedrock surface. Consequently, two primary boundaries were identified and digitized: the upper boundary represents the transition from soil to weathered limestone, where partially consolidated limestone and compacted soil form an intermediate layer. The lower boundary marks the depth of more competent limestone rock, providing a clearer reference for structural interpretation.

An example of a processed radar-gram with the two digitized boundaries areas along the profile is outlined in red on Figure 3.

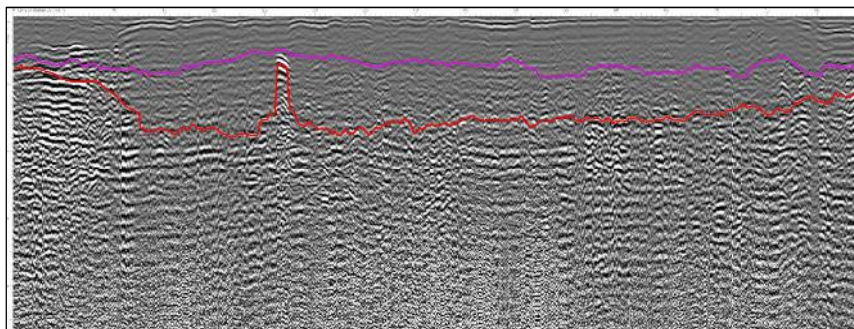


Figure 3: Processed radargram displaying the interpreted digitised weathered rock profile in purple and the interpreted high-amplitude competent bedrock profile in red.

The depth profiles for the interpreted weathered bedrock and competent bedrock across all transects were exported, including their spatial positions and depths, for gridding and visualization in Surfer 25 (Contouring, Gridding, and Surface Mapping Software).

Analysis of Drawing 106764-06, which depict the depths to interpreted weathered rock, indicates that limestone rock is generally encountered at depths of 2 meters or less. Similarly, Drawing 106764-07, shows the depths to competent limestone, suggesting that the rock transitions to a more competent state at depths of 3 meters or more. While this represents the general trend across the survey area, localised variations and exceptions were observed in certain zones.

7.2 Karstic Features

The collected radargrams were analysed for karstic features given the limestone-dominated subsurface. Karstic features are indicated by dissolution cavities, voids, sinkholes and irregular weathering patterns – all of which produce distinct features in GPR data. Due to the highly fractured/weathered nature of the limestone subsurface on Christmas Island, the identification of karstic features in the GPR data was divided into two distinct categories: karst features and heavily fractured rock. This classification was necessary to differentiate between large dissolution-related voids and areas of intense fracturing that, while structurally weak, may not necessarily exhibit true karstic development.

Karst features were identified based on characteristic high-amplitude reflections with abrupt lateral discontinuities, signal attenuation zones, and hyperbolic diffractions. These signatures suggested the presence of voids, dissolution cavities, or large solution-widened fractures.

In contrast, heavily fractured rock was distinguished by densely spaced, discontinuous reflectors that lacked the characteristic hyperbolic signatures of large cavities. Instead of abrupt signal loss, these zones exhibited multiple closely spaced, high-amplitude reflections that indicated a network of interconnected fractures rather than open voids. Signal scattering and minor attenuation were common in these areas, suggesting a high degree of heterogeneity due to fracturing rather than dissolution. Some sections exhibited a transition between fractured rock and true karst features,

where fractures appeared to evolve into wider solution-widened voids. Figure 4 shows an example radargram with several karstic features feature and a heavily fractured rock matrix example.

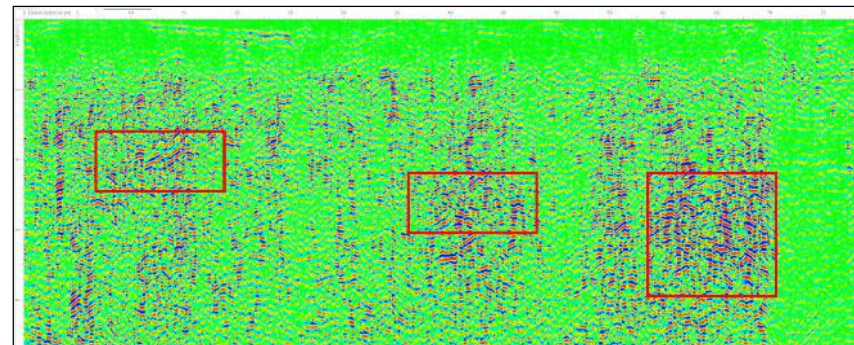


Figure 4: Processed radar-gram showing several high amplitude responses typical of karstic features in red, surrounded by a fractured limestone setting.

A total of 20 were detected in Silver City. Additional radargram examples illustrating these features are provided in Appendix C. The spatial coordinates of the identified karst features are documented in Table 2 for reference.

Table 2 – Silver City - Identified Features. All features are listed in a North-South, East-West orientation. Coordinates are given in MGA 2020

Feature Area	Feature No.	Easting*	Northing*	Depth (m)
Silver City	1	574417.8	8848219	2.7-10m
Silver City	2	574587.5	8848125	7.8-10m
Silver City	3	574612.1	8848110	4.6-5.8m
Silver City	4	574692.5	8848077	1.3-3.1m
Silver City	5	574709.3	8848072	1.3-3.6m
Silver City	6	574188.6	8848020	0.7-3.2m
Silver City	7	574422.5	8847993	5.2-10.8m
Silver City	8	574402.3	8847943	4.2-11m
Silver City	9	574490.2	8847947	5.5-9.7m
Silver City	10	574521.8	8847948	3.1-10.1m
Silver City	11	574566.7	8847938	2.7-10m
Silver City	12	574600.1	8847936	4.9-10m
Silver City	13	574669.6	8847923	6.2-10m
Silver City	14	574135	8847953	1.7-4m
Silver City	15	574108.6	8847902	3.5-5.2m

Silver City	16	574186.8	8847817	7.6-11m
Silver City	17	574034.7	8847785	1.4-3.8m
Silver City	18	574168.4	8847748	5.1-9.6m
Silver City	19	573968.8	8847726	2.2-4m
Silver City	20	573940.6	8847729	1.6-4.5m

8. INVESTIGATION SUMMARY

A Ground Penetrating Radar (GPR) geophysical investigation has been carried out by MNG SubSpatial (MNG), across Silver City, Christmas Island. The Ground Penetrating Radar (GPR) method was used for this investigation to obtain 2D radar-grams (cross-sections) of the subsurface to a maximum uncalibrated depth of 10m below ground level (BGL).

The site is mostly comprised of fractured limestone which is mainly found less than two (2) meters in terms of depth. The rippability or ease of excavation of the bedrock cannot be determined from the GPR signatures. Further trenching investigation is required to determine the ease of excavation across the site. Several Karstic features have been identified across the investigation area, which have been detailed in the appendices.

The methods used during the investigation are geophysical and as such the results are based on indirect measurements and the processing and interpretation of electrical signals. The findings in this report represent the professional opinions of the authors, based on experience gained during previous similar surveys and with correlation to known and assumed subsurface ground conditions at the site.

We trust that this report and the attached drawings provide you with the information required. If you require clarification on any points arising from this geophysical investigation, please do not hesitate to contact the undersigned on (03) 7002 2207.

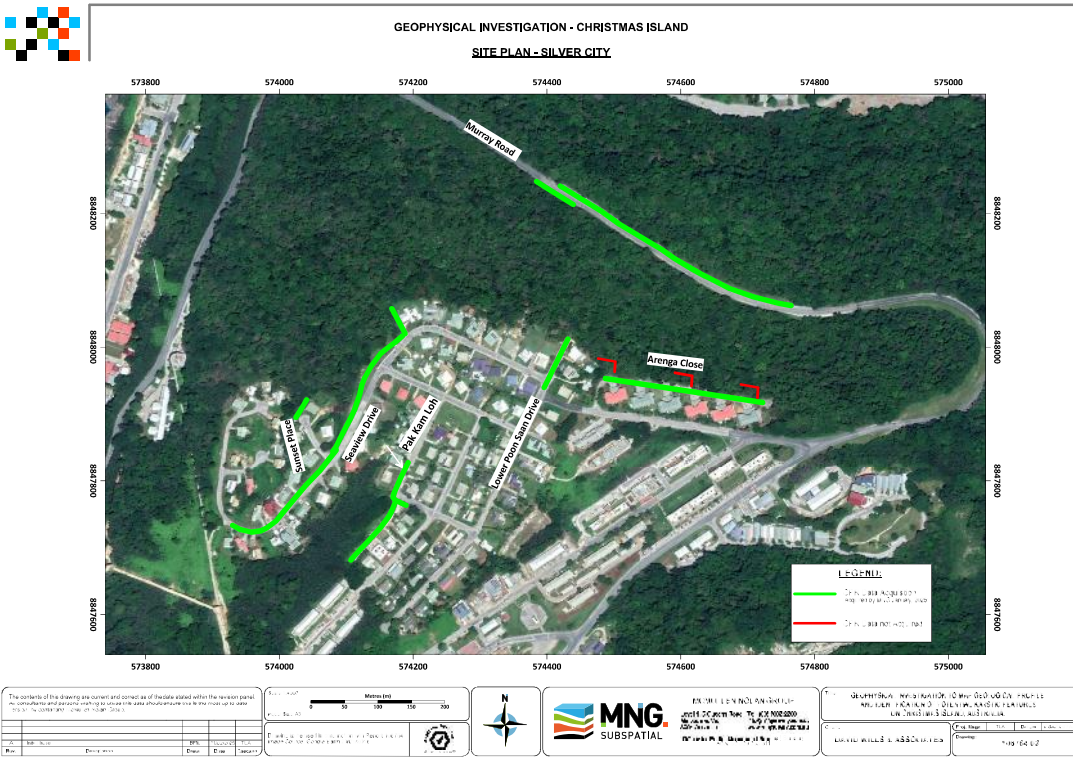
For and on behalf of
MNG SubSpatial



BRIAN MAKONE

Geophysicist

APPENDIX A – SITE PLANS



APPENDIX B – SILVER CITY RESULTS



GEOPHYSICAL INVESTIGATION - CHRISTMAS ISLAND
SILVER CITY - DEPTH TO INTERPRETED WEATHERED ROCK



The contents of this drawing are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should ensure this is the most up to date version, by contacting McMullen Nolan Group.

A	Initial Issue	BFM	21/02/2025	TLA
Rev.	Description	Drawn	Date	Checked

Scale: 1:2800

Metres (m)

0 50 100 150

Paper Size: A3

Drawing to be used in conjunction with Report 106764.
Image Source: Google Earth 28/01/2016

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ABN: 90 009 363 311

Title: **GEOPHYSICAL INVESTIGATION TO MAP GEOLOGICAL PROFILE AND IDENTIFICATION OF POTENTIAL KARSTIC FEATURES ON CHRISTMAS ISLAND, AUSTRALIA.**

Client: **DAVID WILLS & ASSOCIATES**

Proj. Mngr. TLA Datum MGA2020 / AHD

Drawing: **106764-06**



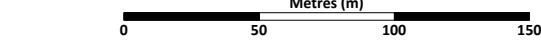
GEOPHYSICAL INVESTIGATION - CHRISTMAS ISLAND
SILVER CITY - DEPTH TO INTERPRETED COMPETENT ROCK



The contents of this drawing are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should ensure this is the most up to date version, by contacting McMullen Nolan Group.

Rev.	Description	Drawn	Date	Checked
A	Initial Issue	BFM	21/02/2025	TLA

Scale: 1:2800



Paper Size: A3

Drawing to be used in conjunction with Report 106764.
Image Source: Google Earth 28/01/2016



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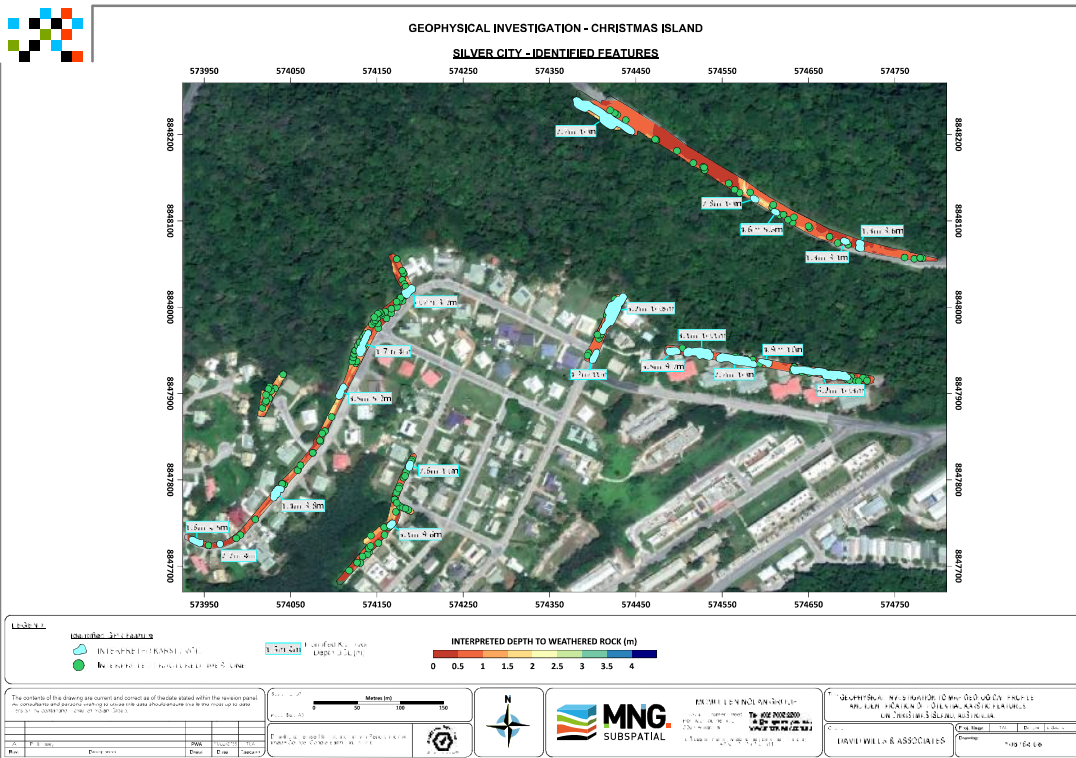
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Title: **GEOPHYSICAL INVESTIGATION TO MAP GEOLOGICAL PROFILE
AND IDENTIFICATION OF POTENTIAL KARSTIC FEATURES
ON CHRISTMAS ISLAND, AUSTRALIA.**

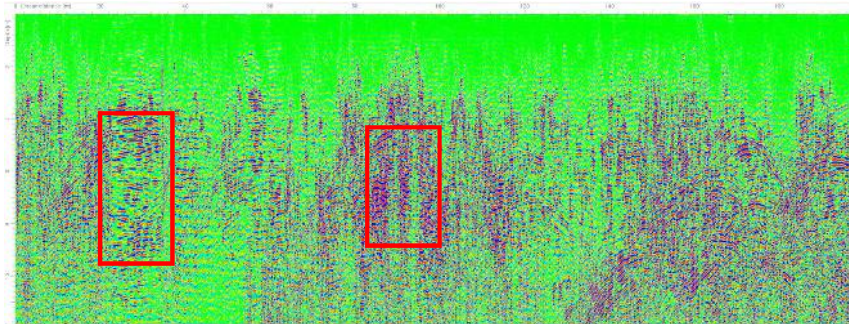
Client: **DAVID WILLS & ASSOCIATES**

Proj. Mngr.	TLA	Datum	MGA2020 / AHD
Drawing:			106764-07

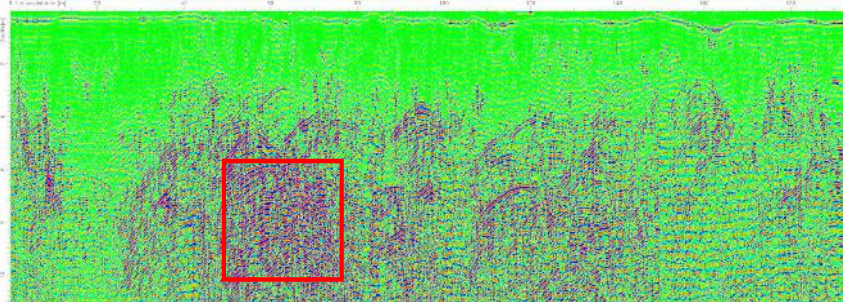


APPENDIX C – GROUND PENETRATING RADARGRAMS IDENTIFIED FEATURE DATA EXAMPLES

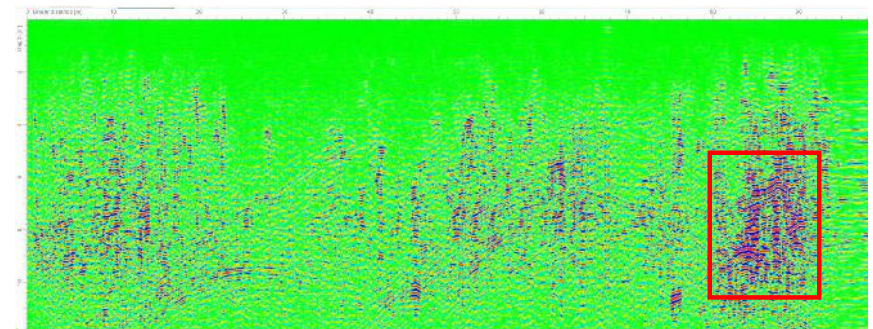
Murray Road Radargram: Numerous high amplitude responses indicate a heavily fractured/weathered subsurface with several karstic formations are dispersed throughout



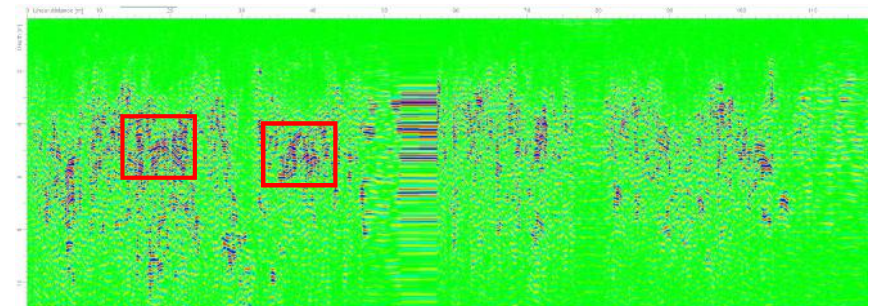
Southern end of track between Oval and Irvine Hill Road Radargram: Many high amplitude responses, with a distinct karstic feature outlined in red.



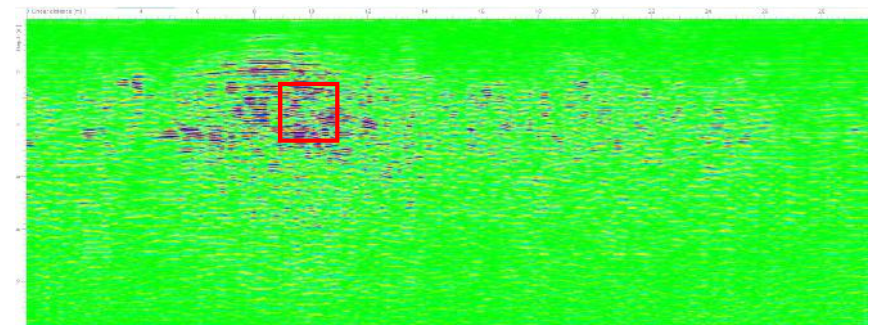
Northern end of track between Oval and Irvine Hill Road Radargram: A slightly weathered profile with a distinct karst feature outlined in red



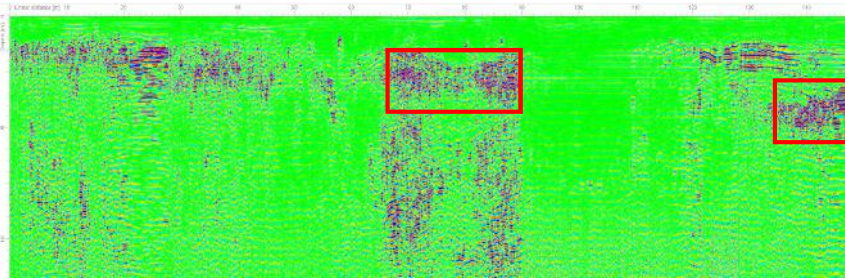
Oval Radargram: Several areas of increased fracturing with possible karst features outlined in red



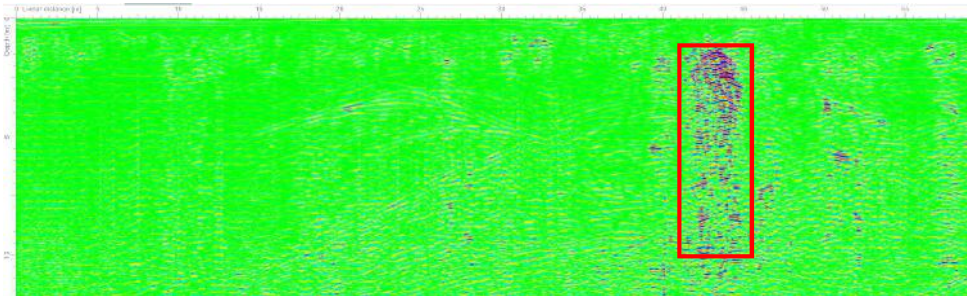
North of Oval Radargram: Discontinuous high amplitude responses indicating the presence of a karstic features with fractured surrounding rock.



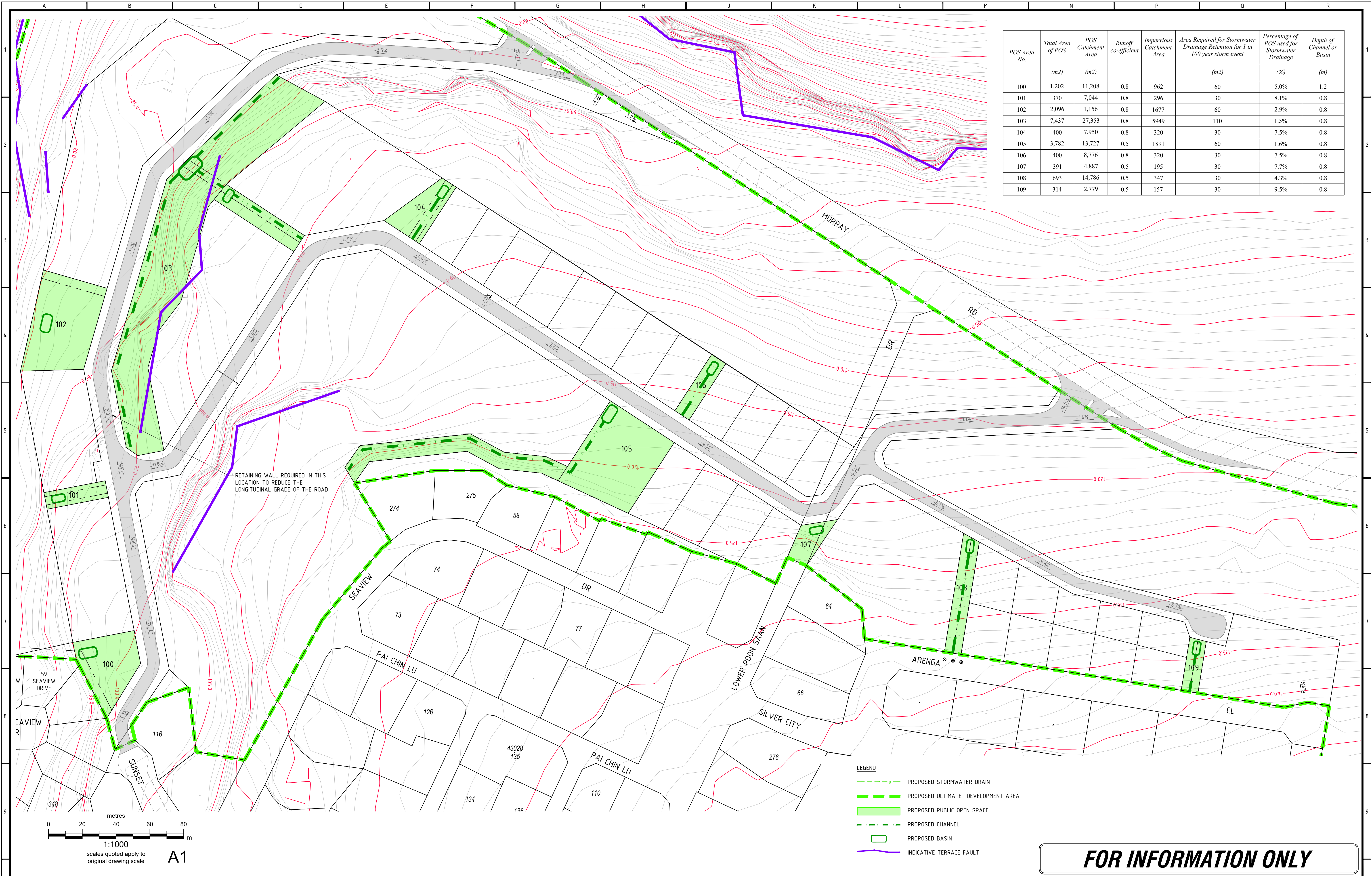
Silver City (West) Radargram: Fractured rock dominant in the top two (2) metres. High amplitude features at greater depths, indicating the possible presence of karstic features.



Silver City (East) Radargram: minimal fracturing and weathering, highlighting a karst feature, possibly a void due to signal loss at depths



APPENDIX C – ROADS AND STORMWATER DRAINAGE LAYOUT



POS Area No.	Total Area of POS	POS Catchment Area	Runoff co-efficient	Impervious Catchment Area	Area Required for Stormwater Drainage Retention for 1 in 100 year storm event	Percentage of POS used for Stormwater Drainage	Depth of Channel or Basin
	(m2)	(m2)			(m2)	(%)	(m)
100	1,202	11,208	0.8	962	60	5.0%	1.2
101	370	7,044	0.8	296	30	8.1%	0.8
102	2,096	1,156	0.8	1677	60	2.9%	0.8
103	7,437	27,353	0.8	5949	110	1.5%	0.8
104	400	7,950	0.8	320	30	7.5%	0.8
105	3,782	13,727	0.5	1891	60	1.6%	0.8
106	400	8,776	0.8	320	30	7.5%	0.8
107	391	4,887	0.5	195	30	7.7%	0.8
108	693	14,786	0.5	347	30	4.3%	0.8
109	314	2,779	0.5	157	30	9.5%	0.8

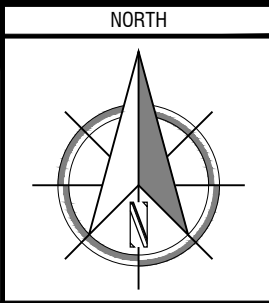
- LEGEND
- PROPOSED STORMWATER DRAIN
 - PROPOSED ULTIMATE DEVELOPMENT AREA
 - PROPOSED PUBLIC OPEN SPACE
 - PROPOSED CHANNEL
 - PROPOSED BASIN
 - INDICATIVE TERRACE FAULT

FOR INFORMATION ONLY

REV	DATE	ISSUE / REVISION DESCRIPTION	DRN	CH	DES	ENG	AUTH
A	16/04/2025	ISSUED FOR INFORMATION	DA	AR	AR	DW	DW
B	12/05/2025	ISSUED FOR INFORMATION	DA	AR	AR	DW	DW

DRAWING NUMBER	DRAWING TITLE / DESCRIPTION

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CIVIL DESIGN
SILVER CITY - CHRISTMAS ISLAND
ULTIMATE DEVELOPMENT - ROADS AND
STORMWATER DRAINAGE LAYOUT

AUTHORISED BY:
A. Rowcliffe
Athena Rowcliffe BE MIEAust CPeng NER
CLIENT REF: --- SCALE: 1:1000 @A1

DRAWING No:
24077-C-221

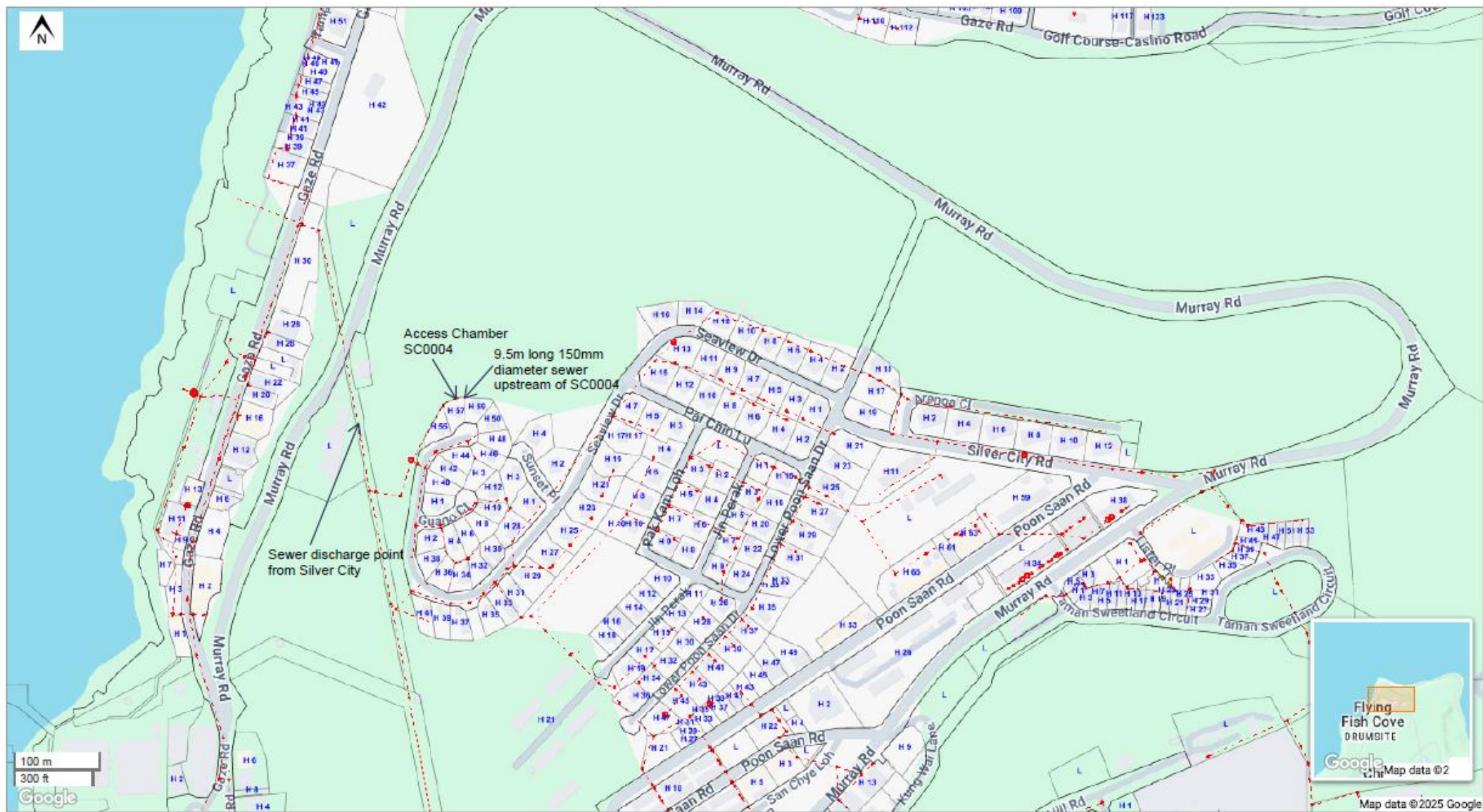
REV
B

SHEET SIZE: A1

APPENDIX D – SEWER

- Existing sewer infrastructure
- Ultimate Development Sewer Layout
- Calculations

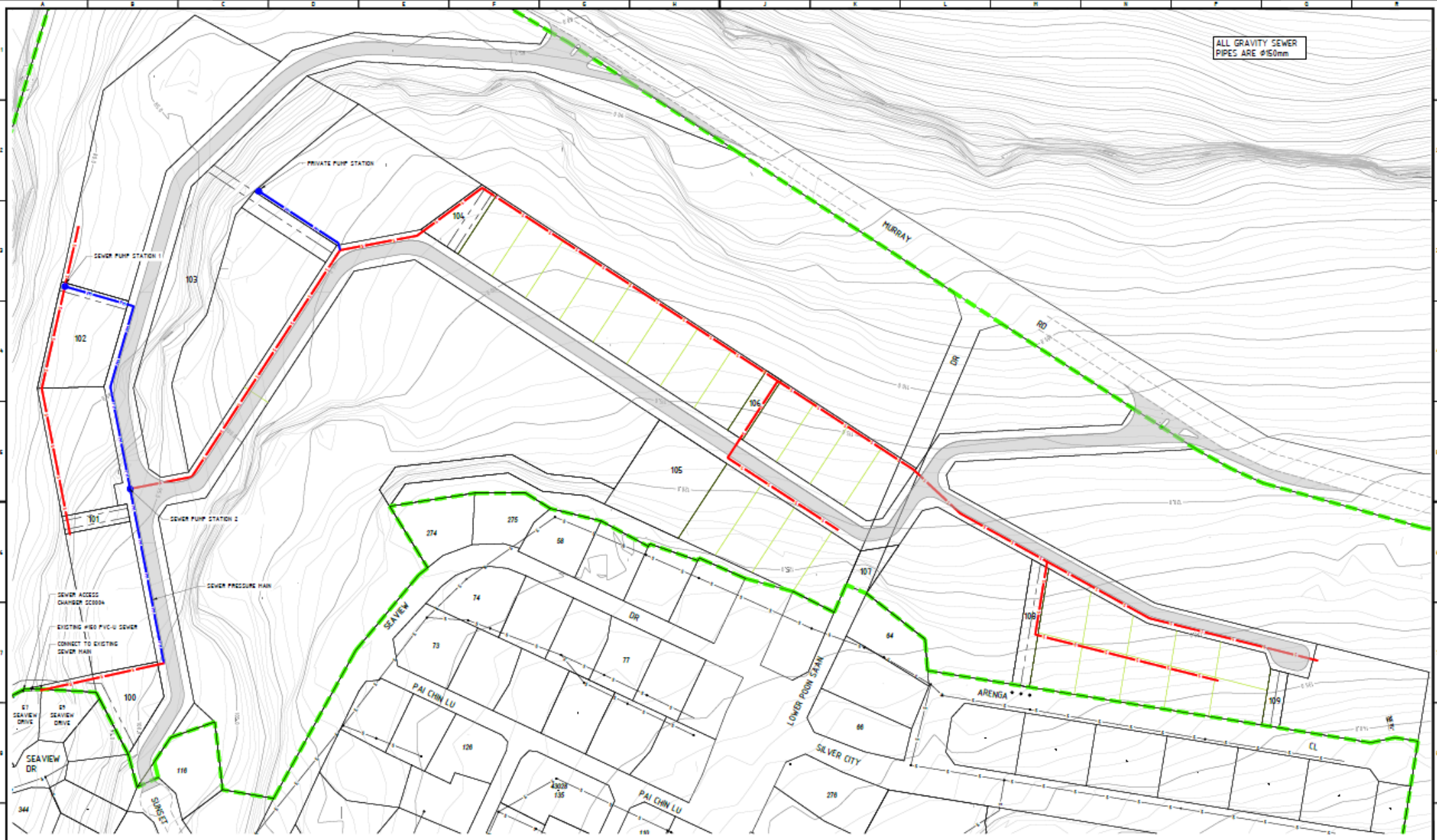
SILVER CITY EXISTING SEWER



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ALL GRAVITY SEWER
PIPES ARE Ø150mm



1:1000
scales quoted apply to
original drawing scale

A1

- LEGEND**
- PROPOSED GRAVITY SEWER
 - PROPOSED PRESSURE MAIN
 - EXISTING GRAVITY SEWER
 - EXISTING PRESSURE MAIN
 - PROPOSED ULTIMATE DEVELOPMENT AREA

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REV	DATE	BY	REVISION DESCRIPTION	CHKD	DATE	BY	CHKD
A	15/10/2020	ISSUED FOR INFORMATION		SA	16/10/2020	SA	SA
B	16/10/2020	ISSUED FOR INFORMATION		SA	16/10/2020	SA	SA
C	15/10/2020	ISSUED FOR INFORMATION		SA	16/10/2020	SA	SA

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CIVIL DESIGN
SILVER CITY - CHRISTMAS ISLAND

ULTIMATE DEVELOPMENT - SEWER LAYOUT

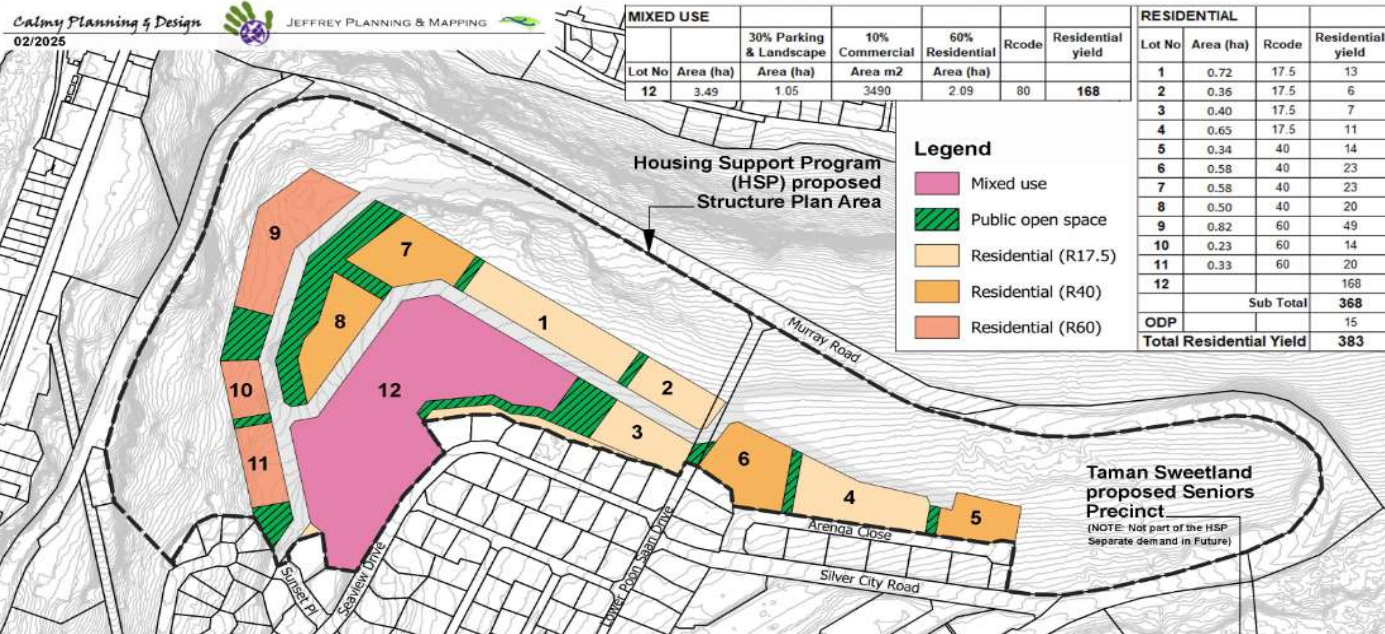
24077-C-201

C

Silver City Sewer Design Flow Calculations

Lot No	Area (ha)	Residential Planning Code	No. dwellings	No. persons per dwelling	Pop. Density Persons/Net Ha	L/pp/day	G.S.D.F L/s/Net Ha	Total No. ppl	Flow L/day	Daily Flow L/s	Design Flow L/s
1	0.72	17.5	13	3.5	70	230	0.28	45.5	10465	0.12	0.18
2	0.36	17.5	6	3.5	70	230	0.28	21	4830	0.06	0.08
3	0.4	17.5	7	3.5	70	230	0.28	24.5	5635	0.07	0.10
4	0.65	17.5	11	3	70	230	0.28	33	7590	0.09	0.13
5	0.34	40	14	3	120	230	0.479	42	9660	0.11	0.17
6	0.58	40	23	3	120	230	0.479	69	15870	0.18	0.28
7	0.58	40	23	3	120	230	0.479	69	15870	0.18	0.28
8	0.5	40	20	3	120	230	0.479	60	13800	0.16	0.24
9	0.82	60	49	3	180	230	0.719	147	33810	0.39	0.59
10	0.23	60	14	3	180	230	0.719	42	9660	0.11	0.17
11	0.33	60	20	3	180	230	0.719	60	13800	0.16	0.24
12	3.49	80		2.5	200	230		168	42141.75	0.49	0.73
Total										2.12	3.18

HSP - S1 - SILVER CITY URBANISED AREA - NOMINAL RESIDENTIAL & COMMERCIAL YIELD ESTIMATE



Pump Station 1 (Lot 9, 10 and 11)

9	0.82	60	49	3	180	230	0.719	147	33810	0.39	0.59
10	0.23	60	14	3	180	230	0.719	42	9660	0.11	0.17
11	0.33	60	20	3	180	230	0.719	60	13800	0.16	0.24
Total										0.66	0.99

Pump Station 2 will serve all proposed lots

Total	2.12	3.18
-------	------	------

TABLE 4.2
WASTEWATER DESIGN FLOWS FROM RESIDENTIAL AREAS NORTH OF LATITUDE 26° SOUTH

RESIDENTIAL PLANNING CODE	NUMBER OF PERSONS PER DWELLING	POP. DENSITY PERSONS/NET ha	DRY GROUND		WET GROUND	
			FLOW L/PERSON/DAY	*G.S.D.F. L/s/NET ha	FLOW L/PERSON/DAY	*G.S.D.F. L/s/NET ha
R15 AND LESS	3.5	52.5	230	0.210	280	0.255
R20	3.5	70	230	0.280	270	0.328
R25	3.5	87.5	230	0.349	260	0.395
R30	3.5	105	230	0.419	255	0.465
R40	3.0	120	230	0.479	250	0.521
R50	3.0	150	230	0.599	250	0.651
R60	3.0	180	230	0.719	245	0.766
R80	2.5	200	230	0.799	245	0.851
R100	2.2	220	230	0.879	240	0.917

NORTH OF LATITUDE 26° SOUTH

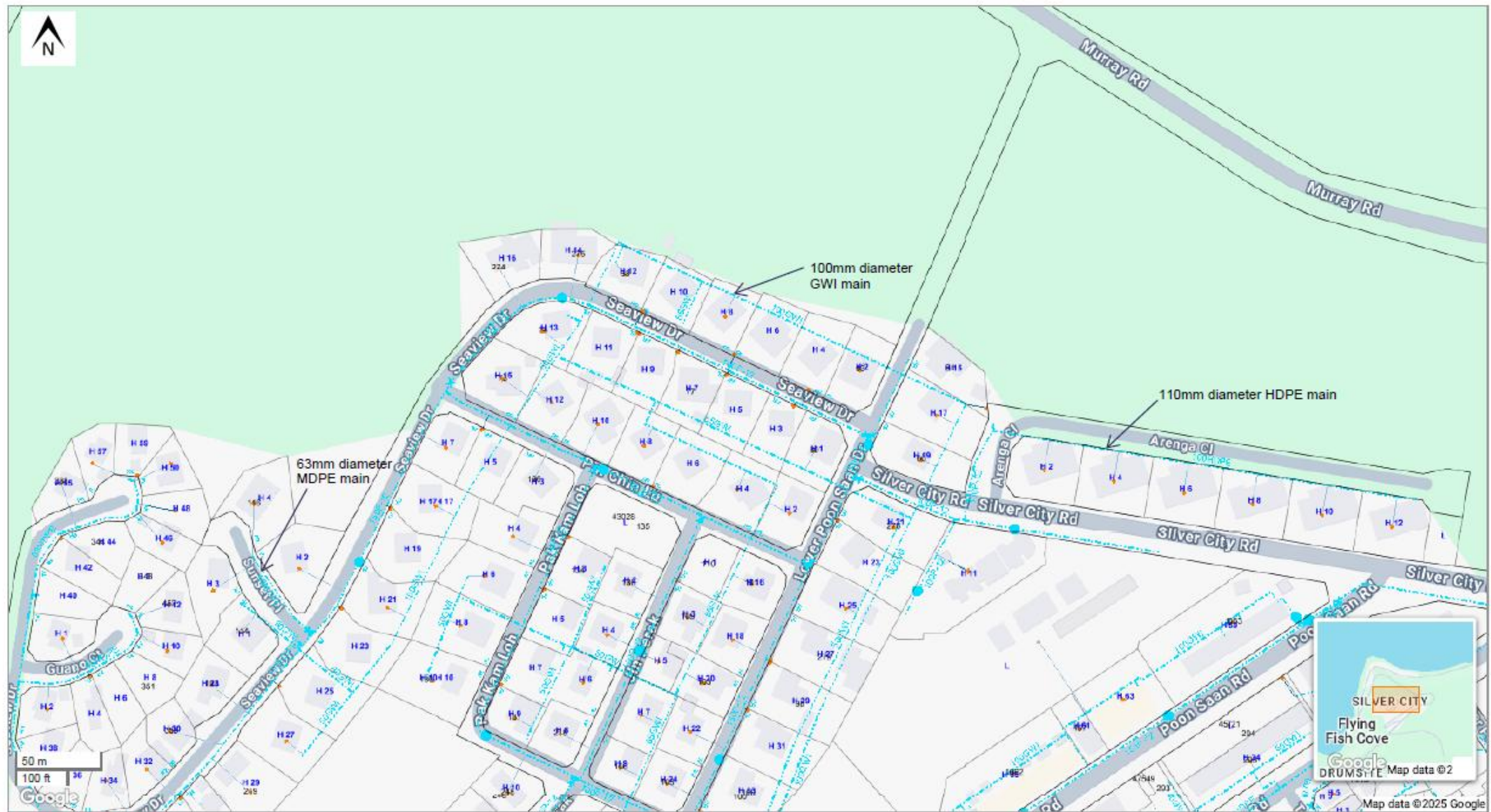
DEVELOPMENT	FLOW LITRES/NET ha/DAY	*G.S.D.F. L/S/net HA	Flow LITRES/net HA/day	*G.S.D.F. L/s/NET ha
DRY GROUND		WET GROUND		
Suburban Commercial Areas, Schools, Hospitals and Public Purpose land	12,075	0.210	14,700	0.255
Hotels and Motels	27,600	0.479	30,000	0.521
Industrial Areas	14,976	0.260	16,992	0.295

*Sewer Design Flow

APPENDIX E – WATER

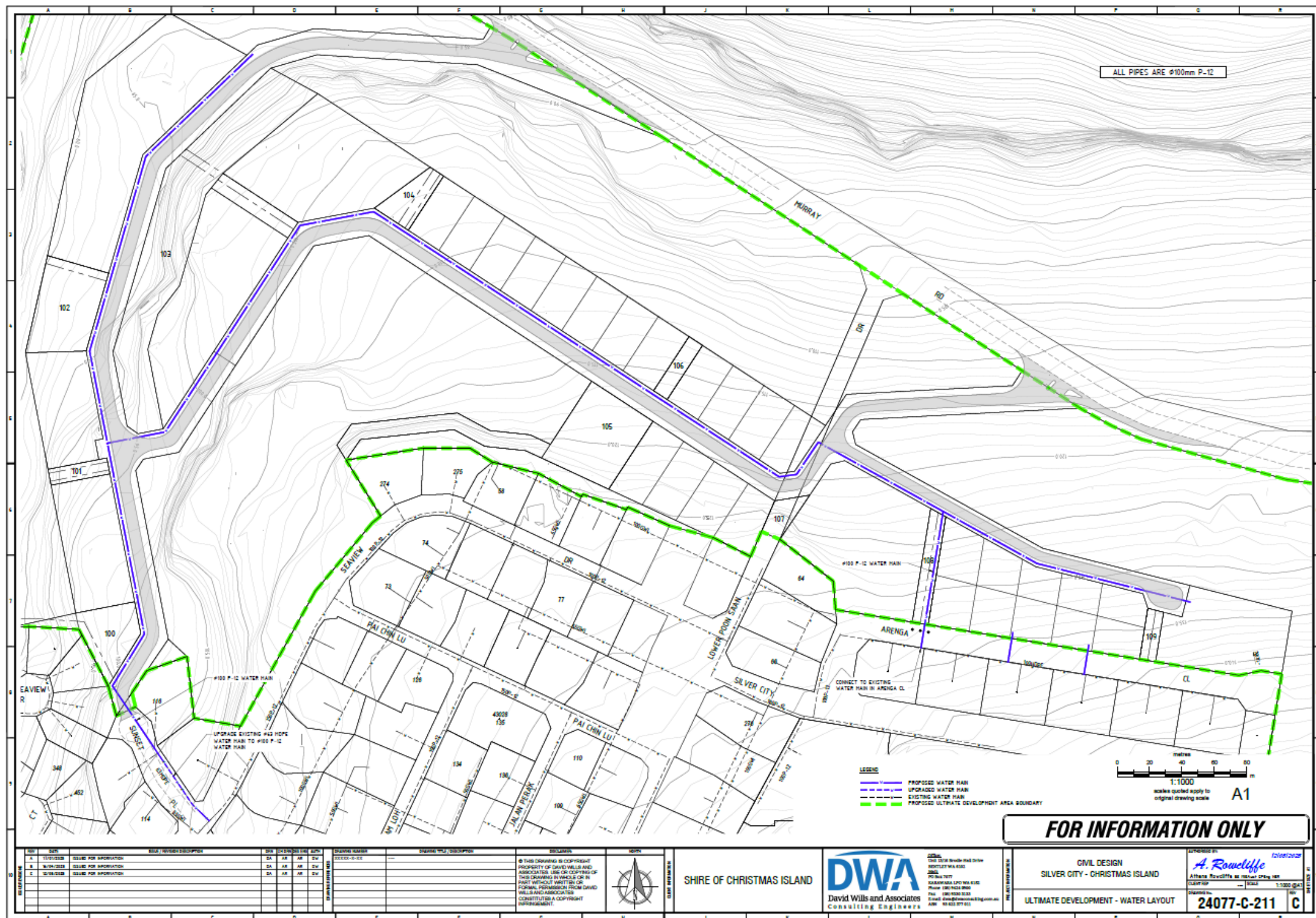
- Existing water infrastructure
- Ultimate Development Water Layout

SILVER CITY EXISTING WATER

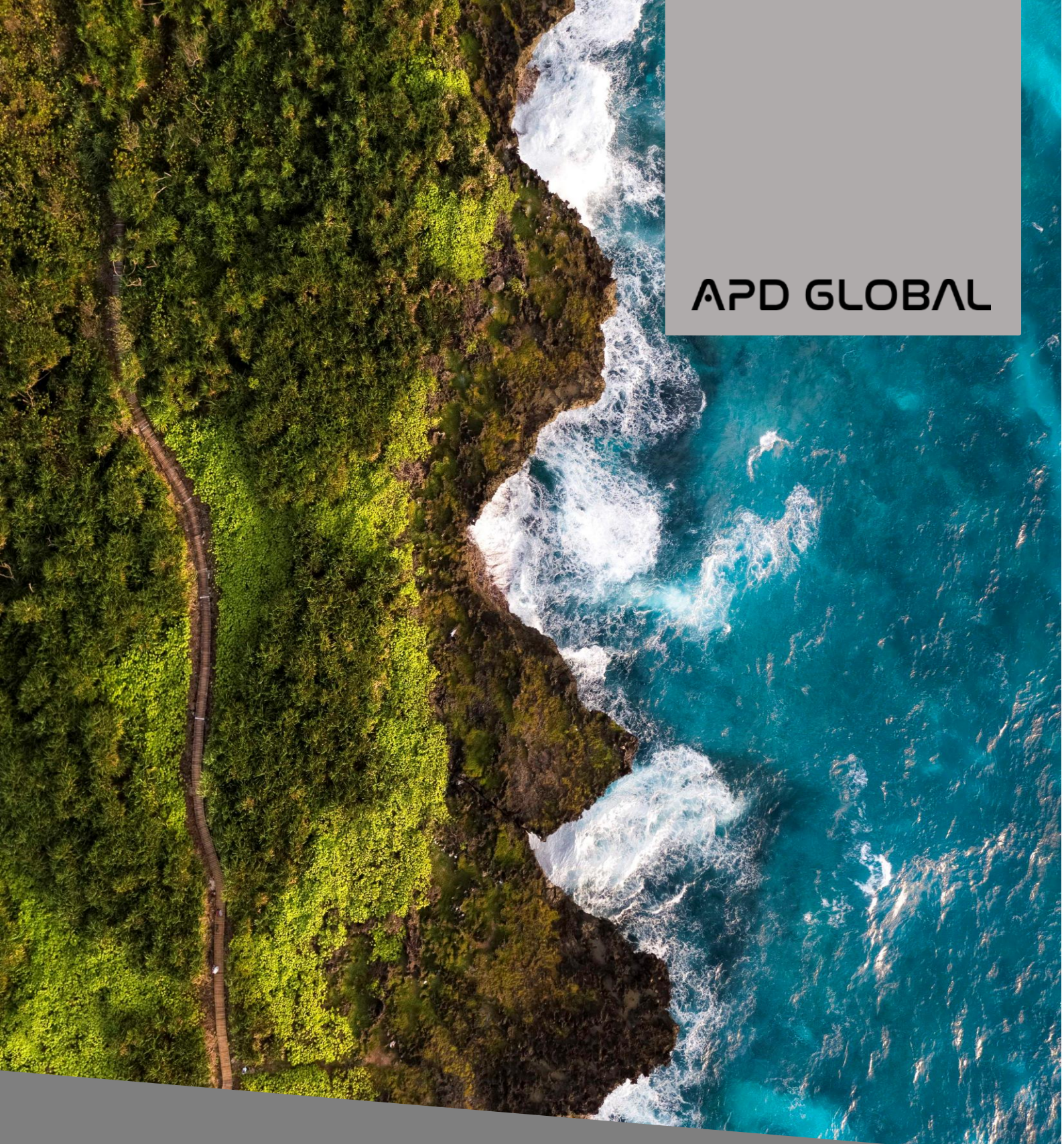


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APPENDIX 4 – APD Power and Renewable Project Report



APD GLOBAL

CHRISTMAS ISLAND - POWER AND RENEWABLE PROJECT (SILVER CITY)

📞 1300 273 797

🌐 APDeng.com.au

REVISION A
Date: 27/05/2025
Client Ref#:
APD Ref#: W_APD06856

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ABBREVIATIONS AND DEFINITIONS

ABBREVIATION	DESCRIPTION
APD	Alliance Power and Data Pty Ltd T/A APD Global
DWA	David Wills and Associates
IOTPS	Indian Ocean Territories Power Services
TX	Transformer
RMU	Ring Main Unit
SUB	Substation

Table 1 - ABBREVIATIONS

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1. INTRODUCTION

APD Global has been engaged by DWA to prepare a concept design for the Electrical Infrastructure for two proposed structure plans located at Phosphate Hill and Silver City in Christmas Island. This report has been prepared based on the information made available to APD by DWA.

APD have been in consultation with IOPTS regarding these Structure Plans. On 11 September 2024, a meeting was held to seek guidance on design requirements with Brett Clifford of IOPTS, Arul Varma of APD, Athena Rowcliffe of DWA and Herve Calmy Planning and Design. The proposed Structure plan layouts were presented. The need for modelling of the power external to the proposed developments by IOPTS was discussed.

The Department of Infrastructure, transport, Regional Development, Communication and the Arts have advised that funding has not been allocated for the required modelling of the power outside of the proposed Structure Plan Areas.

The figures below show the concept of the proposed structure plan layouts for Phosphate Hill and Silver City. The area shaded white indicate proposed Stage 1 of the developments.



Figure 1 – Phosphate Hill Concept Structure Plan Layout



Figure 2 - Silver City Concept Structure Plan Layout

2. EXISTING ELECTRICAL INFRASTRUCTURE

2.1. EXISTING ASSETS

Indian Ocean Territories Power Services (IOTPS) is the local power authority for Christmas Island and provides the main utility power infrastructure across the Island.

The Power Station and 11kV distribution network provides power to a number of substations and RMUs.

These are the existing assets in Christmas Island

SITE	DESCRIPTION
Sub 503	George Fam Substation 503
RMU 503	George Fam Ring Main Unit 503
TX 503	George Fam transformer 503
RMU 113	Pakkam Drive Ring Main Unit 113
TX 113	Pakkam Drive Transformer 113
TX 112	Silver City Drive Transformer 112

SITE	DESCRIPTION
RMU 112	Silver City Drive Ring Main Unit 112
RMU 208	Phosphate Hill Road Ring Main Unit 208
TX 209	Phosphate Hill Road Transformer 209
TX 208	Phosphate Hill Road Transformer 208
SUB 202	Phosphate Hill Road substation 202

Table 2 - EXISTING ASSETS

FEEDER	MAX LOAD
Northwest Point	2.74 MVA
Drumsite	2.64 MVA
Smith Point	2.74 MVA
Irvine Hill	2.74 MVA
Mines	2.65 MVA
Wartsilla Generator Protection	2.79 MVA

Table 3 - EXISTING FEEDERS

3. PROPOSED ELECTRICAL INFRASTRUCTURE

3.1. OVERALL REQUIRED SUPPLY

Overall estimated electrical load requirement for the proposed infrastructure is calculated based on AS3000 standard and Western Power. The proposed structure plan for Silver City is estimated to need 3.15MVA where 886kVA is residential side and 2.267MVA is commercial side.

The proposed structure plan includes the installation of new 1MVA and 2MVA substations to support power distribution for the commercial lot and a portion of the residential lots. The remaining residential lots will be supplied by the existing transformers.

3.2. ELECTRICAL SUPPLY DESIGN

The design provides the electrical supply connections for the proposed lots in Silver City which will be supplied by IOTPS. The design basis for this connection are as follows:

- Maximum Demand of Silver City not to exceed 3.2 MVA- the maximum demand was done on basis of AS 3000 (KVA/m2) for commercial lots and Western Power calculation for

residential lots. The exact maximum demand will be done once the modelling of the area is done by IOTPS.

- A portion of the new residential lots will be supplied by a new 1MVA transformer, and the remaining lots will be supplied from the existing transformer 112 and 503.
- The New Resort site will have an individual 2MVA transformer to supply the load.

3.3. TELECOMMUNICATION SERVICES

It is assumed that adequate optic fibre infrastructure is available along Seaview Place, providing a further opportunity to extend high-speed broadband connectivity to facilities in the surrounding area.

In line with the approach at Silver City, the following communications infrastructure works are proposed for Seaview Place:

- **Identification and confirmation of existing fibre routes** along Seaview Place, including location of existing communications pits and conduit pathways.
- **Installation of new P50 communications conduits**, where required, to connect any unserved facilities to the existing

fibre infrastructure.

- **Connection of new conduits to existing pits**, ensuring seamless integration with current fibre pathways.
- **Upgrade of existing pits** as necessary to meet current telecommunications standards.
- **Installation of additional communications pits** in strategic locations to support conduit alignment, fibre installation, and future maintenance access.

This infrastructure will support reliable, scalable broadband access to any key facilities located along or near Seaview Place. It also provides a secondary fibre route option that can offer redundancy or future expansion capacity, aligning with long-term digital infrastructure planning for the area.

4. RENEWABLE ENERGY

The Shire of Christmas Island has also approached APD to provide details and information for the future development of Renewable Energy on the Island, as the island has high potential and availability for renewable energy such as solar and wind energy and it is recommended that renewable energies are considered in the future development of the Structure Plans.

With the future expansion of housing developments in Silver City, residential solar energy emerges as the most viable and sustainable renewable energy strategy. The nature of these developments—primarily low-rise, single-family homes—provides ample roof surface area for the installation of solar photovoltaic panels. This infrastructure enables homeowners to generate electricity directly where it is consumed, reducing reliance on grid-supplied power and promoting energy independence. In contrast to large-scale commercial zones, which may accommodate centralized renewable installations or battery storage, the residential focus of Silver City supports a decentralized energy model.

Wind energy, while part of the broader renewable strategy, is not

suitable within Silver City due to both spatial and environmental limitations. The designated wind project is planned near Phosphate Hill, where conditions are favourable. However, the electricity generated from this site will be fed directly into the main Grid, supporting regional energy needs rather than serving local consumption at the community level. Although this will strengthen the overall grid supply, it does not contribute directly to the energy independence of the individual households in the new development.

The integration of community battery storage in Silver City also presents challenges. With a limited number of commercial properties and a dispersed residential layout, there is not enough concentrated surplus solar energy to efficiently charge a shared battery system. Community batteries typically require a consistent and high volume of excess energy, which is more common in commercial or high-density residential areas. Given these limitations, investing in individual residential solar systems offers a more effective and scalable solution, taking advantage of the large roof areas and enabling homeowners to benefit directly from the energy they produce.

5. RECOMMENDED RENEWABLE STRATEGY

5.1. RECOMMENDED SOLAR STRATEGY

To effectively facilitate the decarbonisation of the energy system in Silver City, the recommended solar strategy should focus on incentivising residents to install decentralized solar systems. This approach involves encouraging individual households to adopt rooftop solar panels, turning homes into small-scale energy producers. Given the structure of future housing developments—featuring spacious rooftops and low-density layouts—this strategy capitalizes on existing infrastructure to generate clean energy locally, reducing the need for grid-supplied electricity and cutting down on transmission losses.

Customer-led decentralised systems offer significant benefits for both households and the wider energy network. By generating electricity at the point of consumption, these systems help reduce transmission losses and ease pressure on centralised infrastructure, especially during peak demand periods. Incentives such as rebates, feed-in tariffs, and simplified connection processes can make it more attractive and affordable for homeowners to invest in solar. In areas

like Silver City—characterised by low-density housing and large roof spaces—this model is particularly well-suited, enabling wide-scale uptake and effective use of existing infrastructure.

Promoting decentralised, customer-driven solar adoption also builds energy resilience and flexibility. As more homes become producers as well as consumers of electricity, the overall system becomes more robust and adaptable to fluctuations in energy demand and supply. Over time, widespread participation can significantly lower greenhouse gas emissions and support Silver City's broader climate goals. By focusing on empowering residents through incentives and supportive policies, the city can accelerate the shift towards a low-carbon, community-powered energy future.

The benefits of customer led tightly integrated solutions are:

- Use of Customer owned land for asset installation.
- Customer owned assets to be managed by the customer.
- Market ready solutions are available and not requiring bespoke highly

complex control systems that will require highly capable expertise and ongoing support to manage and maintain.

5.1.1. RESIDENTIAL SOLAR

The network operator should adhere to a set of connection standards and requirements for residential scale solar to manage risks associated with distributed small scale solar. A set of requirements documents should be developed to instruct users and installers of the system requirements, installation and commissioning process. The requirements would include but not limited to:

- Permissible sizes and types of inverters that can be installed.
- Export limited systems with default settings for permissible export based on locality.
- Inverter standards to align with AS 4777 standards.
- Protection settings for grid stability.
- Voltage and frequency support settings aligned with specific region.
- Panel installations in accordance with cyclonic conditions.

APD Global can assist in preparation of the requirements documents and also assist in the connection process and modelling of solar connection.

6. SUMMARY

A concept design for the supply of power to the proposed structure at Silver City. This design is based on the assumption that the existing power has adequate capacity to serve the developments. Serving the proposed developments with solar energy as a potential and desirable option.

7. APPENDIX 1- HV CONCEPT PLAN

ELECTRICAL LEGEND

- DRUMSITE FEEDER (26)
- T

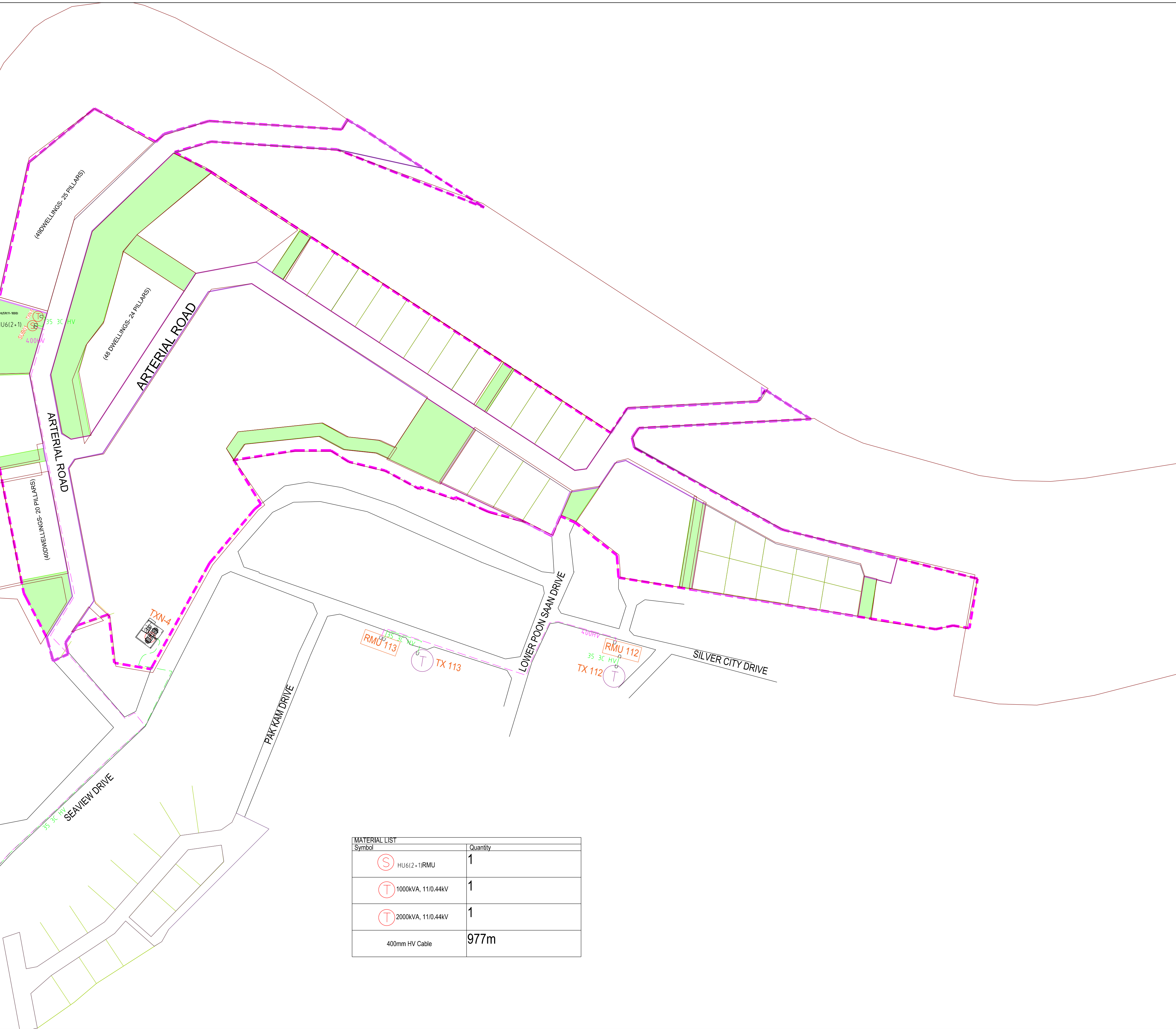
EXISTING TRANSFORMER
- EXISTING FEEDER
- NEW FEEDER
- PROPOSED STAGE 1
- PUBLIC OPEN SPACE AREAS
- T

NEW TRANSFORMER
- S

NEW SUBSTATION

HV CABLES	
CNS3 - 400mm2 (3X1c)	
CNA9 - 240mm2 (3X1c)	
CNA8 - 185mm2 (3X1c)	
CNS0 - 95mm2 (3X1c)	
CNS1 - 50mm2 (3X1c)	
CNS1 - 50mm2 (1c)	
CNA6 - 35mm2 (3X1c)	
CNA7 - 35mm2 (1c)	
EXISTING HV CABLES (SIZE AND TYPE INDICATED)	

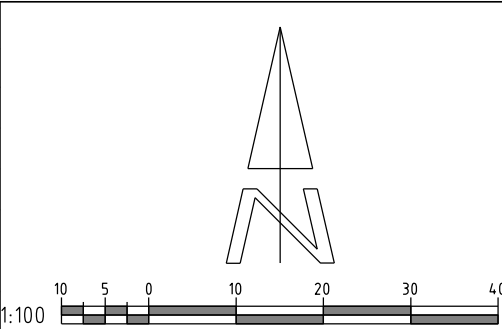
TX 503
35 3C HV
RMU 503



MATERIAL LIST	
Symbol	Quantity
S HU6(2+1)RMU	1
T 1000kVA, 11/0.44kV	1
T 2000kVA, 11/0.44kV	1
400mm HV Cable	977m

NOT APPROVED for CONSTRUCTION

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Braun
A VARMA

Size
A1

Scale
NTS

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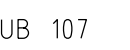
CHRISTMAS ISLAND SUBDIVISIONS CHRISTMAS ISLAND SILVER CITY ELECTRICAL HV CONCEPT SITE PLAN			
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8. APPENDIX 2 – SINGLE LINE DIAGRAM

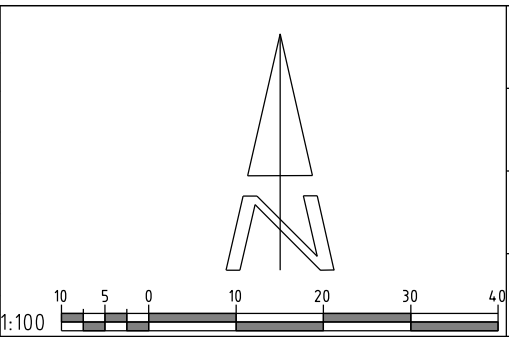
ELECTRICAL LEGEND

	DRUMSITE FEEDER (26)
	NEW FEEDER CABLE

NEW FEEDER CABLE



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Drawn	A.VARMA
Size	A1
Scale	NTS

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Sheet No.
04

9. APPENDIX 3 – LV CONCEPT PLAN

ELECTRICAL LEGEND

- DRUMSITE FEEDER (26)
- T

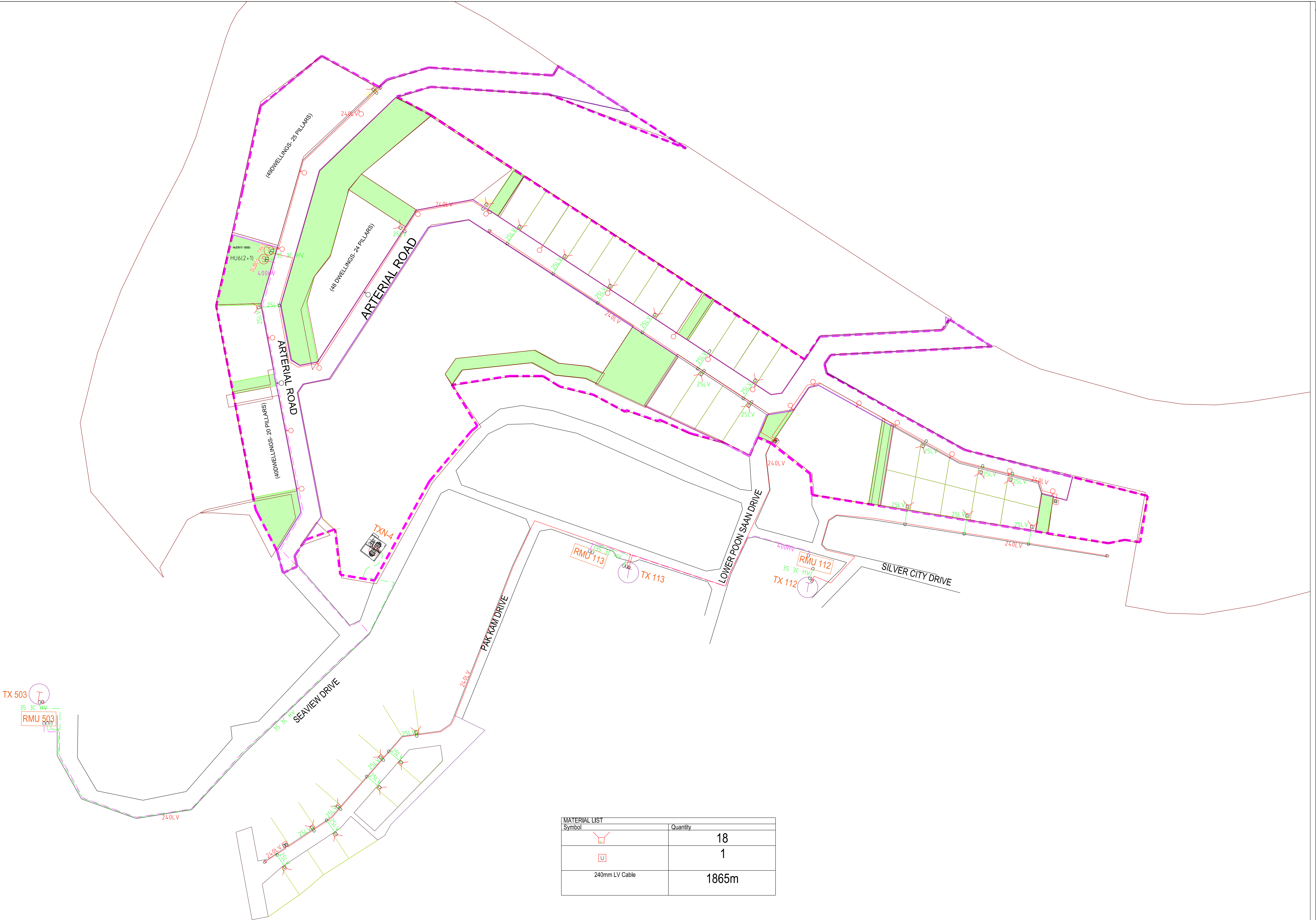
EXISTING TRANSFORMER
- EXISTING FEEDER
- NEW FEEDER
- PROPOSED STAGE 1
- PUBLIC OPEN SPACE AREAS
- T

NEW TRANSFORMER
- S

NEW SUBSTATION

HV CABLES	
CN53 - 400mm ² (3X1c)	
CN49 - 240mm ² (3X1c)	
CN48 - 185mm ² (3X1c)	
CN50 - 95mm ² (3X1c)	
CN51 - 50mm ² (3X1c)	
CN51 - 50mm ² (1c)	
CN46 - 35mm ² (3X1c)	
CN47 - 35mm ² (1c)	
EXISTING HV CABLES (SIZE AND TYPE INDICATED)	

LV-SL CABLES	
CN65 - 240mm ² (1x3c)	
CN44 - 185mm ² (1x3c)	
CN43 - 120mm ² (1x3c)	
CN42 - 25mm ² (1x3c)	
CN41 - 16mm ² SL (1c)	
40 C PILOT	
EXISTING LV CABLES (SIZE AND TYPE INDICATED)	



MATERIAL LIST	
Symbol	Quantity
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	1
240mm LV Cable	1865m

NOT APPROVED for CONSTRUCTION

REVISION DETAILS						REFERENCE DRAWINGS	
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Design
A.VARMA
Braun
A.VARMA
Size
A1
Scale
NTS

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CHRISTMAS ISLAND SUBDIVISIONS
CHRISTMAS ISLAND
SILVER CITY
ELECTRICAL LV CONCEPT SITE PLAN

Drawing Number
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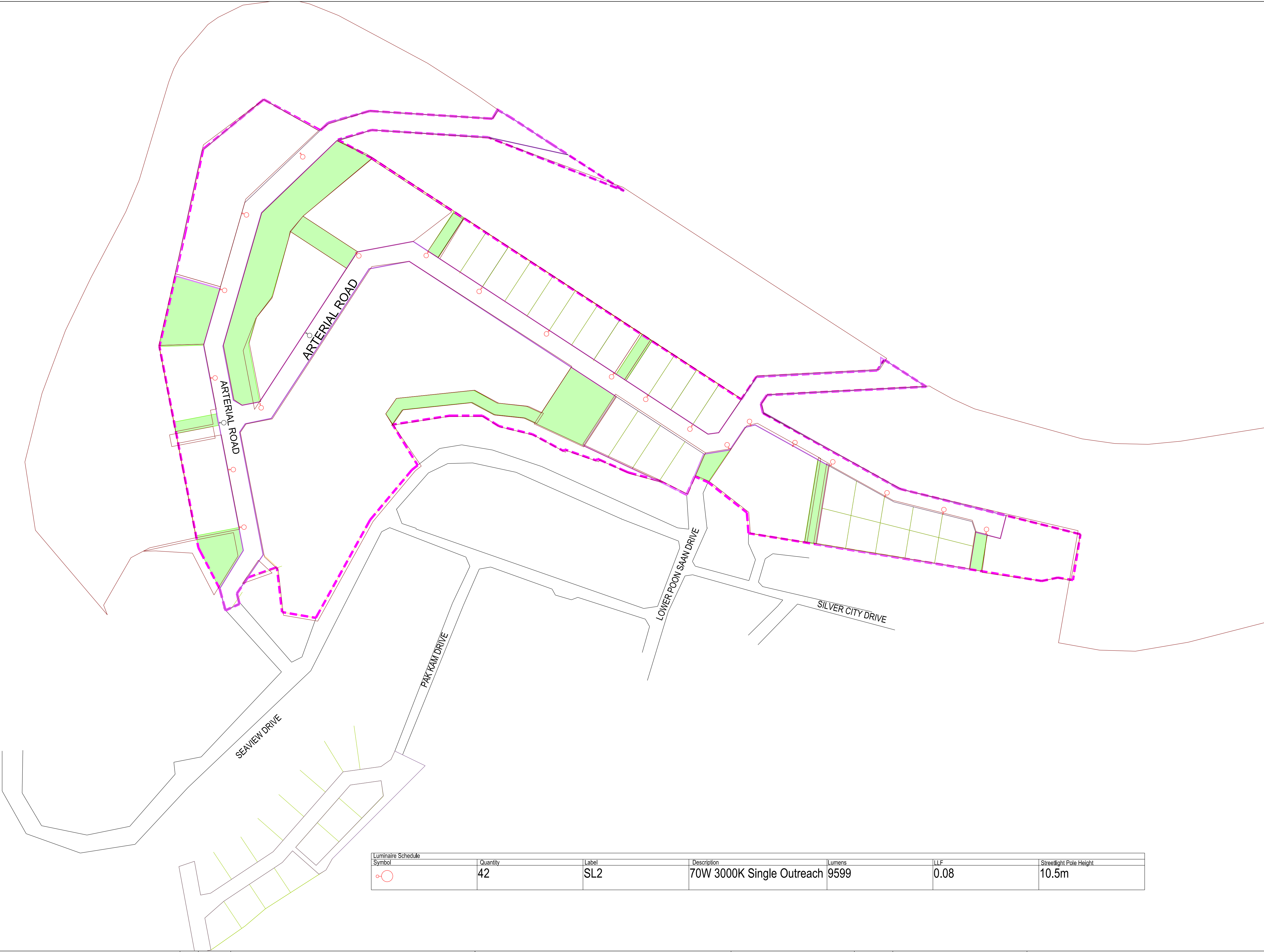
Sheet No
006

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10. APPENDIX 4 – STREETLIGHT

ELECTRICAL LEGEND

 STREETLIGHT- 70W



Luminaire Schedule	Quantity	Label	Description	Lumens	LLF	Streetlight Pole Height
	42	SL2	70W 3000K Single Outreach	9599	0.08	10.5m

NOT APPROVED for CONSTRUCTION

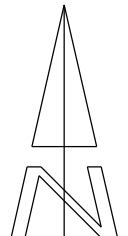
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Design
A VARMA

Drawn
A VARMA

Size
A1

Scale
NTS



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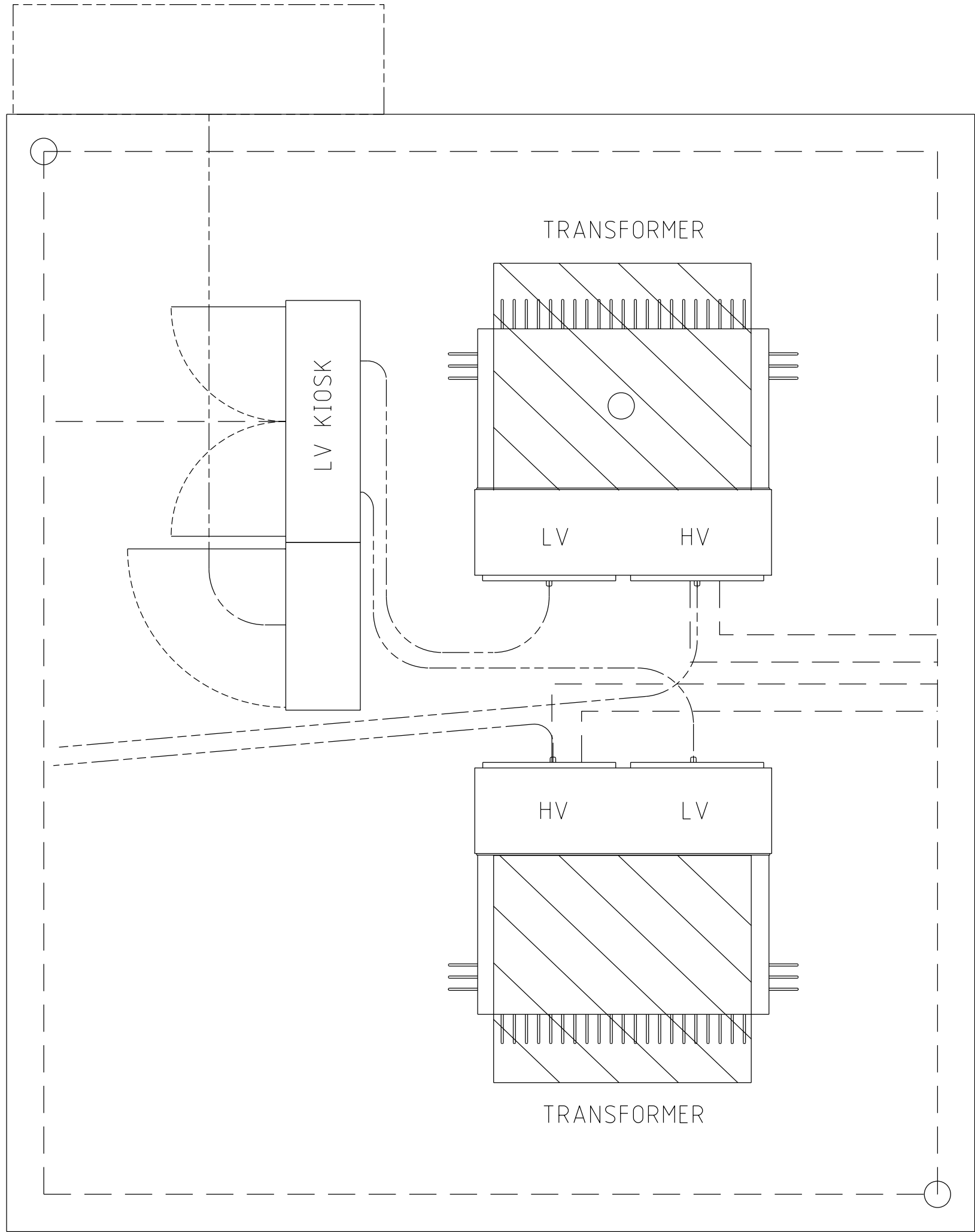
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CHRISTMAS ISLAND
SILVER CITY
ELECTRICAL STREETLIGHT CONCEPT SITE PLAN

Drawing Number
W_APD08430_ELE_009

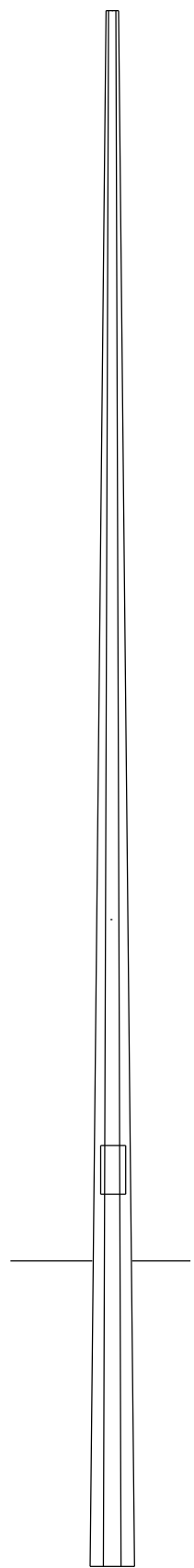
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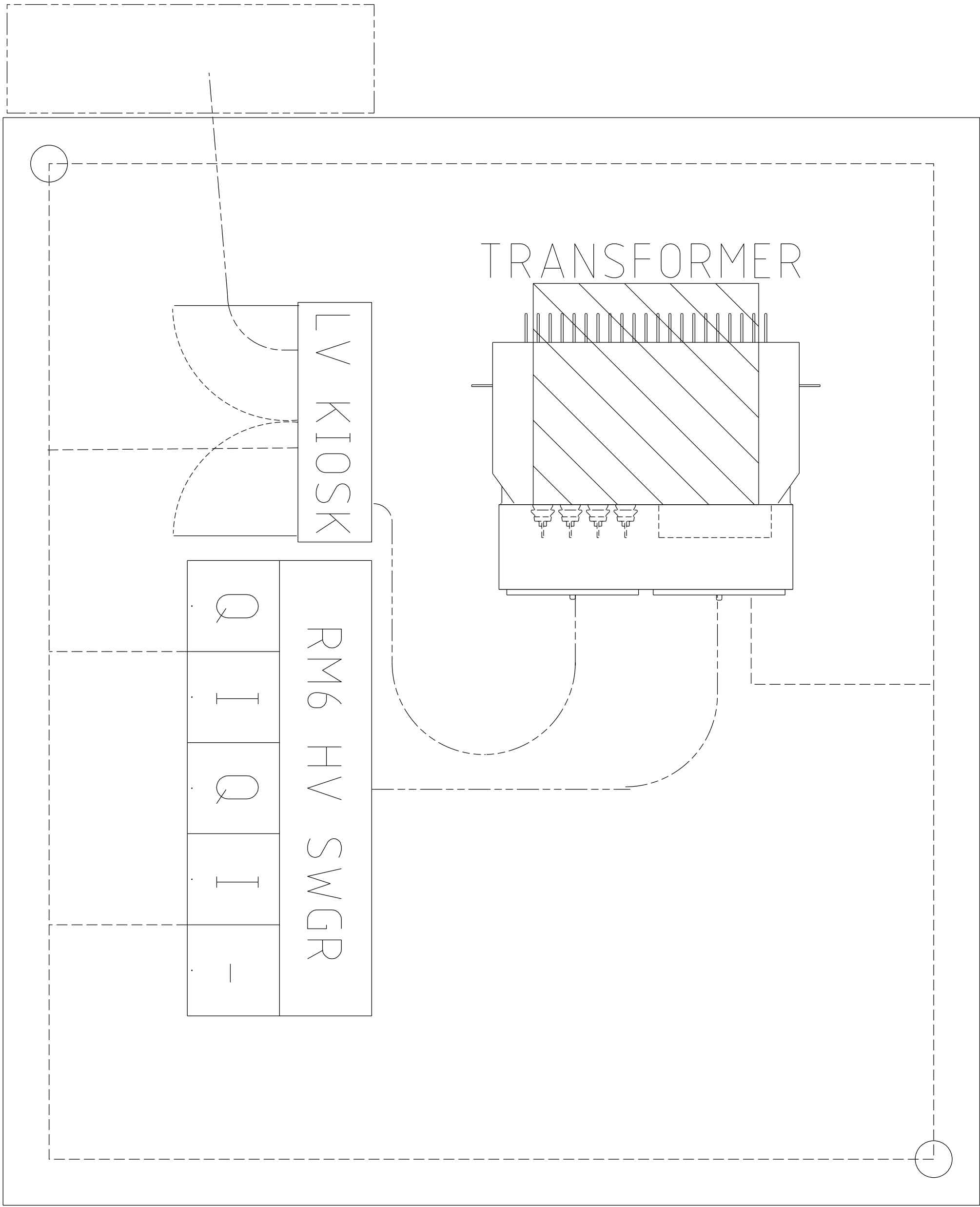
11. APPENDIX 5 – GENERAL ARRANGEMENT



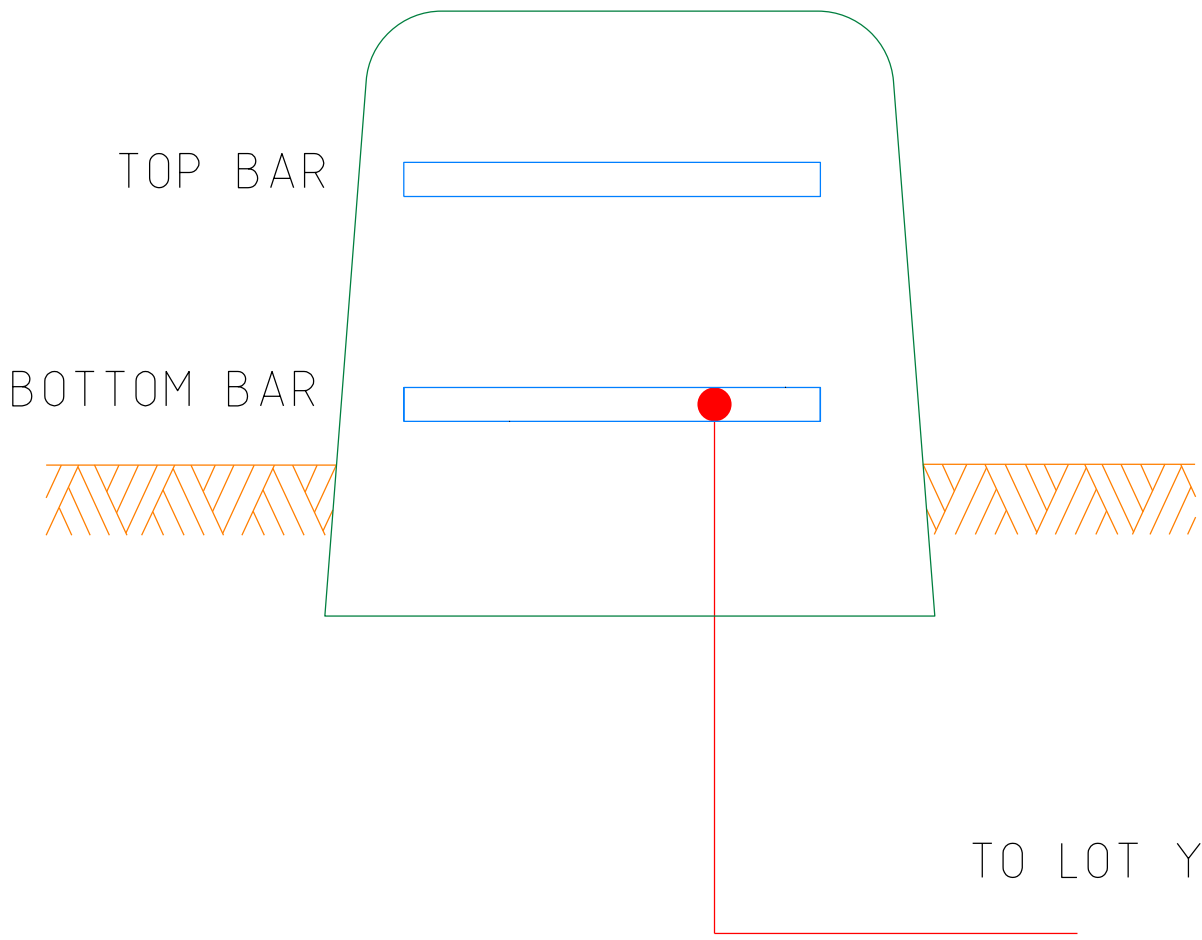
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TYPICAL STREETLIGHT ARRANGEMENT



TYPICAL SUBSTATION ARRANGEMENT



TYPICAL PILLAR ARRANGEMENT

NOT APPROVED for CONSTRUCTION

REVISION DETAILS						REFERENCE DRAWINGS	
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A	20.05.2025	ISSUED FOR REVIEW	AV	AV	RB		

Design A VARMA	APD GLOBAL T: 1300 273 797 E: admin@APDeng.com.au www.APDeng.com.au
Drawn A VARMA	
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Scale NTS	

CHRISTMAS ISLAND SUBDIVISIONS CHRISTMAS ISLAND SILVER CITY TYPICAL GENERAL ARRANGEMENT OF MAJOR EQUIPMENT		
Drawing Number W_APD08430_ELE_010	Sheet No 001	Rev A

APPENDIX 5 – Christmas Island Housing Needs Assessment

Christmas Island Housing Support Program 2024-2025 – Housing Need Assessment

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Executive Summary:

The Shire of Christmas Island engaged the Christmas Island Women's Association to assist in developing its application for the Christmas Island Housing Futures Masterplan project, funded through the Commonwealth's Housing Support Program Stream 1. Our role was to lead community consultation efforts to ensure the Masterplan reflected the most suitable mix of housing and tenure types to meet the island's housing needs. It was also tasked with reviewing and consolidating the literature on housing stress and housing demand on island.

SOCI was successful in its application in July 2024, funding CIWA from September 2024 onwards on the agreed program.

CIWA were tasked with the necessary community consultation research on the following terms of reference:

- Primary research on the housing journey of Christmas Island families from the perspective of women
- Suitable housing designs for new developments
- Options for construction
- Relocation for Flying Fish Cove residents

CIWA consulted its 150-person membership from September to December 2024 on the terms of reference above. CIWA went on to conduct 20 in-person interviews with women of between 60 to 90 minutes each in the language of the interviewee's choice.

The consultation uncovered lived experiences of women across different generations, cultural backgrounds, time periods and household sizes.

The learnings from these interviews and membership research were summarised succinctly by the CIWA interview team upon review of the interview transcripts:

'If you solve women's problems, you solve societies' problems. If you solve men's problems, women still have problems.'

These learnings are summarised in the Key Findings section, and alongside the Recommendations set out in this report, aim to solve women's problems with suggestions from the collective perspectives of the Christmas Island Women's Association.

Definitions:

Affordable Housing: *Housing that is offered for sale at below the market price in the area, typically by a Community Housing Provider although historically the Government as well.*

Community Housing Provider:

A CHP is a registered organisation under their State or Territory legislation that delivers affordable housing options for the community. It does this through either creating rentals within affordability limits or disposal of homes at below market prices to a select demographic. It is also known as a Community Housing Organisation (CHO) in WA government nomenclature.

Social Housing: *Rental housing that is owned and/or managed by not-for-profit organisations and generally allocated to lower income households on either income-linked or "affordable" rents in accordance with eligibility and prioritisation policies of each State/Territory or Community Housing Provider.*

Allocation is the responsibility of Community Housing Providers in accordance with their not-for-profit and/or charitable objects and any other conditions, such as those imposed by governments, in providing assistance.

Public Housing: *Rental housing that is owned and managed by State and Territory government agencies and allocated to very low-income households in accordance with eligibility and prioritisation policies. Allocation is the responsibility of the State and Territory government agencies and generally gives priority to those in greatest need, usually tenants on income support, but the implementation varies across jurisdictions. Rents are generally set as a proportion of income – 25 to 30%.*

On Christmas Island it is the Commonwealth of Australia that provides Public Housing with guidance from the WA Dept. of Communities.

Underhoused Households:

Long term current Christmas Island residents who are unable to meet the criteria for a home loan and are currently excluded from public housing eligibility.

Key Findings:

1. CIWA reaffirmed the Shire's *March 2022 Christmas Island Housing Stress Survey* and subsequent community groups and individuals feedback that the WA benchmarks for entry onto the Christmas Island public housing waitlist have resulted in the creation of an 'underhoused' demographic.

This group earns above the threshold for public housing eligibility but not enough to avoid housing stress in the private rental market. Their capacity to save for a home deposit is severely limited, particularly given the requirement to have 30% of the purchase price in cash to be eligible for *consideration* (but not guarantee) of a loan through the island's sole banking provider.

2. That there were sufficient 'underhoused' persons on the island of varying ages to fill at least 24 units if it were to be made available for them to enter either as social housing through a Community Housing Provider, or through amendment to the existing public housing criteria.
3. That Christmas Island women and men do not have access to the same range of national programs and schemes afforded to mainland Australians for housing. These were not 'WA programs' that may or may not be mirrored by the Dept. of Territories, rather they were programs and schemes available through the national Housing Australia organisation. Access to these programs in conjunction with *access and tenure* to approved land may allow CHPs and other stakeholders to build housing stock on Christmas Island.
4. That there was scope for the Commonwealth of Australia to mirror WA state initiatives that addressed the housing crisis, specifically in the funding of CHPs to deliver solutions on behalf of government in the social and affordable housing sector. CIWA notes the Commonwealth's successful mirroring of the WA Government's *2024 Short Term Rental Accommodation Initiatives* which has seen short-stay accommodation stock move back into the long-term market.
5. Participants were keen to discuss matters around bank lending and insurance provision during the study. CIWA noted the energy in these engagements and informed the participants that the parameters of the present study were around researching the elements of neighbourhood design, housing stock variations and options for construction. There is further research to be done regarding bank lending and insurance options for Christmas Island.
6. Participants saw the proposed Phosphate Hill and Silver City master plan locations as being equally desirable for social and affordable housing developments. Noted that Silver City had in-fill potential.
7. CIWA found that the March 2022 Housing Stress Survey was still in currency, noting the parameters have not changed since then. CIWA cannot ascertain if the circumstances are necessarily more difficult to secure housing in 2025, but estimate that it is not seen as easier to by island residents.

Recommendations:

1. ***That Christmas Island Futures Master Plan caters for 3 bedroom and 2 bedroom residences for women and men of different ages and household sizes noting the number recommended in Quantitative Residential Targets.***

CIWA has completed a Quantitative Residential Target (QRT) for a two year and five year time frame (section 2.1). The QRT was informed from CIWA's consultation within its membership and projects the potential immediate take-up from the existing population. This assessment did not account for potential housing demand arising from new or additional economic activity, as that fell outside the scope of CIWA's terms of reference.

CIWA recommends the 24 unit public housing block set for retirement be replaced with 16 two bedroom units and 8 three bedroom units in the new Housing Master Plan areas.

CIWA documents a significant full-time 'underhoused' demographic that would take the opportunity to occupy social housing on the island outside the public housing stock. CIWA notes the benchmarks to enter public housing stock does not permit the working 'underhoused' to register to apply for housing. Thus using the waitlist for public housing to gauge housing demand presents a distorted view of housing demand on the island.

CIWA notes the distinction between the physical housing stock that needs to be created and the funding and ultimate allocation policies to make that physical housing stock available for distribution to the 'underhoused' demographic. This recommendation pertains only to the creation of housing stock that CIWA has confidence will be filled by the 'underhoused' demographic.

2. ***That new housing development areas create public social space to encourage interaction between neighbours and especially the elderly.***

Respondents noted the Flying Fish Cove was a foot-friendly environment with proximity to grocery retail and a significant place of worship. A new social/affordable housing development should undertake to replicate this and other features that would create a foot-friendly environment. This is unlike the Settlement precinct for example.

3. ***That the design of new social housing areas need not contain security lighting and cameras as a priority. Respondents noted pathway development capable of wheelchair and pram access were essential.***

CIWA discussed elements of mainstream social housing designs with respondents across a range of elements including security and accessibility. Respondents did not prioritise options more common with mainstream social housing projects in terms of fencing, cameras, lighting and other passive security measures. Respondents were keen for amenities suitable for community participation.

4. That housing options for aged persons to reside in were prioritised.

Participants recognised a special need to ensure the aging population had access to housing stock that was suitable for elderly to be able to live independently should their current homes not continue to be suitable.

This included design features such as ramp access and wider-door frames and bathroom designs to accommodate.

5. CIWA recommends the Shire and Federal Government research the banking and insurance options for people seeking to participate in the residential housing market on Christmas Island to study limitations and map resolutions.

Participants noted the requirement to produce a 30% cash deposit, or show significant other collateral, to be able to be considered for a home loan. Some participants also raised the lack of state-type assistance programs afforded to WA residents as also impinging on first home buyers especially to secure accommodation on Christmas Island.

CIWA recorded consistent feedback from its membership and the wider community of the unlikelihood of raising 30% cash deposit whilst paying rent. CIWA recorded the 'bank of mum and dad' phenomena in assisting children to secure accommodation mirroring the mainland in this respect.

Of great concern CIWA recorded in four of its 20 long-form interviews representing 20% of interviewees, that women had either drained their superannuation completely or sold their own homes to provide a child/children the means to make up a deposit to enter the private housing market. The instance of a CIWA member selling their own home has resulted to them living in public housing in their advanced age.

CIWA documents that women consistently self-sacrifice in a way throughout their lives as daughters, wives and mothers to assist others in achieving financial challenges experienced by others in the family unit.

6. That the Shire and seek Commonwealth clarification on what WA State Government funding they would mirror from the WA Community Housing Provider sector for the IOTs; and to subsequently seek to engage and fund a Community Housing Provider to create a feasibility study on service delivery for Christmas Island.

In summary, CIWA advises that registered Community Housing Providers (CHP) can provide the governance structure to deliver social/affordable housing programs to residents should they be able to access the according funds to do so from the Commonwealth. CHPs are also referred to as Community Housing Organisations (CHOs) in WA state literature. This report will utilise CHP, the nomenclature used by the national Housing Australia organisation. The only other organisation

that can realistically deliver social/affordable housing in scale on Christmas Island is the Commonwealth of Australia.

In examining the service delivery agreement benchmarks the Commonwealth in delivering state-type services to the Indian Ocean Territories, CIWA recommends the Shire engage with the Commonwealth through its Community Consultative Committee and full Council membership for the ability for the Commonwealth to mirror the *Social Housing Economic Recovery Package (SHERP)* which delivered hundreds of 250 new social housing properties in metro and regional WA¹ via registered CHPs as well as other initiatives in this space.

Clarification on such funding may give rise to local CHP being developed, or to attract a WA CHP to commence activities in the IOTs.

7. CIWA recommends that the Shire engage with the Commonwealth to secure acknowledgement of special funding consideration for external territories for equitable inclusion in the Housing Accord (see 3.1.2) with a view to provide a qualified, registered CHP access to funds to be able to deliver on the Mandate (see 3.1).

In section 3.1.2, CIWA highlights the inadvertent exclusion of external territories, such as Christmas Island, from Housing Australia's strategic plans and funding programs. Section 3.1 of the report outlines Housing Australia's statutory obligation to deliver social, affordable, and acute housing stock on Christmas Island. This presents an impasse: while Housing Australia is legally required to develop housing on the island, its current operational funding streams do not accommodate external territories in the same way they do for mainland Australians.

CIWA conducted a literature review studying the options available to WA residents for home ownership, the current housing program initiatives available through Housing Australia, and an analysis of the 2025 housing policy proposals put forward by the two major parties. There will be an addendum to this report submitted to Shire post May 3rd 2025 election to expand further on the local impact of the new Government's housing policy direction.

A recurring theme in CIWA consult with women was that women could not attain viably housing without a partner, or significant family assistance in the private market. A non-private market housing pool which allowed women to pursue career development on island was essential to retain unmarried women on the island pursuing a career. It can also play a role in providing long-term tenure for families and retired elderly.

Density was not a concern. This leads to the conclusion that R20, the typical free standing home zoning of low density, is not desired or expected for the development of future social and affordable housing options. CIWA notes that this feedback does not represent the feedback of Flying Fish Cove resident relocation.

¹ <https://www.wa.gov.au/organisation/departments/social-housing-economic-recovery-package-sherp>

Limitations of this research

CIWA was unable to conduct the planned rescheduled Flying Fish Cove relocation workshops due to inclement weather in Q1 2025. The island experienced one cyclone and two significant tropical lows that damaged Flying Fish Cove considerably. The in-situ weather developments did not provide an opportunity for considered community workshop facilitation given the significant community stress around the storm damage.

CIWA advises it will assist SOCI in its efforts to resume Flying Fish Cove relocation workshops in the future.

CIWA notes the body of work SOCI collected in the 2020-2021 Flying Fish Cove Kampong Coastal Risk Dialogues which is covered in Section 4 *Relocation of Flying Fish Cove Residents*.

1.0 Primary Assessment on the housing journey of Christmas Island families from the perspective of women

1.1 Methodology

CIWA engaged its membership from September to December 2024 to gather the historical perspective of women's housing journeys on Christmas Island. The 150 membership represent different waves of migration and islander born generations. CIWA members reported their perspectives with the Executive Committee.

The thematic list of questions were as follows:

Where was your first home on Christmas Island, and how did you get it?
Where is your current home on Christmas Island, and how did you get it?
How did women in your era without a partner attain housing?

Collated responses are as below –

Where was your first home on Christmas Island, and how did you get it?

- | | |
|---|--------------------|
| 1. Issued by employer. All related to the BPC except for one who gained housing through an immigration service provider in the 2010s. | (29 conversations) |
| 2. Bought home with partner in the 2000s when they moved to CI | (1 conversation) |
| 3. Married a partner who had own free hold housing | (1 conversations) |
| 4. Married a partner who had public housing | (2 conversations) |

Where is your current home on Christmas Island, and how did you get it?

- | | |
|----------------------------|--------------------|
| 1. Public housing | (5 conversations) |
| 2. Employer issued housing | (3 conversations) |
| 3. Own home with partner | (22 conversations) |
| 4. Own home by self | (2 conversations) |
| 5. Renting | (1 conversations) |

How did women in your era without a partner attain housing?

The age cohort of the CIWA membership respondents are over 55. They recounted that when a female did not have options to stay with family, that they rented rooms with other families. This was extremely rare as there was no true housing market to speak of pre-1992. A small number of clerically trained specialists were afforded employer accommodation at female quarters.

Younger women reported that local women without partners did not obtain their own housing.

1.2 Housing Journey of CI Women Findings

A significant number of older CIWA members reported that their current housing tenure originated from their forced self-relocation into vacant homes across the island in the aftermath of the 1986 cyclone. This subsequent recognition and formalisation of their tenure in 1992—when residents were granted title to the homes they occupied upon payment of an assessed value—constituted the largest-scale Affordable Housing disposal program in the island's history.

CIWA noted that even in contemporary times, women overwhelmingly had their accommodation tied to marital status. CIWA uncovered only five instances of women gaining housing ownership as an unmarried single woman household in its considerable collective memory. Two of these abodes were a Poon Saan unit, one a Kampong unit, the fourth was a residence in Taman Sweetland and the fifth a donga in Settlement.

Assistance from family members to procure housing varied between the five instances from 'none' to 'some.' The time period of acquisition was from the 1980s through to the 2020s.

Note, there are in the Shire rate record, several instances of married women owning property in their name on Christmas Island, without their spouse on the title.

Three women provided they had housing provided by an employer; they considered themselves island residents. CIWA is aware of many more instances of single women, and partnered women, who have some housing provision from their employer; these are typically Commonwealth Government workers or a small number of private sector employers.

CIWA also documented ten unmarried women who were provided housing attached to their employment; this cohort were specifically temporary visa holders.

1.3 Conclusion

CIWA documents that the private market cannot provide housing options to single women from its inception in 1992 through to today. Only five unmarried women were able to attain private ownership of accommodation in 45 years on Christmas Island without a spouse.

The balance of unmarried women rent in the private market, live in public housing or are provided housing from an employer. The latter CIWA notes is for higher paid professional workers or lowly paid transient women doing entry-level manual labour work. Both were typically not Christmas Island long term residents.

Historically, housing options for single women outside their parental home or spousal home on Christmas Island *did not exist*. The CIWA membership reported a historical legacy of marginalisation of young women who sought independence from family and a home maker role during the consultation. It was so unusual to have women in housing independent of marriage that the one-room housing assigned by the British Phosphate Commission in Settlement through the early 1980s was misogynistically called then, and regrettably still today – ‘*The Virgin’s Castle*.’ The historical name for the complex is the Mandor’s Quarters in the original British Phosphate Commissioner time.

CIWA documents that modern day women on Christmas Island, both single and attached, face a private market that cannot cater to their housing needs.

A Social Housing development operated by a regulated Community Housing Provider would assist in addressing the needs of ‘underhoused’ women and men across different household makeups from single to family groupings with children.

A Public Housing policy that did not disenfranchise persons who were otherwise disqualified for earning over the benchmark would also satisfy some numbers.

The nigh impossibility for credit access under present 2025 loan terms at the local bank prevented women and men from private market options without significant guarantor access from the ‘bank of mum and dad.’

CIWA cannot conclude that the private market has adequately generated new housing options for women and first home buyers since 1992. CIWA does not foresee the private market being able to adequately deliver such housing options in the future either.

CIWA notes that SOCI records only two new home builds in its *2021 Report of Review for the Local Planning Strategy No.2*. SOCI advises CIWA that there have been no planning approvals for new housing given from the 2021 report to 2025. CIWA notes that in December 2024, SOCI denied planning applications for three new houses on Poon Saan Road, as they did not comply with the planning requirements set out in the WA Residential Design Codes.

2.0 Suitable Housing Designs for New Developments

2.1 Quantitative Residential Targets

CIWA provides the below housing needs table comprising of the immediate demands for housing from underhoused households and cohorts of people who are seeking improved or alternative accommodation options to where they presently are.

Underhoused Households are defined as current on island long term residents over 18 who are unable to meet the criteria for a home loan on Christmas Island and are currently excluded from public housing eligibility.

Incoming Households are defined as people on the mainland that seek housing on Christmas Island. This is made up of projected estimations of Islanders seeking to return based on historical averages, and professionals seeking secured housing to commence work search or contracted employment.

Accommodation Types	2026-2028 DEMAND		2028-2030 DEMAND		TOTAL from 2026-2030
	2 bed self-contained	3 bed self-contained	2 bed self-contained	3 bed self-contained	
Demographic Types					
Underhoused - Single	8	0	8	0	16
Underhoused - Couple	4	2	4	2	12
Incoming Households Young Adults (18-24)	8	0	8	0	16
Incoming Households Birthing Age (25-39)	2	4	2	4	12
Seniors (65+)	4	0	2		6
Total	26	6	24	6	

Note these figures do not include potential Flying Fish Cove relocation housing. CIWA refers to the SOCI

estimate of 170 dwellings on freehold lots or strata apartments it made to Dept. of Planning, Lands and Heritage which forms the basis for its drafting of the Housing Support Program's Structure Plans which seek to produce dwelling space for any possible future Flying Fish Cove relocation. The community consultation for density, make-up and type of dwelling required for any future Flying Fish Cove relocation is on ongoing process with SOCI and the residents.

3.0 Options for Construction

CIWA reviewed the *2011 Accommodation Needs Assessment for Christmas Island and the Cocos (Keeling) Islands* by the Dept. of Regional Australia, Regional Development and Local Government (the former name for the Dept. of Infrastructure, Transport, Regional Development Communications and the Arts. It contained a study of the then major incentives of the era that promoted development and construction.

Some of these incentives have evolved to the present day, and some discontinued.

CIWA in its literature review also examined the modern set of circumstances for the support of housing development, most notably through *Housing Australia*.

3.1 Housing Australia

Housing Australia was formerly known as the *National Housing Finance and Investment Corporation* until 2023.

Housing Australia is the independent national housing agency. We work with the private sector, community housing providers and all levels of Government to facilitate and deliver programs that help more Australians to access social and affordable housing or to buy a home.

To help deliver on its purpose, Housing Australia set five strategic objectives focused on building the business and continuing to embed best-practice systems, processes and governance practices into operations.

The strategic objectives are to:

- *facilitate the sustainable growth of the community housing sector across Australia*
- *facilitate investment to increase the supply of social and affordable housing*
- *strengthen stakeholder relationships that support better housing outcomes*
- *deliver high-performance organisation practices and outcomes*
- *establish a best-practice governance regime.²*

² <https://www.housingaustralia.gov.au/who-we-are>

Housing Australia is directed through Parliament with the '*Housing Australia Investment Mandate Direction 2018*' (the Mandate)³.

The present [Mandate](#) is the *13 March 2025 Housing Australia Investment Mandate 2018 (Compilation No, 16)* edition which includes the following amendments being:

- *Housing Australia Investment Mandate Amendment (2025 Measures No. 1) Direction 2025*
- *Housing Australia Investment Mandate Amendment (2025 Measures No. 2) Direction 2025*
- *Housing Australia Investment Mandate Amendment (2025 Measures No. 3) Direction 2024*
- *Housing Australia Investment Mandate Amendment (2025 Measures No. 2) Direction 2024*
- *Housing Australia Investment Mandate Amendment (2025 Measures No. 1) Direction 2024*

CIWA notes that clauses one to three in *Section 10A Minimum number of dwellings to be made available* in the Mandate reads requires Housing Australia to achieve in each State and Territory, delivery of a minimum of 1,200 social/affordable/acute housing dwellings.

10A Minimum number of dwellings to be made available

- (1) In performing its financing function, Housing Australia must take all reasonable steps, during a period of 5 years beginning on the day this section commences, to achieve the outcome of making available, in each State and Territory, a minimum of 1,200 applicable dwellings.
- (2) In determining whether the outcome of a minimum of 1,200 applicable dwellings has been achieved, Housing Australia must include any applicable dwellings made available in a State or Territory as a result of a grant of financial assistance made under subsection 18(1) or 18(3) of the *Housing Australia Future Fund Act 2023*.
- (3) An ***applicable dwelling*** is a dwelling that is or will be any of the following:
 - (a) social housing;
 - (b) affordable housing;
 - (c) addressing an acute housing need.
- (4) However, a dwelling that is crisis and transitional housing is ***not an applicable dwelling***.

- the '*Housing Australia Investment Mandate Direction 2018*,' *13 March 2025 edition*

CIWA notes that the '5 years' period commences from 1st July 2024. This falls in line with the Government's 2022 *Housing Accord's* goal of establishing 1.2m homes by 2030. ⁴

CIWA also notes that the territory of Christmas Island is specifically documented in clause 3 of s.4 *Meaning of capital city, regional centre and regional area*:

³ <https://www.legislation.gov.au/F2018L00994/2025-03-13/2025-03-13/text/original/pdf>

⁴ <https://treasury.gov.au/policy-topics/housing/accord>

(3) A **regional area** is:

- (a) a Statistical Area Level 4 area in a State or the Northern Territory that is not the capital city of that State or Territory; or
- (b) Norfolk Island; or
- (c) the Jervis Bay Territory; or
- (d) the Territory of Christmas Island; or
- (e) the Territory of Cocos (Keeling) Islands.

- 'Housing Australia Investment Mandate Direction 2018,' 13 March 2025 edition

CIWA records that Housing Australia is under mandate to deliver 1,200 homes to each State and Territory of Australia as per s.10 of the Mandate. CIWA also records that s.4 of the Mandate specifically identifies the Territory of Christmas Island and the Territory of Cocos (Keeling) Islands.

The conclusion is that Housing Australia 'must take all reasonable steps to' create 1,200 social, affordable and acute needs housing dwellings on Christmas Island.

CIWA recommends that the Shire contact the Ministry of Housing and Homelessness and Housing Australia to inform them of the potential to reasonably deliver on its Mandate on Christmas Island in Shire's Housing Support Program Master Plan areas.

3.1.1 Housing Australia's Six Activity Vehicles

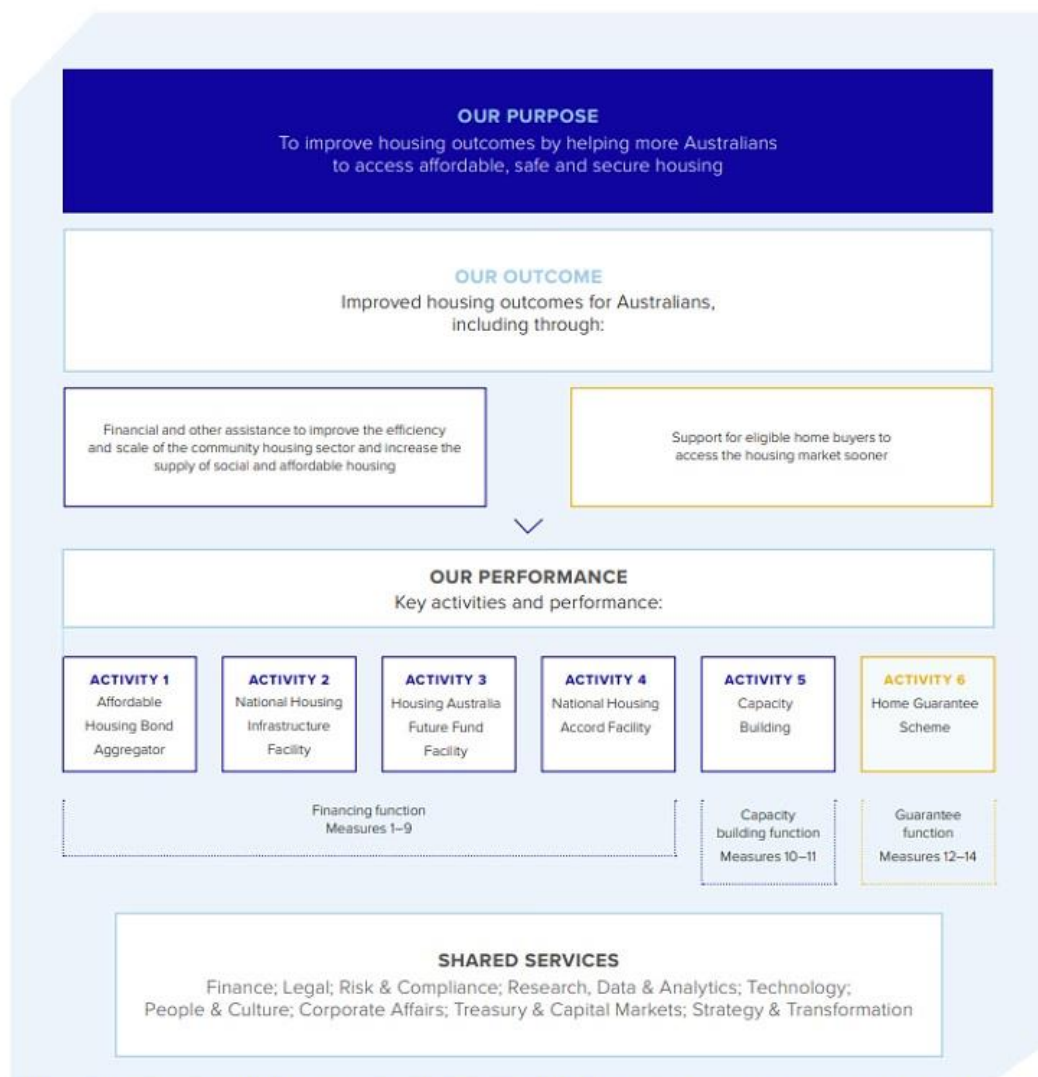
Housing Australia delivers on its mission statement through six Activity Vehicles:

- Affordable Bond Housing Aggregator
- National Housing Infrastructure Facility
- Housing Australia Future Fund
- National Housing Accord Facility
- Capacity Building
- Home Guarantee Scheme

CIWA notes that the results of the Federal Election May 3rd 2025 may alter, add or otherwise change the six Activity Vehicles. Please see Figure 1 overleaf for extract from *Housing Australia Corporate Business Plan 2024-2025* detailing the Housing objectives being delivered by the Six Activity Vehicles⁵

⁵ https://www.housingaustralia.gov.au/sites/default/files/2024-08/housing_australia_corporate_plan_2024-25.pdf

Figure 1: Housing Australia's purpose



https://www.housingaustralia.gov.au/sites/default/files/2024-08/housing_australia_corporate_plan_2024-25.pdf

3.1.2 Special Consideration for External Territories to achieve Equitable Inclusion

CIWA documents that the Shire of Christmas Island identified to the Housing Ministry in 2023, and again to the Member for Lingiari Marion Scrymgour and Senator Mc Carthy for NT in 2024 that critical elements of Housing Australia's six Activity Vehicles and the Commonwealth's overarching strategic document the *Housing Accord 2022* inadvertently omit the external Territory of Christmas Island from their remit.

On 16 August 2023, the National Cabinet adopted the Implementation Schedule for the Housing Accord 2022. This Implementation Schedule documents how many homes the states and territories will build in their jurisdictions with support from the Commonwealth Government in the form of the \$3bn New Home Bonus and \$400m Housing Support Program⁶.

States and territories have agreed to build the following affordable homes:

State	Allocation
New South Wales	3,100
Victoria	2,546
Queensland	2,049
Western Australia	1,076
South Australia	700
Tasmania	220
Northern Territory	96
Australian Capital Territory	175

- <https://treasury.gov.au/policy-topics/housing/accord>

CIWA observes that the Territory of Christmas Island was not involved in National Cabinet discussions. The NT Government, WA Government and ACT Government do not represent residents on Christmas Island; furthermore they have no jurisdiction to do so.

Thus the Implementation Schedule features no housing commitments from State or Territory Government

⁶ <https://treasury.gov.au/policy-topics/housing/accord>

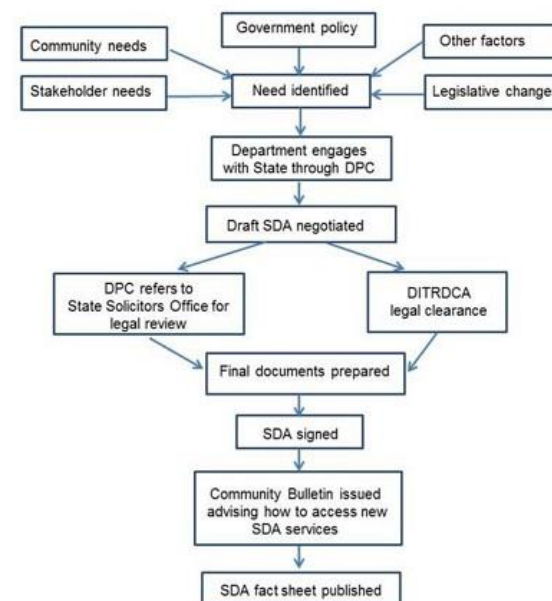
to develop on Christmas Island.

CIWA concludes that, as Australian citizens, there must be special consideration given to external territories like Christmas Island to address our inadvertent exclusion from this federal rollout. It is the responsibility of the Commonwealth Government to ensure equitable inclusion.

3.2 WA Mirrored Funding

CIWA records the potential for the Commonwealth to tailor service delivery arrangements in the IOTs based on needs identified and raised by the community as described in section 6.1 of the *Service Delivery Agreements Information Kit - Indian Ocean Territories November 2024*⁷

6.1 SDA development process flowchart



The WA Govt is involved in funding Community Housing Providers (CHPs). CHPS must be registered under the WA Community Housing Registration Office under the *Community Housing Regulatory Framework*⁸.

⁷ <https://www.infrastructure.gov.au/sites/default/files/documents/service-delivery-arrangements-information-kit-indian-ocean-territories-november2024.pdf>

⁸ <https://www.wa.gov.au/government/document-collections/housing-investors-and-partners-community-housing-organisations>

Thursday 7th April 2022, the WA Government announced \$38.9m in grants to nine separate CHPs to build 173 new homes through the *Social Housing Economic Recovery Package (SHERP)*⁹.

The WA Government has so far budgeted \$319m in their SHERP program from 2020 to present.¹⁰

- \$141.7m of this was for refurbishing of existing housing;
- \$97.3m to build or buy 250 new social housing builds
- \$80m for refurbishing existing regional public housing

"One of our Government's top priorities is to ensure we meet the diverse needs of tenants across WA, particularly those who are finding it difficult to access housing in the tight private rental market.

"The SHERP New Build Grants program is a substantial investment to help meet this priority by enabling the construction of much needed new social housing with a variety of dwelling types and configurations.

"These grants will provide much needed financial support to these organisations, and is a great example of the strong partnership between our Government and the community housing sector.

"The grants will support projects estimated to be worth more than \$60 million that will deliver new housing for a wide range of individuals and families including Aboriginal and Torres Strait Islander people, young people, people with disability, seniors, and women and children leaving family and domestic violence situations.

"It's great to see such an innovative range of projects funded through the grants program including \$5 million for Bethanie Housing, which is delivering a new 50 apartment development for low-income earners over the age of 55.

"The SHERP Grants Program is a critical part of our \$2.1 billion social housing investment program, and is providing critical financial support to the community housing sector to deliver for our State's most vulnerable people."

- statements made by Minister for Housing, Lands, Homelessness and Local Govt John Carey.

CIWA recognises that providing seed funding on Christmas Island—equivalent to that granted by the WA State Government to WA Community Housing Providers (CHPs)—either to a local CHP or to support the expansion of a WA-based CHP to the island, would serve as a catalyst for establishing a viable social housing sector.

CIWA notes the funding from the WA Government to CHPs below from 2018 to 2025 below:

⁹ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2022/04/More-than-170-new-social-houses-to-be-delivered-through-39-million-dollar-grants-program.aspx>

¹⁰ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/06/Housing-stimulus-protects-jobs-and-charts-path-to-economic-recovery.aspx>

SHERP funds – Media Release April 7th 2022¹¹

Organisation	Number of projects	Number of dwellings	Project location/s	Grant funding
Agencies for South West Accommodation (Accordwest)	1	3	Collie	\$1,084,021
Bethanie Housing	1	50	Fremantle	\$5,000,000
Community Housing Limited	2	10	Viveash, Mandurah	\$4,645,375
Housing Choices WA	8	49	Viveash, Falcon, Greenfields	\$8,142,723
Indigo Junction	1	20	Midland	\$4,207,946
Shire of Harvey	1	12	Brunswick	\$4,980,400
Shire of Murray	1	12	Dwellingup	\$4,624,634
Stellar Living	1	16	Rockingham	\$3,729,791
UnitingCare West	1	1	Spearwood	\$2,537,265
Total	17	173		\$38,952,155

Royalties for Regions funds six separate Housing initiatives in the 2021/22 WA Budget.

Initiative	Grant Fund over 4 years 2021-2025
East Kimberly Transitional Housing	5.3m
Hedland Transitional Housing	4.3m
North West Aboriginal Housing Initiative	51.9m
Wheatbelt South Aged Housing Alliance	1.3m
Yindihbarri Ganali Accommodation and Transitional Housing Program	3.3m
Bridge ST, Affordable Housing Project	\$900k

The Regional Aged Accommodation Program contributed \$3.5m for 8 Independent Living Units for aged persons in the Shire of Leonora in March 2022.

Project	Units	2018 funding +
Armstrong Village Project (Dunsborough)	33	\$2.5m
Bedingfield Park (Pinjarra)	25	\$2m
Bridge Street Affordable Housing Project (Donnybrook)	11	\$2m
Brunswick River Cottages (Brunswick Junction)	11	\$2m

¹¹ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2022/04/More-than-170-new-social-houses-to-be-delivered-through-39-million-dollar-grants-program.aspx>

Dongara Age Appropriate Accommodation Facility (Dongara)	6	\$2.5m
Great Southern Housing Initiative	18	\$2.6m

The WA Government has even built Worker Accommodation in remote parts of the state for local businesses to utilise for attracting workers into the region¹².

In 2012 The WA Govt spent \$17m to build 37 staff houses in Coral Bay for accommodation options for the private sector.

In 2018 they committed a further \$2.9m for headworks (water, power, sewerage) to develop Baiyungu Aboriginal Corporation's Lot 308 to address "...a chronic shortage of affordably priced accommodation for workers and families in the town. This is having a detrimental impact on the ability of local businesses to attract and retain key workers, and for local businesses and State Government to provide essential services within the community, stifling job creation in this tourist destination."

CIWA documents that CHPs routinely receive funds from the WA Government to commence capital works to address accommodation issues.

Refer to Appendix 1 on the list of entities that have received SHERP funding from the WA Government. Refer to Appendix 2 to see the full list of registered Community Housing Providers in WA.

Commonwealth Involvement in CHPs

Housing Australia is the peak Government agency involved in the funding of Community Housing Providers nationwide (see 3.1.1).

There are no registered Community Housing Providers in the IOTs registered with the WA Community Housing Registration Office. Hence, delivery of social/affordable/acute housing stock on Christmas Island does not occur.

CIWA recommends that the Shire engage with the Commonwealth to secure acknowledgement of special consideration for external territories for equitable inclusion in the Housing Accord (see 3.1.2) with a view to provide a qualified, registered CHP access to funds to be able to deliver on the Mandate (see 3.1).

¹² <https://www.miragenews.com/milestone-for-leonora-aged-accommodation-project-746032/>

3.3 Challenges for Individual Home Loans

CIWA documents that the only bank to provide residential home loans to Christmas Island in Australia without collateral is Westpac. Westpac require a 30% cash deposit to consider a loan application. The value of the applicable stamp duty must also be held in cash.

Other mainland banks do not consider home loan applications from Christmas Island. This has been tested by Shire in 2023 liaising with the Commonwealth's Housing Australia *Regional First Home Buyers Guarantee*.

The RFHBG offered was a 5% loan deposit scheme for first home buyers that would have the Commonwealth backstop 15% so the loan applicant met the typical 20% Lenders Mortgage Insurance benchmark for a deposit.

Unfortunately the sole banker Westpac requires a 30% deposit for consideration of a loan; hence the RFHBG program was moot on Christmas Island.

CIWA reaffirmed SOCI's engagements with the community stating that it was extremely challenging raising 30% in cash to be considered for a bank loan.

CIWA foresees this challenge directly affecting any release of even affordable housing stock in the proposed Master Plan areas as Islanders would be challenged in the 30% deposit requirement that would still apply.

This presents the possibility of a 'Rent-to-Buy' scheme where a CHP, or level of Government, would construct a building for this scheme where the tenant would eventually take possession after a number of continued rental payments.

CIWA notes that during the 2024 election campaign, the Labor Party made an election commitment to enable first home buyers to access home loans with a 5% deposit. It also notes the commitment to build 100,000 homes for FHBs across the nation¹³. CIWA advises SOCI to follow up on these commitments should a Labor Government be re-elected.

3.4 Insurance – Further Research Needed

A study of the insurance environment was not in the terms of reference for the study. However CIWA came across feedback in this area which pertains to housing development and ownership.

It is presently impossible to acquire Property Insurance for flood, earthquake, fire, cyclone, etc on Christmas Island from any provider in Australia for a business or residence. The sole exception is that a number of Westpac customers have been able to secure this insurance through the local bank from which their home loan originates.

This lack of access to insurance is a consideration that many developers and potential investors would take into account when choosing to invest on Christmas Island. It requires further research separate to this

¹³ <https://alp.org.au/news/labor-to-deliver-5-deposits-for-all-first-home-buyers-and-build-100-000-homes/>

4.0 Relocation for Flying Fish Cove Residents

CIWA's literature review into Flying Fish Cove relocation planning draws from the 2010 Attorney General's Department IOT Climate Change Risk Assessment and the 2020-2021 Shire of Christmas Island facilitated consultation workshops with Flying Fish Cove residents.

1. Attorney-General's Department Indian Ocean Territory Climate Change Risk Assessment - 2010

The specific risks and vulnerabilities for the Kampong at Flying Fish Cove are:

- Sea level rise expected to exacerbate inundation, storm and tidal surge, erosion and other coastal hazards potentially threatening Flying Fish Cove jetty, wharf and boat ramp as well as the Kampong sea wall and buildings beyond and
- Increase intensity in cyclonic rain inducing land slide and associate rock fall around Flying Fish Cove with potential impact to the structural integrity of buildings and amenities.

In terms of adaptation to the effects of climate change the risk assessment report makes at page vi the following recommendation:

"Adapting to climate change involves preparing for, responding to and coping with climate induces changes. This can be best achieved through government and community working together to improve the ability of island communities to cope with or respond to the impacts of climate change. Hence, it is strongly recommended that a community-based approach be implemented to dealing with climate change over the long term. Of course, there are also a number of immediate short-term issues, such as the protection of coastal infrastructure, life and property, and emergency preparedness that need to be addressed as a matter of urgency, and again it is imperative that community be given the opportunity to be involved in the adaptation planning and decision-making process associated with these activities."

The report makes this specific recommendation:

"Develop a Climate Change overlay for planning development in Christmas Island including a longer-term transition plan for the Kampong".

2. Land Use Planning for Disaster Resilient Communities - 2020

CIWA notes the Shire's referral to the Australian Institute for Disaster Resilience and Commonwealth Home Affairs' *Land Use Planning for Disaster Resilient Communities Handbook 2020*¹⁴ in its 2020-2024 Flying Fish Cove consultations.

The vulnerability of the Kampong area is identified in SOCI's 2015 Local Planning Strategy that specifically advocates at page 46: *"Develop a long-term residential transition plan (20-30 years) for the Kampong towards safer existing and new urban areas"*

The SOCI resolved at its 22 September 2020 Ordinary Council Meeting to initiate a formal dialogue with the Kampong residents to collaboratively explore a future sustainable planning and social approach in response to on-going climate change induced risks at Flying Fish Cove. The SOCI subsequently facilitate two workshops where relocation possibilities at Phosphate Hill, Silver City and Taman Sweetland were explored with sustained interest from the community.



Capton: Extract from Issue 720, *The Islander*, October 2nd 2020 – Kampong Coastal Risk Dialogue Meeting

As part of the Housing Support Program -Stream One initiative, SOCI has presented the Phosphate Hill and Silver City proposed structure plans (ref. following maps) at public meetings at the Kampong on the 7 and 14 November 2024 to further gauge the community's sentiments and expectations associated with these more detailed plans. It was subsequently agreed the SOCI would prepare a questionnaire to be issued to

¹⁴ <https://knowledge.aidr.org.au/resources/handbook-land-use-planning-for-disaster-resilient-communities/>

each household to refine aspirations in terms of future relocation to either Silver City or Phosphate Hill and the desirable housing type being on single 900m2 lots or apartment format.

As of November 2024, the Kampong population is 427 of which 147 are children. In 2021 the average Australian household size was 2.5. This indicates that the orderly relocation of the residents could require the identification and protection of suitably zoned land to accommodate up to 170 dwellings on freehold lots or strata apartments.

CIWA were unable to engage with Flying Fish Cove residents as requested by the Shire regarding future relocation needs. The planned Q4 2024 engagements were postponed to Q1 2025. However, a cyclone in February and two tropical lows in the subsequent weeks did not present an opportunity to engage Flying Fish Cove residents who experienced significant weather impacts in Q1 2025. CIWA notes the Shire seeks to deliver the questionnaire in 2025.

Appendix Item 1–

Successful grant recipients in the April 7th 2022 WA State SHERP Grant announcement -

Organisation	Location*	Total grant value
55 Central Inc	Maylands	\$258,028
Aboriginal Biodiversity & Conservation Foundation	Carnarvon	\$4,012,02
Accordwest	South Bunbury	\$1,420,192
Albany Youth Support Association	Albany	\$371,955
Amaroo Care Services Inc.	Geraldton	\$1,938,245
Autism Association of Western Australia Inc.	Shenton Park	\$1,082,310
Bethanie Housing Limited	Northbridge	\$3,870,049
Brightwater Care Group Limited	Osborne Park	\$865,157
Broome Community Housing Group	Broome	\$2,308,347
Bunbury Housing Association Inc.	Bunbury	\$2,446,210
Community Housing Limited	Geraldton	\$6,738,861
Connect Victoria Park Inc.	Victoria Park	\$953,140

Co-operation Housing	Hamilton Hill	\$89,499
Eastern Region Domestic Violence Services Network Inc.	Midland	\$396,184
Foundation Housing Ltd	Leederville	\$1,723,921
Housing Choices Western Australia Ltd	Burswood	\$6,746,120
Indigo Junction	Midland	\$5,038,172
Mawarnkarra Health Service	Roebourne	\$497,909
Menzies Aboriginal Corporation	Menzies	\$858,625
Mission Australia	Cloverdale	\$85,579
Mosaic Community Care	Jandakot	\$152,578
Multicultural Services Centre of Western Australia	North Perth	\$45,053
Murchison Region Aboriginal Corporation	Geraldton	\$221,313
Newman Women's Shelter	Newman	\$500,000
Noongar Mia Mia	Maylands	\$191,542
Nulsen Group	Cannington	\$135,474
Pat Thomas House Inc.	Mandurah	\$487,215

Pathways SouthWest Inc.	Bunbury	\$344,136
Rise Network Inc.	Middle Swan	\$249,630
Rocky Bay Ltd	Mosman Park	\$2,446,153
Ruah Community Services	Subiaco	\$792,735
Share & Care Community Services Group Inc.	Northam	\$460,216
Shire of Boyup Brook	Boyup Brook	\$143,340
Shire of Donnybrook-Balingup	Donnybrook	\$2,866,825
Shire of Williams	Williams	\$386,494
South West Refuge Inc.	Perth	\$10,333
Southern Aboriginal Corporation	Albany	\$742,207
Southern Cross Housing Limited	Rivervale	\$400,330
St Bartholomew's House Inc.	East Perth	\$769,353
St Vincent de Paul Society (WA) Inc.	Canning Vale	\$1,565,518
Stellar Living Limited	Thornlie	\$411,130
Sun City Care Inc.	Geraldton	\$500,000

The Goldfields Indigenous Housing Organisation (GIHO)	Kalgoorlie	\$147,490
UnitingCare West	Perth	\$728,711
West Court Retirement Village Inc.	Kondinin	\$86,951
Yaandina Community Services	Roebourne	\$94,934
Zonta House Refuge Association	Shelley	\$950,831

Appendix Item 2:

https://www.housing.wa.gov.au/investorsandpartners/communityhousingorganisations/registeredproviders/Pages/registered_providers_under_community_housing_regulatory_framework.aspx

Registered Providers in WA

List of Providers Registered under the Community Housing Regulatory Framework

Provider's Name	Category of Registration	Registration Date	Registration Status	Primary Jurisdiction	Other Jurisdiction	Enforcement Action*
St Vincent de Paul Society (WA) Inc.	Tier 3	16 April 2021	Approved	Western Australia	None	1
St Bartholomew's House Inc.	Tier 3	22 Dec 2020	Approved	Western Australia	None	1
Narrogin Cottage Homes Inc.	Tier 3	9 Jul 2019	Approved	Western Australia	None	1
Mosaic Community Care Inc.	Tier 3	9 Jul 2019	Approved	Western Australia	None	1
Bethanie Housing Limited	Tier 2	15 Apr 2019	Approved	Western Australia	None	1
Activ Foundation Inc.	Tier 3	8 Apr 2019	Approved	Western Australia	None	1
Southern Cross Housing Limited	Tier 2	25 Mar 2019	Approved	Western Australia	None	1
Zonta House Refuge Association Inc.	Tier 3	12 Mar 2019	Approved	Western Australia	None	1
Rise Network Inc.	Tier 3	6 Dec 2018	Approved	Western Australia	None	1
Autism Association of WA Inc.	Tier 3	4 Dec 2018	Approved	Western Australia	None	1
Advance Housing Limited	Tier 2	4 Dec 2018	Approved	Western Australia	None	1
Bunbury Housing Association Inc.	Tier 2	28 Nov 2018	Approved	Western Australia	None	1
Co-operation Housing	Tier 3	25 Oct 2018	Approved	Western Australia	None	1

UnitingCare West	Tier 2	19 Oct 2018	Approved	Western Australia	None	1
Indigo Junction Incorporated	Tier 3	23 Aug 2018	Approved	Western Australia	None	1
Agencies for South West Accommodation Inc.	Tier 3	26 Jul 2018	Approved	Western Australia	None	1
South West Refuge Inc.	Tier 3	27 Jun 2018	Approved	Western Australia	None	1
Foundation Housing Limited	Tier 1	27 Jun 2018	Approved	Western Australia	None	1
Nulsen Group Limited	Tier 3	17 May 2018	Approved	Western Australia	None	1
Housing Choices Western Australia Limited	Tier 1	16 Mar 2018	Approved	Western Australia	None	1
St. Patrick's Community Support Centre	Tier 3	15 Mar 2018	Approved	Western Australia	None	1
Richmond Wellbeing Inc.	Tier 3	21 Dec 2017	Approved	Western Australia	None	1
Mission Australia Housing Limited	Tier 1	21 Dec 2017	Approved	New South Wales	Western Australia	1
Community Housing Limited	Tier 1	3 Nov 2017	Approved	New South Wales	Western Australia	1
Salvation Army Housing Limited	Tier 2	23 Oct 2017	Approved	South Australia	Western Australia, Tasmania	1
Stellar Living Limited	Tier 2	23 Oct 2017	Approved	Western Australia	None	1