PLANNING REPORT

Proposal to Amend the NT Planning Scheme:
Rezoning to MD, MR, C and PS Zones

Portion 2167 (94) Boulter Road, and
Sections 4278 (32) and 4279 (38) Bowerlee Road, Berrimah

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1.0 INTRODUCTION

This report has been prepared on behalf of Elias Investments and considers the land at Portion 2167 (94) Boulter Road, and Sections 4278 (32) and 4279 (38) Bowerlee Road, Berrimah. The proposal is to amend the Northern Territory Planning Scheme, pursuant to Section 13(1) of the *Northern Territory Planning Act*. The specific amendment comprises the Northern Territory Planning Scheme, Darwin Zone Map.

A detailed statement describing the proposed amendment is contained in Section 3.0 of this Report. In summary, the submission seeks to rezone Portion 2167 (94) Boulter Road, and Sections 4278 (32) and 4279 (38) Bowerlee Road from CP (Community Purpose) and RL (Rural Living) Zones, to MD (Multiple Dwelling), MR (Medium Density Residential), C (Commercial), and PS (Public Open Space) Zones. The proposed amendment will facilitate residential use, development of a neighbourhood centre, open space and drainage requirements in accord with the Berrimah North Area Plan. The development will assist in meeting the demands for developable residential land that is well serviced and located.

In preparing this submission, MasterPlan NT has examined the existing and proposed zoning implications, considered the most relevant provisions of the Northern Territory Planning Scheme and *Northern Territory Planning Act*, along with the Berrimah North Area Plan and other relevant Northern Territory strategic planning documents. Investigations have also included detailed land capability research, a land use and amenity assessment, service and infrastructure capacities including access and stormwater, and market/growth investigations.

Throughout the planning phase, consultation was undertaken with authority and referral agencies in order to identify issues and confirm suitability of the land for the proposed land use. Agencies consulted included the Department of Lands, Planning and the Environment (including Strategic Lands Planning and Development Assessment Services), Department of Transport, City of Darwin and the Power and Water Corporation.
2.0 SITE AND LOCALITY DESCRIPTION

2.1 Description of Subject Land

The subject land comprises the following:

- **94 Boulter Road, Berrimah**, formally recognised as Portion 2167 Hundred of Bagot, identified on S75/41 and CUFT 702 505 (order 1), being 8.42 hectares. This land is rectangular in shape and comprises a frontage to Boulter Road of 407.985 metres, and to Vanderlin Drive of 191.61 metres. This land contains a 51.295 metre electricity supply easement to the Power and Water Corporation, located part-way along the northern site boundary with a total width of 5.5 metres.

  The land at 94 Boulter Road is currently used for community living purposes and is occupied by the Yilli Rreung Housing Aboriginal Corporation, with 42 multiple dwellings in total. A number of buildings adjacent Vanderlin Drive are used as offices. The site also contains a caretakers’ residence, training buildings, a community hall, a swimming pool and outdoor recreation areas. Areas of land, including in the north-eastern corner of the site, and at the west of the property are currently vacant. The south-western corner of the site is used for warehousing and storage purposes. The land at 94 Boulter Road has an existing driveway to both Boulter Road and Vanderlin Drive.

- **32 Bowerlee Road, Berrimah**, formally recognised as Section 4278 Hundred of Bagot, identified on LTO91/074 and CUFT 775 490 (order 1), being 2.06 hectares in total. This land is irregular in shape, with a frontage of 62 metres to Bowerlee Road. The land contains a 7.5 metre wide drainage easement to the NTG along the northern boundary, and along the northern section of the eastern side boundary to a depth of 6.5 metres.

  The land at both 32 and 38 Bowerlee Road is used for rural living. Both lots contain single dwellings, with established vegetation, including mango plantations to the rear. The dwelling at 32 Bowerlee Road contains a single driveway crossover to Bowerlee Road at the eastern part of the frontage, whereas 38 Bowerlee Road contains two separate driveway crossovers.

- **38 Bowerlee Road, Berrimah**, formally recognised as Section 4279 Hundred of Bagot identified on LTO91/074 and CUFT 746 645 (order 1), being 2.09 hectares in total. This land is triangular in shape, with a frontage of 44.85 metres to Bowerlee Road. The land contains a 7.5 metre wide drainage easement to the NTG along the northern boundary.

  Title Documents for the site are contained in Attachment A. A Site Plan is contained within Attachment B. The land is generally flat, and covers 12.57 hectares in total.
2.2 Description of Locality

The location of the land in relation to the surrounding zones, and surrounding services and facilities is identified in Attachment B.

The site is located in Berrimah, part way between Darwin and Palmerston. Berrimah comprises service, commercial, industrial, business and employment uses along the Stuart Highway, however further north around Boulter Road, the area known as ‘Berrimah North’ comprises a mixture of community purpose, vacant residential, light industrial, rural, and rural living uses.

The site specifically comprises land located between Boulter Road and Bowerlee Road, currently zoned for community purpose and rural living uses.

Within the immediate locality, the following land uses occur:

• Land to the north of Boulter Road is under development for residential use in accord with its MD (Multiple Dwelling) Zoning and further land has been cleared for this purpose. The Marrara Christian College is located further to the north-west of the site adjacent the intersection of Amy Johnston and McMillians Roads.

• The Milkwood Steiner School, and an early childhood and child care centre ‘NT Explorers’ are located to the north-east of the site, adjacent the intersection of Boulter Road and Vanderlin Drive. A CSIRO facility is located to the north-east at the intersection of McMillians Road and Vanderlin Drive. These areas are zoned CP (Community Purpose).

• Immediately adjacent the site to the east of Section 4278, and to the south of Portion 2167, land comprises a water storage facility owned by the Power and Water Corporation, and zoned U (Utilities). Land located immediately east of Section 4278 comprises an outdoor storage yard, and is zoned RL. Land located at Section 3071 to the south of the water storage facility is used as a place of worship.

• To the east of Vanderlin Drive, land at Portion 2708 comprises the Peter McCauley Police Station and the Northern Territory Emergency Centre at the intersection of Vanderlin Drive and McMillians Road, zoned CP. Land at the intersection of Vanderlin Drive and Secrett Road, land at Section 4458 is zoned CV (Caravan Parks) but remains vacant. Land further to the east comprises rural living uses, and to the south of Secrett Road comprises rural uses.
• Land at Section 4882 to the south of Bowerlee Road comprises mango and melon plantations and rural living, with land zoned R (Rural). Further south, land at part Section 6442 and Section 4303 is zoned SD42 and SD43 respectively, which provide for the development of light industrial uses, although both zones are currently vacant. Land located in the U (Utilities) Zone adjacent Vanderlin Drive comprises a kerosene-powered power station at Portion 2237 owned by the Power and Water Corporation, however a large part of this land remains vacant.

• Land immediately adjacent the site at Section 4280 accessed from Bowerlee Road is used for rural living. Immediately to the west of the site along Boulter Road, land is used for the RSPCA Darwin regional animal shelter, and a telecommunications tower. Land further to the west accessed along Crerar Road comprises various community purpose uses, including public housing, the Council for Aboriginal Alcohol Program Services, the NT Timor Chinese Association and a Christian Outreach Centre. Further to the north-west along Boulter Road, the Marrara Garden Centre and Gimbells Landscaping comprise horticultural and rural uses located in the CP (Community Purpose) and R (Rural) Zones. Section 4106 at the corner of Boulter Road and Amy Johnson Avenue is vacant, and zoned CP.

The introduction of the Berrimah North Area Plan in the NT Planning Scheme in 2010, then covering land to the north of Boulter Road only, has resulted in a changing character of the locality through the introduction of urban development along the northern side of Boulter Road. The planning principles for future development of the subject land as reflected in the current Berrimah North Area Plan are addressed further in Section 8.1 of this Report.
3.0 DESCRIPTION OF PROPOSED AMENDMENT

The purpose of the rezoning is to facilitate a residential, commercial and industrial development, as an effective extension of the existing Berrimah North urban area documented in Clause 14.1.2 of the NT Planning Scheme. The Proposed Zone and Concept Plans located at Attachment B set out the proposed land use and intended development of the land consistent with the Area Plan.

The introduction of urban uses is expected to complement existing and anticipated development in the Berrimah North locality, and to provide for additional residential land proximate to the range of services and facilities available within the Darwin region. The submission proposes to rezone 94 Boulter Road from Zone CP, and 32 and 38 Bowerlee Road from Zone RL to the following:

- Zoning to provide a development area of approximately 6.6 hectares of Zone MD (Multiple Dwelling), comprising the majority of the site. The proposal reflects the intended use of land covered by the Berrimah North Area Plan, and would introduce urban residential uses at 32 and 38 Bowerlee Road and provide that potential for the majority of 94 Boulter Road.

- Zoning to provide a development area of approximately 1.1 hectares of Zone MR (Medium Density Residential) located adjacent zoned open space and proximate to the neighbourhood centre and main bus routes.

- Zoning to provide for an approximate development area of 1.5 hectares of Zone C (Commercial), located adjacent Vanderlin Drive, and extending along part of the frontage to Boulter Road. Existing offices and administration buildings as part of Yilli Rreung Housing Aboriginal Corporation would be incorporated as part of the C Zone. This area would capitalise on frontages to both Vanderlin Drive and Boulter Road, enabling the development of a neighbourhood centre, employment and community service node to residents of the area consistent with the area plan principles.

- Zoning to provide for an approximate 9,000 square meters of Zone PS (Public Open Space), located to provide recreation and open space facilities proximate to all future residential uses within the site. The open space has also been located to provide for necessary detention basins located in accord with the Berrimah North Drainage Study (July 2014) and the principles of the Area Plan. The open space areas are in excess of the minimum 10 percent of developable residential area required and located within 150 metres of all residential areas providing ready access and meeting the principles of design for community safety. The zoned areas of open space in Portion 2167 have been specifically designated as such as the location is critical to the achievement of the Area Plan outcomes. Open space to be provided as part of the development of the Bowerlee Rd lots will be established as part of the development of that land and has not been specifically zoned to provide the flexibility to reflect final detailed design outcomes.
The Concept Plan proposes a number of public roads links within the site, including a connection between Boulter Road and Bowerlee Roads, and a new access to Vanderlin Drive. These road connections are in accord with the Area Plan and provide a high level of connectivity across the subdivision area and servicing of the proposed commercial area. Public road reserves are 20 metres wide generally and can be increased where bordering open space areas if required in providing additional parking capacity. Further discussion regarding the traffic and access arrangements proposed is considered in Section 7.1 of this Report. A Preliminary Infrastructure Assessment, including servicing, traffic investigations and details of upgrades required is contained at Attachment D.

The proposed land use allocation as reflected in the zoning plan has been established in reflection of the Berrimah North Area Plan, land capability, service and infrastructure investigations, demand considerations and broader requirements for management of stormwater in the area.
4.0 BERRIMAH NORTH AREA PLAN

The Berrimah North Area Plan (Area Plan) provides the primary planning guidance for the future zoning and development of the subject land. This is set out in the Planning Principles and the Area Plans Part 1 and 2. These are at Attachment D. As primary guidance the Area Plan provides that all development shall respond to the sites natural features, particularly drainage catchments and the constraints that arise associated with Darwin International Airport. Further specific land use principles are provided and these are addressed below with reference to the subject land.

4.1 The Area Plan - Part 1 and 2

The Area Plan Part 1 designates site constraints and strategic infrastructure requirements to facilitate coordinated development. For the subject land there are no constraints identified. Infrastructure requirements are limited to the establishment of a stormwater discharge control feature on the western boundary of Portion 2167, connected to the west via swale drainage along Boulter road. It is also identified that the site will be affected by two arterial access connections to Vanderlin Drive being at the existing Boulter Road and at the southern boundary of Portion 2167.

This proposal reflects these requirements in the zoning allocation. An area of approximately 0.38 hectares is zoned PS on the western boundary of the site to provide for open space functions and the incorporation of a stormwater detention basin for up to 2000 cubic meters of storage. This is in accord with the recommendations of the Berrimah North Drainage Study developed in support of the Area Plan.

For the subject land the Area Plan Part 2 provides an indicative land use allocation for the site. This reflects Urban Residential use over the majority of the site, open space allocation on the western boundary (detention basin) and in association with a Commercial/Mixed Use node on the Vanderlin Drive frontage. Pedestrian – cycleway links are also shown on the Boulter Road and southern boundary of the site in conjunction with a new access. The zoning proposal and proposed concept plan is consistent with all of these components of the Area Plan. This is demonstrated below in discussion of the applicable Planning Principles.

4.2 Urban Residential – Planning Principles 6, 7, 8, 9, and 11

The Area Plan sets out those area that are to be developed for urban residential uses but it does not specify the densities at which that development is to occur other than where constrained by the biting insect buffer, which is not applicable to this land. Development guidance is provided by a number of principles to meet the objective of “Creating a safe and viable mixed-use urban residential environment”. 
Principle 6

This principle provides that residential development should be outside the 20 ANEF contour, provide a safe, efficient and walkable neighbourhood with diverse and climate responsive housing. Higher residential densities are noted as appropriately located in proximity to the neighbourhood centre and public transport. Road networks are promoted as being highly connected and facilitating pedestrian, cyclist and public transport use.

The proposed zoning allocation and land use concept are consistent with these principles to the extent that can be achieved by zoning.

- The residential land use allocation is for both medium density and multiple dwelling development. This provides for a range of opportunities up to four storey units at a range of unit sizes and densities. Importantly areas of MR zoning are located in proximity to Vanderlin Drive and the proposed neighbourhood centre. This will provide ready access to the services and opportunities that develop in this centre and the key public transport stops nearby. This site is also in proximity to an area of open space that will be developed to form an attractive extension of the commercial centre as part of the development of a strong local community and creating a vital commercial centre.

- The proposal provides for a primary transport structure that is highly permeable. This is achieved through connecting Bowerlee Road to Boulter road and establishing the necessary reserve within the subject land for a connection to Crerar Road. An additional connection to Vanderlin Drive also provides for distribution of traffic across an additional east–west link within the development area. This is also aligned to provide for future connection through to Crerar Road. In addition to traffic distribution advantages this network provides direct access from the residential areas to the neighbourhood centre thereby ensuring that over 95% of the subject land is within a five minute walk of this facility and the associated public transport access. This road design will thereby also achieve the principle of encouraging pedestrian and cyclist transport in the development.

Principle 7

Principle 7 provides a number of more detailed design requirements with the objective of creating a compact, walkable and viable neighbourhood. The proposed zoning demonstrates consistency with these requirements as follows:

a) Locate the centre to maximise opportunities for direct access via cycle and pedestrian corridors and to benefit from exposure to passing traffic.

b) Provide an interconnected street network supporting access, route choice and designed with priority for safe and convenient walking and cycling.
c) Provide a collector road through the neighbourhood centre, designed to support efficient 
public transport, the pedestrian and cyclists network, and with street trees to provide shade and 
visual amenity.

d) Provide convenient access to open space.

Principle 8

This principle requires a focus on local community needs and opportunities for employment by providing 
a community focused neighbourhood centre accommodating commercial and business activities.

Principle 9

This principle requires a number of design mechanisms to be addressed to ensure provision of housing 
choice in appropriate locations.

a) Create a mix of lot sizes single, multiple, and medium density dwellings, supporting a mix of 
housing types including small-lot single dwellings.

b) Locate higher density housing, and any accommodation for aged persons or people requiring 
assistance close to the neighbourhood centre.

c) Reduce residential density where land is affected by constraints such as biting insects.

Review of the proposed zoning against the Urban Residential zoning principles of the Area Plan shows 
that these have been complied with in the development of the plan and the design will facilitate the 
objectives of the plan being achieved.

Principle 11

This principle requires a number of design mechanisms to ensure provision of a safe neighbourhood with 
focal spaces able to support place making initiatives.

a) Design the neighbourhood centre to provide active interfaces to public space and create 
opportunities for casual surveillance.

b) Support community facilities that will accommodate a variety of uses and be adaptable to 
changing neighbourhood requirements over time.
4.3 Commercial /Mixed Use – Planning Principles 12 and 13

The integration of commercial facilities is critical in the development of a balanced, serviced urban environment. The Berrimah North Area Plan contemplates a significant population increase in the area and recognises the need for the development of an adequate local neighbourhood centre to support and service this population. The Area Plan nominates a portion of land at 94 Boulter Road for development as a neighbourhood centre and encourages a compact development form within a 400 meter pedestrian catchment of this. The site is based on the accessibility and exposure provided by both the Boulter Road and Vanderlin Drive frontages to this site. This is reflected in the proposed zoning and demonstrated in the concept plan submitted.

Both Principles 12 and 13 primarily deal with access issues and encourage a highly connected road system that services commercial areas and links these into residential precincts. The road network proposed in the zoning plan is consistent with that set out in the Area Plan and will provide a high level of vehicle and pedestrian access to the neighbourhood centre. Accessibility and use of the centre is further facilitated by the location of the site on the main public transport route through the area that has connections to the three main transport exchanges of Darwin, Palmerston and Casuarina. In respect to Principle 13 (c) the design of the primary road network in association with this centre will also facilitate public transport into the centre through the additional provision of access to the full internal frontage of the site.

Principle 8 provides that the community focussed neighbourhood centre shall also provide for the accommodation of commercial and business needs to service the local community and provide opportunities for local employment. The designation of a site of 1.5 hectares for this centre, and the zoning as C, will ensure that the centre has the capacity to incorporate existing business/community uses in addition to new services and commercial activities for the expanding population of the area. The development of the centre, in accord with the Area Plan objectives, will depend on demand and the subsequent approvals process, however, both the site zoning, size and location, in respect to access and residential zoning, establish the appropriate framework for this to occur.

4.4 Land Use Interface

The majority of the subject land has common boundaries with either residential roads or other land designated for urban residential use under the Area Plan. The only area that is seen as providing potential land use conflict is in respect to the existing City of Darwin facility on the western boundary of Lot 2167. The Area Plan designated this area as Community Purpose indicating a continuation of public use for the foreseeable future. Buffering of this area from the proposed residential development of the remainder of Lot 2167 is provided for with the location of the 0.38 hectares of opens space/drainage site on this common boundary. This has been shown to provide an overlap with the existing kennel facility reducing any potential for conflict if this facility is still in operation at the time this land is developed.
The southern portion of the subject land is bordered by proposed urban residential land and is outside the ANEF 20 contour. This land should therefore not be adversely affected by aircraft noise in excess of that provided for under the Australian Standards for sensitive land uses.

In terms of internal land use interface, the only potential conflict area is seen as between residential uses and the neighbourhood centre. Land use designation has minimised this potential with buffering between commercial and residential uses provided in part by the proposed open space. Potential for amenity impact is also reduced through the location of MR zoning adjoining the neighbourhood centre.
5.0 DEMAND CONTEXT

5.1 Population Growth

Figure 5.1 below identifies the historic population growth as measured by the Australian Bureau of Statistics (ABS) between 2001 and 2010, and the projected population growth for Greater Darwin between 2011 and 2026 as calculated by the NT Treasury, 2013\(^1\). The ‘Greater Darwin’ region comprises the Darwin, Palmerston and Litchfield municipalities.

The NT Treasury predicts that by 2026, 164,916 persons could reside in Greater Darwin, an increase of approximately 37 percent based on the 2011 population of 120,586 persons in Greater Darwin (ABS, 2011).

Based on the current average of 2.7 persons per household, we conservatively estimate that an additional 12,715 dwellings may be required to support the population by 2026. These estimates differ from the Darwin Regional Land Use Plan which identified an additional 5,700 dwellings are required in the short term and an additional 46,000 over the next 40 years. Whichever forecast is used it is clear that there will be significant demand for additional housing in the Greater Darwin Region during the period of development of the Berrimah North area.

\(^1\) [http://www.treasury.nt.gov.au/Economy/populationprojections/Pages/default.aspx](http://www.treasury.nt.gov.au/Economy/populationprojections/Pages/default.aspx)
5.2 Residential Demand

The introduction of Zones MD and MR will facilitate additional housing within Berrimah North, and will assist in alleviating the residential shortage in the Greater Darwin region.

The June 2013 release of quarterly rental data by Australian Property Monitors identified Darwin as Australia’s most expensive capital city rental market for both houses and units, with weekly house rents at $690.00, which is $190.00 above the next most expensive capital (Sydney), and $245.00 above the national capital city average. Similarly, Darwin weekly unit rents are $50.00 above the next most expensive capital (Sydney), and $136.00 above the national average. Although the demand during the most recent quarter has slowed slightly, the change from the previous year is a 6.2 percent increase in house rental prices (national average 2.5 percent increase), and a 8.3 percent increase in unit rental prices (national average 1.8 percent increase). Although rental vacancy rates have improved since the September 2012 low of 0.6 percent, more recent rates are still the ‘tightest vacancy rate of the capital cities’, with a vacancy rate of 1.1 percent.

There are no residential sales history data in the Berrimah region from which to determine local demand for residential land, given existing uses comprise community purpose, rural and industrial uses. However, the most recent release of the Real Estate Institute of the Northern Territory in March 2013 (REINT, 2013, as reported by realestateview.com.au) identified that the median house price in Greater Darwin rose by 1.7 percent to $578,000, and sales volume was up by almost 29 percent during the December quarter. The release identified that although there was a slight decline in the sales volume of units/townhouses by 9.1 percent, volumes are still up by 32 percent from the same time in December 2011. Overall the medium price for units/townhouses rose by 1.2 percent to $430,000.

It is expected that future housing must rely in part on the private sector for the delivery of planned dwelling outcomes. Strong demand for housing is represented by house and rental prices in the Greater Darwin region.

5.3 Commercial Context

The rezoning proposes a 1.5 hectare site Zoned C to provide for the development of a neighbourhood centre providing for local shopping and convenience needs, for local business development and employment for future residents in the locality.


This is consistent with the Area Plan designation of the site as commercial/mixed use with associated reference to it performing as a neighbour activity centre servicing the adjoining compact neighbourhood.

The proposed site is considered necessary if it is to develop as a neighbourhood centre that provides meaningful services to the local population and the opportunity for some level of local employment self-sufficiency. Working in conjunction with further commercial zoned land to the south this development does have the potential to provide local based employment above that generally applying in urban residential development. The provision of the commercial site as proposed will allow for the integration of uses additional to standard daily retail uses and provide the following benefits:

- Enable the development of local shopping and convenience uses to service both approved and future residential developments. In particular, should commercial uses be integrated at the corner of Vanderlin Drive and Boulter Road, this site would be within 1.0 kilometre of all residential areas represented within the Berrimah North Area Plan, with a number of recent development sites located within 400 metres walking distance.

- Improved local access to services, particularly should land to the east of Vanderlin Drive be developed for urban residential purposes as identified in the High Growth Scenario of the Knuckey and Ironstone Lagoons Discussion Paper. Should these areas be developed for urban residential use the resultant demand on local services, including local shopping facilities would increase substantially. Notwithstanding, this area will however provide for convenience needs for existing rural residents in the wider area, including Knuckey Lagoon to the east as existing.

- The site capitalises on frontages to both Vanderlin Drive and Boulter Road providing for the location of local services earlier than otherwise may be the case, supporting a greater range of business opportunities and providing ready access to public transport.

- Ability for incorporation of a number of the existing community business uses on the current site as redevelopment of the area progresses.

5.3.2 Activity Centre Hierarchy

A Neighbourhood Activity Centre is described in the Draft Darwin Regional Land Use Plan by reference to the Fannie Bay, Rapid Creek and Parap centres. They are also defined as serving a population within 2.0 and 5.0 kilometres with the competitive advantage being due to convenience of access to the immediate catchment. For comparison purposes the Parap, Rapid Creek and Fannie Bay sites have gross areas of approximately 3.0 hectares, 1.4 hectares and 1.3 hectares respectively. The Berrimah North neighbourhood centre will however service a larger catchment population, although of a lower overall density, due to the separation form other existing activity centres.
The catchment for the proposed commercial area will comprise approved and proposed residential uses at Berrimah North. Future development anticipated as part of the Berrimah North Area Plan is located at most, around 1.0 kilometres from the site. The location of the zone adjacent Vanderlin Drive will also provide for convenience needs for passing vehicles. The nearest commercial uses comprise the following:

- Karama shopping centre, Kalymnos Drive. This centre is located 1.7 kilometres north-west, and comprises a Coles supermarket, medical centre, optometrist, pharmacy, library, post office, newsagency, plus a bistro, tavern and a number of speciality shops and restaurants.

- Berrimah locality, Stuart Highway. A range of service commercial, commercial and industrial uses are located in the Berrimah locality, around 1.5 kilometres south of the site. Uses include a small supermarket, post office, chemist, service stations, plus various speciality shops including furniture and electrical. The locality does not provide any immediate day-to-day shopping needs, or larger supermarkets.

The commercial area is not expected to detract from existing retail uses, given the physical separation between Berrimah North and surrounding areas, including as a result of the overall distance, and lack of direct pedestrian/cyclist connections across major roads. The Karama shopping centre is not expected to be affected by the commercial component of the rezoning given:

- the limited size of centre anticipated at Berrimah North;

- the separation of 1.7 kilometres; and

- the centre is proposed primarily to cater for the new resident population of Berrimah North (rather than to cater for an existing population).

Accordingly, the existing retail hierarchy is not expected to be impacted by this proposal with the option to generate local employment opportunities seen as important for the future development of the area.

6.0 LAND USE ASSESSMENT

6.1 Physical Characteristics

The site is located within land Units 3a and 3b, which are classified as:

- 3a: flat to gently undulating upland surface, gradient 0 – 2 percent, deep red massive earths, minor yellow massive earths; and

- 3b: flat to gently undulating upland surface; gradient 0 – 2.5 percent, moderately deep yellow massive earths, minor red massive earths.
Land Units 3a and 3b are situated across a substantial portion of the Greater Darwin region and are considered physically suitable for development. The land unit map for the site is provided in Attachment B.

The site is relatively flat, cleared of native vegetation, and is not affected by seasonal inundation nor located within proximity of any identified watercourse. The Vegetation Map at Attachment B provides an indication of native vegetation in the wider area.

The site is considered physically capable of accommodating the form of development possible within the MD, MR, C and LI Zones.

6.2 Land Use and Amenity Assessment

The following considers the expected interface between land uses as a result of the proposed rezoning. The zoning of the surrounding land is identified in Attachment B. Aviation land use interface is considered separately in Section 6.3 following.

6.2.1 Urban Residential Uses

The land is surrounded by a mixture of community purpose, rural living, rural, and utility uses. A number of lots to the north of Boulter Road have approved MD residential land uses and development of these sites is significantly progressed. There will be a substantial increase in the resident population in the area as these developments are completed. Proposed land use allocation within the centre is consistent with the Area Plan.

The land at 94 Boulter Road already comprises multiple dwellings in association with the existing community purpose use of the land. The rezoning will facilitate the further development of the land in a planned manner with internal and through access and public open space provided, which will improve the residential function of the area.

The introduction of the MD Zone at 32 and 38 Bowerlee Road will expand urban residential uses further south from that indicated in the 2010 Berrimah North Area Plan. This is however consistent with the intended urban character for the locality as contemplated in the current Area Plan.

The introduction of medium density residential uses (Zone MR) at 94 Boulter Road is considered appropriate as the land is relatively unconstrained, separate from the existing low density rural residential character to the east of Vanderlin Drive, and located within the site. This zoning will also assist in facilitating the provision of additional housing to alleviate the residential shortage in the Greater Darwin region, housing choice and affordability, and the establishment of an active neighbourhood centre.

Increasing the range of densities at Berrimah North will broaden the appeal of residential living in the locality, provide housing for a wider demographic, and increase the area’s function as a new suburb.
The lack of established residential development currently within Berrimah North means that properly planned and located medium density residential development can occur with little adverse amenity impacts.

The investigations herein demonstrate that medium density residential uses can be achieved through service provision, including road, water and wastewater, open space and access to services and facilities. Any future development would also need to be consistent with the building height limits required for the safe operation of the Darwin International Airport provided by the Defence (Areas Control) Regulations.

6.2.2 Rural Living Uses

There are four lots located along the northern side of Bowerlee Road which are zoned RL, two of which are proposed for Zone MD as part of this application. Given the nature of the surrounding land uses in zones CP, R and U, rural living uses at this location are somewhat isolated. The locality of the RL Zone is affected by surrounding uses, including industrial uses directly to the south, community purpose uses to the west including multiple dwellings in association with community purpose uses, and the RSPCA animal shelter to the north.

The Area Plan recognises that these uses, where outside the 20 ANEF contour, will develop for urban residential uses and the proposal is consistent with this.

6.2.3 Rural Uses

Land at Section 4882 (25) Bowerlee Road is located in the R (Rural) Zone and comprises a mango and melon plantation. Typical land use interface issues between rural uses may occur as a result of noise from farm machinery or odour, however the small size of the land limits the intensity of broad acre agricultural practices and the land is separated by the width of Bowerlee Road. It is noted that this land is designated for light industry uses in the Area Plan and any potential for rural land use conflict is likely to only exist in the short term. The separation of the subject land from the future light industrial area by Bowerlee and future road extensions will also ensure no amenity impact from these uses.

6.2.4 Commercial Uses

Clause 5.8 of the Planning Scheme restricts the development of inappropriate uses where they are proximate to sensitive uses, including residential uses:

“3. Development should:

(a) be of a scale and character appropriate to the service function of a particular centre;

(c) respect the amenity of adjacent and nearby uses; and
(c) promote community safety in building design, having regard to adjacent and nearby uses.

The incorporation of commercial uses is expected to service demand from approved and anticipated residential uses in the wider locality.

Further, Clause 8.3 of the Planning Scheme provides for setback requirements for commercial buildings which are adjacent residential zones, including Zones MD and MR. A setback of at least 5.0 metres is required for buildings adjacent a residential boundary, including landscaping to a visual depth of 3.0 metres and a solid screen fence to a minimum height of 1.8 metres. The provisions of Clause 8.3 will apply to any future commercial development at the site where it is adjacent the proposed MD and MR Zones.

All of the proposed commercial areas are well separated from residential uses through 20 metre road reserves and open space areas. Accordingly this component of the rezoning is considered appropriate.

6.2.6 Utility Uses

The site is adjacent to Power and Water Corporation owned Section 3915, which comprises a pump station and emergency spares storage facilities. Although this site is unmanned, contractors access the site via the main access road along the northern boundary (adjacent the southern boundary of Portion 2167.

The Power and Water Corporation has advised that noise may be caused at the site, including from pump starts, valves opening and/or closing, the undertaking of repair works, and the noise of water. Further upgrades to the site for additional ground level water storage may increase noise during the construction period.

Whilst we acknowledge future residential development at the site will be affected to some extent by operations at the utility site, it is expected that noise would generally not exceed that expected in the area and will predominantly occur during business hours. Ongoing noise impact is understood to be minimal and generally contained within the site. Future dwellings will be spatially separated through building setbacks, open space provision, landscaping, and the location of the northern boundary access within Section 3915. We note that the existing use of Portion 2167 is for multiple dwellings, and that existing residents have never reported any issues to the owner of Portion 2167 in relation to noise from the adjacent site.

6.3 Aviation Land Use Interface

The interface with the Darwin International Airport (DIA) is a critical element for consideration, particularly considering the role of the airport for Defence operations.
Attachment B details the relevant airport constraints associated with the site, including the Australian Noise Exposure Forecast (ANEF) units for 2030, the Joint Civil Military N70 Chart (which details the number of noise events greater than 70dB), and the Defence (Areas Control) Regulations 1989 building height limit boundaries.

6.3.1 Noise

Australian Standard AS2021-2000 provides guidance for new development located in close proximity to airports and where land is located within ANEF contours, and is referenced in the Northern Territory Planning Scheme for the assessment of impacts from aircraft noise. The site is located outside of the ANEF 20 unit value contour, where dwellings are an ‘Acceptable’ use without the requirement for any additional noise control features.

The Joint Civil and Military Daily Noise Occurrences over 70dB(A) in 2030 Plan details the number of noise events louder than 70dB(A) over a single day, for both civil and military operations up to 2030. The level of 70dB(A) has been selected as it is equivalent to the single event level of 60dB(A) specified in the Australian Standards AS2021 as the indoor design sound level for normal domestic areas in dwellings. The site is expected to achieve between 10 – 19 noise events over 70dB(A) external to buildings in a single day.

Whilst the site will be affected to some extent by noise from civil and defence aircraft, as the site is located outside of the ANEF 20 unit value contour, the Planning Scheme does not require any attenuation measures. This is reflected in the Area Plan designation of the subject land.

6.3.2 Building Height Limits

The purpose of the Commonwealth Defence (Areas Control) Regulations 1989 is to designate and control building height limits within proximity to an airport. The designated building height limits in proximity to the subject site are identified on the Constraints Plan. As per the Regulations, all buildings higher than 15 metres within the subject land require approval by the relevant Minister.

Development in the MD and LI zones are subject to Clause 6.1, which limits the height of development to 8.5 metres above ground level. This is consistent with the maximum building heights which currently apply in the CP and RL Zones. Accordingly, development will be in accordance with the requirements of the Defence (Areas Control) Regulations 1989.

Development in Zone C will be limited by Clause 6.4 of the Scheme which requires a maximum plot ratio of 1, with the exception of residential development. Development in Zone MR is limited by Clause 7.1 which allows a maximum of four storeys above ground level, subject to relevant design considerations. Notwithstanding the building height limits of the Planning Scheme provided in Zones C and MR, building heights will need to comply with the federal Defence (Areas Control) Regulations and will require approval from the controlled agency should heights over 15 metres be proposed.
6.3.3 Lighting

The Civil Aviation Safety Authority (CASA) has power under the Civil Aviation Regulations 1998 to control ground lights where they have the potential to cause confusion or distraction from glare to pilots, including as a result of light reflecting across expansive surfaces.

Given the base zoning of MD development will require an application for planning consent and the consent authority will have the opportunity to scrutinise and enforce lighting details for individual developments. It is not expected that any lighting developed as a result of the proposed rezoning will have any effect on airport operations.

It is expected that the provisions of the Civil Aviation Regulations 1998 will also provide for the protection of Defence aircraft movements in this regard.

6.3.4 Birds

Development which may be facilitated from the rezoning including residential, and commercial uses are unlikely to contribute to the attraction of birds to the extent that birdlife will create an undue risk for aviation in the wider locality. This issue will however require management with respect to drainage basins proposed within the open space system.

As any substantial development will require an application for planning consent, the consent authority will have the opportunity to scrutinise proposed land uses and enforce specific conditions for individual developments if required.

6.4 Access to Public Services and Facilities

As identified in the Services and Facilities Plan at Attachment B, the site has access to a range of services and facilities located in the surrounding locality, including:

- educational uses, including the Milkwood Steiner School, and an early childhood and child care centre ‘NT Explorers’ located to the north-east of the site, adjacent the intersection of Boulter Road and Vanderlin Drive. Marrara Christian College is located to the north-west of the site adjacent the intersection of Amy Johnston and McMillians Roads;

- community uses including the RSPCA Darwin regional animal shelter located to the west, public housing, the Council for Aboriginal Alcohol Program Services, the NT Timor Chinese Association and a Christian Outreach Centre. The Police and Citizens Youth Club is located directly east of the site, opposite Vanderlin Drive. Although there are a large number of community uses in the locality, we acknowledge the majority of these provide a specific service and may not be directly relevant to any future population as a result of the rezoning;
• emergency services including the Police Station and the Northern Territory Emergency Centre at the intersection of Vanderlin Drive and McMillians Road; and

• recreational uses including the Flight path Golf and Outdoor Recreation Centre, and the Holmes Jungle Nature Park.

The site has access to the public bus network which provides connections between Berrimah, and major centres of the Greater Darwin region including Darwin, Palmerston and Casuarina. The closest bus stops are located directly adjacent the site along both Boulter Road and Vanderlin Drive. Bus Route 5 provides connections between Casuarina and Darwin with travel along Vanderlin Drive at regular intervals between Monday and Friday; and deviations 5A/B provide services directly along Boulter Road. Bus Route 9 provides connections between Casuarina and Palmerston, with travel along Vanderlin Drive at regular intervals Monday through to Sunday, including public holidays.

As there are limited commercial uses available in the immediate area, 1.5 hectares is proposed to be rezoned for commercial purposes. Additional commercial uses will service both the approved, and future urban residential development proposed as part of the Berrimah North Area Plan.

Over 9,000 square meters of open space is proposed as part of this application portion of which will be zoned as PS. That open space located within Lot 2167 will be specifically zoned as such as the location of these two areas is critical for the establishment of the drainage basin on the west boundary and the function and development of the commercial centre. Open space to be allocated within Lots 4278 and 4279 while shown on the concept plan is not specifically zoned as part of the proposal. Flexibility is retained for this Open space to be established in the most suitable location as part of the integrated and detailed subdivision design of these sites. This opens space will more than adequately service the local requirements of the residents of the area. Access to a range of formal active recreation facilities is provided by the proximity to the Marrara recreation grounds to the west of the site.

In the wider locality, Berrimah, located around 1.5 kilometres south provides access to a range of service, commercial, industrial, business and employment uses along the Stuart Highway. The Karama shopping centre, located around 1.7 kilometres north-west provide for shopping and medical needs.

7.0 TRAFFIC AND INFRASTRUCTURE ASSESSMENT

The following provides a summary of the Preliminary Infrastructure Assessment prepared Sinclair Knight Merz, with the report provided at Attachment C.

7.1 Access

The rezoning is proposed to be facilitated through four new accesses to the existing road network, including two along Boulter Road, one to Vanderlin Drive, and one to Bowerlee Road.
Nearby intersections to the development include the Vanderlin Drive/Boulter Road intersection, and the Bowerlee Road/Boulter Road intersection.

In consideration of the City of Darwin draft Developer Contributions Plan which is in place for upgrades to Boulter Road, and discussions with the City of Darwin and Road Network Division, the following upgrades are anticipated to enable access to the development:

- It is anticipated that the western access to Boulter Road will comprise a channelized intersection layout. It is expected this access will accommodate the majority of traffic from the development.

- The eastern access to Boulter Road will comprise a basic ‘T’ intersection, to provide access to the commercial lots and residential development. The location of existing access to the Milkwood Steiner School on the northern side of Boulter Road limits the size of intersection works in this location.

- The proposed access to Vanderlin Drive will be designed with regard for the proximity of adjacent access on the eastern side of Vanderlin Drive (although this will be relocated in the longer term), the existing intersections at Boulter Road and Bowerlee Road, and the limited width of the road reserve. This access replaces an existing driveway crossover to Vanderlin Drive on this frontage.

- The access to Bowerlee Road is proposed as a ‘T’ intersection, to provide access from the development south. This access is anticipated to enable pedestrian and vehicular connections through the site from Boulter Road.

As a result of the rezoning, improvements to the Vanderlin Drive/Boulter Road intersection, including a formal right turn lane on Vanderlin Drive, and extended left turn lanes to/from Boulter Road are anticipated. It is understood that a contribution plan is under development by the City of Darwin that will set out these requirements.

The overall approach to traffic management as required by the Area Plan has been reflected in this proposal and will provide an improved and connected traffic system in the area. This will reduce the traffic impact on each individual intersection.

It is anticipated that a formal traffic assessment will be required to detail required works at the time of subdivision if not already established through the contributions plan.

### 7.2 Drainage

The site is very flat, with a very slight fall towards the north-west of 0.4 percent on average. Runoff from 94 Boulter Road currently sheet flows in this direction towards an open unlined drain (OUD) along the southern side of Boulter Road.
Land in the wider area generally falls away from the site, including to the north of Boulter Road (where it falls north-west), to the south of Bowerlee Road (falls south-west), and east of Vanderlin Drive (falls south-east). Stormwater from Section 3915, 4277 and 3071 to the south east of the site bound by Vanderlin Drive and Bowerlee Road currently drain to an OUD within the easement located within the eastern and northern boundaries of Section 4278 and the northern boundary of Section 4279, where it eventually discharges into the OUD along Crerar Road.

The draft Development Contributions Plan prepared by the City of Darwin identifies the intentions for upgrading Boulter Road stormwater infrastructure to accommodate development both approved and anticipated in the locality. The draft Contributions Plan is currently under review by Council. The cost of the upgrades required to facilitate the development should be offset against the amount payable under the Contributions Plan.

A new easement will be required along the south-eastern boundary of Section 4278 to capture existing flow from the site which are directed east, and then south towards Bowerlee Road. The easement along the northern boundary of Section 4279 is no longer required as drainage can be directed within the north-south public road proposed within the site. The primary requirement associated with this development will be the establishment of a significant detention basis within the western portion of Lot 2167. This is designated open space and drainage on the concept plan and while having an important drainage function will be able to also function as useable open space for the majority of the year. Primary drainage from this site will occur to the west, within open swale drainage on Boulter road. The southern portion of the subject land will drain in part to this basin and in part to the extension of Bowerlee in the south.

### 7.3 Services

#### 7.3.1 Sewer

Sewer upgrades are identified based on the maximum anticipated EP (equivalent population) for the rezoning. The anticipated EP based on the maximum possible development within the residential, commercial and light industrial area is 726 persons.

Consultation with the Power and Water Corporation has indicated that due to capacity constraints, only part of Portion 2167 can connect to the existing sewerage infrastructure along Boulter Road. Development at Sections 4278 and 4279, and the remainder of Portion 2167 will ultimately need to be directed south towards the Berrimah ponds for treatment.

Notwithstanding, a temporary solution for development may be acceptable, allowing the southern sections to connect to Boulter Road infrastructure, should capacity exist at the time of development.
A temporary system requires the development of a sewerage pump station along Bowerlee Road, and a rising sewer main to connect to Boulter Road infrastructure. A contribution would be required by the developer for a new gravity sewer main to connect south, once constructed along Bowerlee Road.

Upgrades are anticipated to manage the increase in sewerage requirements along Boulter Road. Approximately 400 metres of DN225 gravity sewerage mains along Boulter Road will need to be upgraded to a DN300 pipeline to accommodate development facilitated by the rezoning.

In addition, an underground sewerage network will be required within the development to direct effluent to the existing gravity sewerage mains along Boulter Road, including infrastructure of DN150 – 300 within the site, with two DN225 sewerage outlets along Boulter Road.

7.3.2 Water

Water upgrades are identified based on the maximum anticipated EP (equivalent population) for the rezoning. The anticipated EP based on the maximum possible development within the residential, commercial and light industrial areas is 726 persons.

The Power and Water Corporation has advised that contributions will be required to upgrade existing water infrastructure in the locality, which are proposed in response to the Berrimah North Area Plan. These upgrades include to the existing DN150 water main along Boulter Road, in addition to a 2nd distribution main along Vanderlin Drive. As part of the upgrades, the water main may connect either through Portion 2167 (through a new easement requested by PWC), or within the Vanderlin Road reserve. Details of the location of the new water main can be arranged at the time of upgrade or development.

It is anticipated this infrastructure will be constructed by PWC prior to any development at the site, for which a contribution will be required. However in the instance the infrastructure is not yet developed, the developer may need to construct a section of the second distribution main to service future development.

To service development facilitated by the rezoning, a potable water network utilising DN225 pipe will be required along the public road network within the site.

7.3.3 Electricity

The total electrical demand anticipated by development facilitated by the rezoning is estimated at 3.812MVA, based on PWC guidelines and anticipated building sizes. This includes a residential load of 1.922MVA plus the commercial and light industrial loads of 1.89MVA.

Although the anticipated load cannot be fully supplied from existing high voltage reticulation, there will be approximately 2MVA capacity available in existing reticulation once the Leanyer zone substation is commissioned (anticipated 2015). In this instance, the development may be staged to postpone the additional feeder from the Berrimah zone substation.
It is anticipated that development will connect at two locations to the existing overhead high voltage reticulation along Boulter Road, and at one location to the existing high voltage reticulation along Bowerlee Road, via an extension of the existing overhead reticulation. An underground high voltage connection to the Berrimah Zone substation would then extend along Vanderlin Drive and interconnect with a new ring main unit at the site.

Within the development, underground reticulation is proposed. It is anticipated that lots will be serviced via a number of package substations that would be located to suit lot layout.
8.0 NORTHERN TERRITORY PLANNING SCHEME

The proposed amendment to the NT Planning Scheme will rezone the land from CP (Community Purpose) and RL (Rural Living) to the MD (Multiple Dwelling), MR (Medium Density Residential), C (Commercial), and PS (Public Open Space) Zones at 94 Boulter Road, and 32 and 38 Bowerlee Road.

The following assesses the intent of the existing Planning Scheme in recognition of the amendment and Concept Plan proposed.

8.1 Berrimah North Area Plan

The proposed zoning of the land is consistent with the intent and objectives of the Berrimah North Area Plan as recently adopted for exhibition. Once incorporated in the Planning Scheme this plan will supersede the 2010 Area Plan and provide the primary guidance for the development of the subject site. Consistency of the current proposal with the Draft Area Plan has been demonstrated in Section 4. As the existing Berrimah North Area Plan does not directly affect the subject site this plan does not prevent this proposal progressing in parallel with exhibition of the 2014 Area Plan.

8.2 Existing Zoning

Clause 5.21 provides the purpose statement of Zone CP:

1. The primary purpose of Zone CP is to provide for community services and facilities, whether publicly or privately owned or operated, including facilities for civic and government administration.

2. Design is expected to incorporate landscaping that will enhance the visual appearance of the development. The development of residential accommodation is to be only in association with and ancillary to the primary use of the land.

Clause 5.19 provides the purpose statement of Zone RL:

1. The primary purpose of Zone RL is to provide for low-density rural living and a range of rural land uses including agriculture and horticulture.

2. If lots are unsewered, provision for the disposal of effluent must be made on-site so that the effluent does not pollute ground or surface waters.

The proposal will facilitate urban residential and commercial uses in an area which currently contemplates community purpose uses and low-density rural living. These existing zoning do not however reflect the contemporary planning for the area which is reflected in the Draft Area Plan.
This proposal is consistent with that area plan and will introduce development opportunities for the site that will enable the Area Plan objectives to be achieved while also addressing those drainage and infrastructure requirements of the plan.

8.3 Land Use

The development of multiple dwellings will be Discretionary in the areas proposed to be rezoned to MD and MR. The MD and MR Zones also contemplate other residential uses including bed and breakfast, dependant unit, group home, home based child care centre, home based contracting, home occupation, medical consulting rooms, single dwellings, supporting accommodation, plus community centres.

In comparison to the existing CP Zone, the C Zone will restrict the development of animal boarding, educational establishments, hospitals, passenger terminals, and recycling depots, but includes the development of car parks, hostels, hotels, licenced clubs, medical consulting rooms, motel, motor repair stations, multiple dwellings, offices, restaurants, service stations and vehicle sales and hire. As described in Section 6.2 of this Report, Zone C restricts development to ensure appropriate separation to sensitive uses.

Further, the range of agricultural, horticultural and animal related land uses which are contemplated in the RL Zone including agriculture, animal boarding, domestic livestock, horticulture, intensive animal husbandry, plant nursery, retail agricultural staff, and stables would be Prohibited in the MD Zone. This is consistent with the shift of the primary use of the area from mixed use to an area predominantly of residential character where a residential amenity is required to be achieved.

8.4 General Performance Criteria

The purpose of Clause 6.1 is to ensure that the height of buildings in a zone is consistent. Clause 6.1 will apply within the MD zone, with maximum building heights limited to 8.5 metres above natural ground level. This is consistent with the maximum building heights which currently apply in the CP and RL Zones. Building heights will also need to comply with the building height restrictions set by the Defence (Areas Control) Regulations, as described in Section 6.3.

The purpose of Clause 6.4 is to provide for development that will be compatible in terms of building massing. Clause 6.4 provides that development in Zone C should have a maximum plot ratio of 1. Building heights in Zone C will also need to comply with the Defence (Areas Control) Regulations.

Clause 6.5.1 relates to the provision of sufficient off-street car parking for developments, and to ensure parking is constructed to a standard and is conveniently located. Clause 6.5.1 will be applicable to any development at the site.
The purpose of Clause 6.6 is to provide for the loading and unloading of vehicles associated with the use of the land. Uses including hospital, hotel, licensed club, light industry, motel, office, restaurant, shop, showroom sales, transport terminal and warehouses which may be contemplated within either the C or LI Zones have loading bay requirements.

The purpose of Clause 6.9 is to minimise the detrimental effects of aircraft noise on people who reside or work in the vicinity of an airport. Clause 6.9 requires that where land is subject to the ANEF 20 unit value contour line or greater, the consent authority is to have regard to the Building Site Acceptability Table of AS2021-2000. Whilst the site will be affected to some extent by noise from civil and defence aircraft, as the site is located outside of the ANEF 20 unit value contour, the Planning Scheme does not require any attenuation measures. An aviation interface assessment is provided in Section 6.3.

Residential density and height limitations of Clause 7.1 will apply to any future residential development in the MD and MR Zones. As per Clause 6.1, the maximum height is 8.5 metres and maximum number of storeys is 2 in the MD Zone. The maximum density in the MD Zone is one dwelling per 300 square metres.

Building heights in the MR Zone are a maximum of four storeys. The maximum density in the MR Zone as provided in Table A to Clause 7.1.1, as provided in Table 8.1 below.

<table>
<thead>
<tr>
<th>Number of Storeys Above Ground Level</th>
<th>1 or 2 Bedrooms</th>
<th>3 Bedrooms</th>
<th>4 Bedrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>155 square metres</td>
<td>180 square metres</td>
<td>215 square metres</td>
</tr>
<tr>
<td>2</td>
<td>125 square metres</td>
<td>170 square metres</td>
<td>210 square metres</td>
</tr>
<tr>
<td>3</td>
<td>95 square metres</td>
<td>130 square metres</td>
<td>180 square metres</td>
</tr>
<tr>
<td>4</td>
<td>85 square metres</td>
<td>130 square metres</td>
<td>140 square metres</td>
</tr>
</tbody>
</table>

As a result of the rezoning, a maximum of 106 dwellings could be developed in the MR Zone (assuming one or two bedroom multiple dwellings up to four storeys in height). Building heights will also need to comply with the building height restrictions set by the Defence (Areas Control) Regulations, as described in Section 6.3.

There are additional requirements for dwelling density in Zone C, including a dwelling density of one dwelling per 400 square metres if proposed on first level, one dwelling per 200 square metres if proposed on two upper levels, and one dwelling per 133 square metres if proposed on three upper levels. There are restrictions on residential development at ground level in Zone C as described in consideration of Clause 7.9 below.
The MD and MR Zones will require building setbacks in accordance with Clause 7.3. The setback requirements for one or two storey residential developments include:

- primary street setback: 6.0 metres, and 4.5 metres for verandahs, balconies and structures without external walls; and
- side and rear lot boundaries: 1.5 metres including structures without external walls and 0.9 metres for shade sails.

There are additional building setbacks for residential buildings if greater than two storeys at the site if proposed in the MR Zone. The following setback requirements for buildings over two storeys would apply:

- Primary street setback: 7.5 metres, and 4.5 metres for verandahs, balconies and structures without external walls.
- Secondary street setback: 2.5 metres including verandahs and balconies, and 1.5 metres for structures without external walls.
- Side and rear lot boundaries: 1.5 metres for non-habitable rooms, and 3.0 metres for habitable rooms.

In accordance with Clause 7.3.1, additional setback requirements would apply should a residential building be proposed which is longer than 18 metres in length, and where there is more than one residential building per lot.

Clause 7.5 requires for private open space for dwellings including in Zones MD and MR. Where a multiple dwelling has ground level access, 45 square metres of open space is required, inclusive of an area of minimum dimensions of 5.0 metres by 5.0 metres. Where a multiple dwelling does not have direct ground level access, the private open space area required is a minimum of 12 square metres, inclusive of an area with minimum dimensions of 2.8 metres by 4.0 metres.

Pursuant to Clause 7.5(5), communal open space is required where a multiple dwelling does not have direct access to private open space at ground level. In this instance, Clause 7.6 requires a minimum of 15 percent of the site is required as communal open space, being not less than 6.0 metres wide at any point.

The purpose of Clause 7.7 is to ensure landscaping for hostels, multiple dwellings and supporting accommodation complements and enhances the streetscape, is attractive, pleasant and contributes to a safe environment. At least 30 percent of a site that is used for hostels, multiple dwellings and supporting accommodation will be required for a multiple dwelling development in the MD Zone.
The purpose of Clause 7.8 is to promote site-responsive designs for hostels, multiple dwellings and supporting accommodation. Clause 7.8 requires that building design should be correctly orientated, achieve passive design features and allow breeze penetration and circulation. Clause 7.8 also requires that building design should minimise expanses of blank walls and reflective surfaces, achieve visual and acoustic privacy, and provide varying building heights, setbacks and facades. Servicing, including ducts and air conditioners should be concealed. Clause 7.8 will apply for a multiple dwelling developments in the MD and MR Zones and will assist in ensuring an attractive and site-responsive development.

The purpose of Clause 7.9 is to ensure residential development in Zones C and TC does not prejudice the use and development of the site for commercial and retail activity in accordance with the purpose of the zone. Clause 7.9 states that in Zones C and TC, a site is only to be used or developed for a residential building where the development includes, on the ground floor, occupancies for commercial activity that is consistent with the service function of the site.

Clause 8.1 provides requirements for the development of uses in commercial zones, including Zones CV, CL, GI, DV, OR and CN. Specific to this rezoning, Clause 8.1.1 limits the development of shops in Zones LI to 200 square metres, permits the change of use between restaurant and shops in Zone C, and provides additional design requirements for the development of service stations and child care centres.

Clause 8.2 provides requirements to ensure site-responsive commercial, civic, community, recreational, tourist and mixed-use developments which are attractive and which contribute to a safe environment. The provisions require a development which is sympathetic to local character, adds variety and interest at the street level, maximises energy efficiency, conceal service equipment, and provides for pedestrian and cyclist access and facilities. Any future commercial development in Zone C will be subject to the requirements of Clause 8.2.

Clause 8.3 provides for setback requirements for commercial buildings which are adjacent residential zones, including Zones MD and MR. A setback of at least 5.0 metres is required for buildings adjacent a residential boundary, including landscaping to a visual depth of 3.0 metres and a solid screen fence to a minimum height of 1.8 metres. The provisions of Clause 8.3 will apply to any future commercial development at the site where it is adjacent the proposed MD and MR Zones.

8.5 Subdivision Criteria

Clause 11 of the NT Planning Scheme provides for the different subdivision requirements for each zone, with the purpose of ensuring that land will be of a size capable of accommodating potential future uses. As a result of the rezoning, the minimum lot size will decreased from 2.0 hectares in the Zone RL, to 300 square metres in Zone MD. There is no minimum lot size in Zone C.

The purpose of Clause 11.1.4 is to ensure that new ownership arrangements resulting from a unit title scheme subdivision allow each element of the development to continue to be available to the occupants
of the development, that older developments are upgraded, and that development will not have a detrimental environmental effect on the land or result in a loss of amenity in the locality.

Should areas of the site be subdivided as a unit title scheme, then the subdivision would need to meet the performance criteria of Part 4 of the Planning Scheme, including car parking, loading bays, private open space, and communal open space. A unit title subdivision will also need to be consistent with the minimum lot sizes and requirements, and to ensure all infrastructure is provided to the site. The relevant performance criteria of the Planning Scheme which will be relevant to the assessment of future proposals is described in Section 7.4 of this Report.

Clause 11.1.4 also requires the consideration of areas set aside for communal storage and infrastructure is part of common property, and that all required services can be connected via the proposed public road.

The purpose of Clause 11.2.1 is to ensure that residential subdivisions respond to the physical characteristics of the land, are appropriately integrated, and contain lots of an appropriate size, configuration and orientation suitable for residential purposes. Specific provisions which will apply to future development include:

“2. Residential subdivision design should:

(a) avoid the development of land of excessive slope, unstable or otherwise unsuitable soils (eg seasonally waterlogged) and natural drainage lines;

(b) retain and protect significant natural and cultural features;

(c) avoid development of land affected by 1% AEP flood or storm surge event;

(d) retain and protect natural drainage lines and any distinctive landform features or stands or natural vegetation and incorporate them in public open space.”

The site does not include any areas of excessive slope, seasonally waterlogged soils, natural or cultural features, land affected by floods, or vegetation, and accordingly the subdivision of the land should not be constrained by these features.

The purpose of Clause 11.2.2 is to ensure that residential subdivisions are integrated with infrastructure, community services and facilities. Clause 11.2.2 provides:

“2. Residential subdivision design should:

(a) provide a high level of internal accessibility and external connections for pedestrian, cycle and vehicle movements;

(b) provide links to schools, commercial facilities and public transport facilities;
(c) provide traffic management to restrain vehicle speed, deter through traffic and create safe conditions for all road users;

(d) incorporate street networks capable of accommodating safe and convenience bus routes with stops within a 400m radius of a majority of dwellings;

(e) provide for connection to reticulated services;

(f) provide a minimum of 10% of the subdivision area as public open space which:

(i) ensures the majority of dwellings are within 400m walking distance of a neighbourhood park;

(ii) incorporates recreational open space in larger units available for active leisure pursuits;

(iii) in unencumbered by drains and has sufficient flat area for informal recreation; and

(iv) is designed to provide a safe environment for users by allowing clear views of the open space from surrounding dwellings or passing vehicles.

The rezoning will facilitate the eventual residential subdivision of the land. The Concept Plan, enclosed at Attachment B demonstrates the location of a proposed road connection through the site to provide for connections between Boulter and Bowerlee Roads. A public road in this location is expected to increase connectivity to existing services and facilities in the locality and provide for connection to reticulated services.

The purpose of Clause 11.2.3 is to ensure residential subdivisions contain lots of a size, configuration and orientation suitable for residential purposes. Clause 11.2.3 provides:

“2. Residential subdivision design should provide that:

(a) lots have sufficient area and appropriate dimensions to provide for the proposed density of developments including dwellings, vehicle access, parking and ancillary buildings;

(b) lots conform with the building envelope requirements in the table to this clause;

(c) there are no battleaxe lots;

(d) lots are oriented to allow dwellings to take advantage of environmental conditions such as prevailing breezes and sunlight;
(e) lots are connected to reticulated services;

(f) potential land use conflicts are minimised by taking account of the visual and acoustic privacy of residents; and

(g) where there are lots for medium and higher density residential development, those lots are:

(i) distributed in small groups serviced by public transport;

(ii) in close proximity to public open space and with adequate access to community facilities and services; and

(iii) not located in a cul-de-sac.”

Any subdivision will need to demonstrate compliance with Clause 11.2.3 including appropriate lot size and configuration, and to ensure dwellings have access to prevailing breezes and sunlight. Investigations contained in Attachment C have demonstrated that with various upgrades, and site can be serviced.

An assessment of land use and amenity is contained in Section 6.2 of this Report. The provision of open space areas between light industrial and commercial areas proposed is expected to minimise any potential for land use conflicts. There are provisions of the Planning Scheme, including the zone purpose statements of Zones C and LI, plus Clause 8.3 which assist in ensuring appropriately designed development to prevent land use conflict.

The medium density residential area is centrally located, directly adjacent a central open space area, and accessible from the proposed public road network. Accordingly, the rezoning complies with the requirements of Clause 11.2. It will also form an important component of the development of an active neighbourhood centre that will contribute to the development on a strong local community.

9.0 CONCLUSION

The rezoning will facilitate the introduction of urban uses at the site in the MD, MR and C Zones and is expected to complement existing and planned development along Boulter Road. The rezoning will also provide for the extension of urban residential uses in an unconstrained area proximate to a range of services and facilities, and assist in meeting the demands for developable land in Darwin.

The land is physically capable of accommodating the rezoning. The concept plan includes the intended location for an internal road network to facilitate access and traffic flow. It is anticipated that service infrastructure can be provided to the site, and safe and efficient access can be achieved, although upgrades will be required.

The proposal is consistent with the Draft Berrimah North Area Plan which identifies ‘urban residential’ uses at the site. The proposal introduces medium density residential uses which will broaden the appeal of
residential living, provide housing for a wider demographic, and increase the areas functionality and vitality as a new suburb. The land is relatively unconstrained, proximate to the Greater Darwin region, and separate from the existing low density rural residential areas to the east of Vanderlin Drive.

The integration of commercial uses concentrated at the Vanderlin Drive/Boulter Road intersection will complement existing community uses in this location, and is appropriately sized to service future populations. The introduction of commercial uses will service future urban residential uses in the wider locality, provide employment opportunities and assist in the creation of a commercial and community ‘heart’ for the Berrimah North locality.

The proposal reflects the contemporary planning of the Draft Berrimah North Area Plan in the provision of a range of residential density development opportunities, increased connectivity in residential design and a focus on the establishment of a viable neighbourhood centre. The rezoning also provides for the development of largely unconstrained land in proximity to a range of services and facilities within the Greater Darwin region and addresses the primary drainage infrastructure requirements to ensue overall coordinated and effective development overall.

The applicant and sub-consultants have consulted with Strategic Lands Planning within the Department of Lands, Planning and the Environment, the Department of Transport, City of Darwin, and the Power and Water Corporation. Information and findings from all consultation has been considered and incorporated within the approach contained herein.

Overall, we respectfully submit that the proposed amendment is appropriate within the context of the immediate and greater locality, accords with existing planning policies and objectives, and will increase the range of suitably zoned and serviced residential land at Berrimah.

Nigel Bancroft
MasterPlan

Attachments:  
Attachment A: Title Documents.
Attachment B: Plans.
Attachment C: Preliminary Infrastructure Assessment.
This plan represents a concept only for development of the sites based on the draft Berrimah North Area Plan. Final development outcomes will be dependent on detailed design and the finalised Area Plan.
Location Plan

ZONING

94 Boulter Road
32 Bowerlee Road
38 Bowerlee Road
BERRIMAH

Subject Site
Community Purpose
Restricted Development
Utilities
Main Road
Tourist Commercial
Caravan Park
Multiple Dwelling
Rural Living
Rural
Restricted Rural Residential
Commonwealth Land
ANEF 2030
Airport Constraints Plan

BUILDING HEIGHT LIMITS

94 Boulter Road
32 Bowerlee Road
38 Bowerlee Road
BERRIMAH

Subject Site
Defence Area Control Regulations: Structures higher than 7.5m require approval
Defence Area Control Regulations: Structures higher than 15m require approval

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1:5000
A3
100m
Land Units Plan
94 Boulter Road
32 Bowerlee Road
38 Bowerlee Road
BERRIMAH

Subject Sites
- Water course
- Short steep slopes and rises; gradients 5-15%; shallow gravelly lithosols; Eucalypt woodland.
- Gentle sideslopes; gradient 2-5%; moderately deep gravelly yellow massive earths, minor lithosols; Eucalypt open woodland to woodland.
- Flat to gently undulating upland surface; gradient 0-2%; deep red massive earths, minor yellow massive earths; Eucalypt open forest.
- Flat to gently undulating upland surface; gradient 0-2.5%; moderately deep yellow massive earths, minor red massive earths; Eucalypt woodland to open forest.
- Flat to gently undulating upland surface; gradient 0.5-2%; wet-season water table; hardsetting deep mottled yellow massive earths; variable woodland, minor open forest.
- Gently lower slopes; gradient 0.5-1.5%; wet-season water table, hardsetting deep mottled yellow massive earths; mixed species open forest, minor woodland.
- Upland depressions and floodways; gradient <1%; moderately deep to deep siliceous and earthy sands; grassland dominant with minor woodland.
- Swamp depressions; gradient negligible, <0.5%; ponded drainage; friable apedal mottled yellow; open to closed forest of Melaleuca spp.
Subject Sites

Water course

Eucalyptus tetradonta, E. miniata open forest with Sorghum intrans and Heteropogon triticeus grassland understorey.

Eucalyptus tetradonta, E. miniata woodland to low woodland, with mixed species mid stratum and grassland understorey.

Eucalyptus tectilia low open woodland, with E. clavigera, Xanthostemon paradoxus and grassland understorey.

Lophostemon lactifluus, Pandanus spiralis open forest, with Sorghum intrans and Pennisetum pedicellatum grassland understorey, and mixed shrubs and herbs.

Pandanus spiralis low woodland to very low open woodland, with Lophostemon lactifluus and Grevillea platyphylla. Ground layer dominated by mixed species grasses and sedges.

Sorghum intrans grassland, with Yakirra nullas, Mnelistia rotbodies and Aristida holathera.

Pennisetum pedicellatum closed grassland with Pennisetum pedicellatum. Other species include Andropogon gayanus, shrub Arachnophyllum amenzianae and vines Calopogonum mucunoides and Centrosema pubescens.

Regeneration

Melaleuca viridiflora low woodland to very low open woodland with Pandanus spiralis and Lophostemon lactifluus. Commonly includes areas of seasonal swamp.
Proposed Zoning Plan

- 94 Boulter Road
- 32 Bowerlee Road
- 38 Bowerlee Road

BERRIMAH

1:2000 @ A3

Proposed Zones:
- Commercial
- Medium Density
- Multiple Dwelling
- Public Open Space

Existing Zones:
- Community Purpose
- Restricted Development
- Utilities
- Main Road
- Caravan Park
- Multiple Dwelling
- Rural Living
- Rural
- Restricted Rural Residential

40m

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Woolner NT 0820
P: (08) 8942 2600
masterplan.com.au
Bowerlee Rd / Boulter Rd Development

PRELIMINARY INFRASTRUCTURE ASSESSMENT

- Version D
- 03 September 2014
Bowerlee Rd / Boulter Rd Development

PRELIMINARY INFRASTRUCTURE ASSESSMENT

- Version D
- 03 September 2014
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Author: Rohan Langworthy / J-P Foster/Alek Gangur
Project manager: John-Paul Foster
Name of organisation: MasterPlan
Name of project: Bowerlee Rd / Boulter Rd Development
Name of document: Preliminary Infrastructure Assessment
Document version: Version D
Project number: DB05892
1. Introduction

MasterPlan are providing planning support to the landowners of section 2167 Boulter Road, 4728 Bowerlee Road and 4279 Bowerlee Rad to enable re-zoning of the lots for multiple dwellings and medium density residential uses together with commercial and light industry as per Figure 1, a full size concept plan is also provided in Appendix A.

- **Figure 1 Development concept plan**

SKM was commissioned by MasterPlan to provide a traffic and infrastructure assessment to support the re-zoning application. This report provides a brief summary of the assessment into infrastructure covering:

- Stormwater drainage
- Sewerage
- Potable water supply
- Power supply
- Telecommunications
- Vehicle traffic
It is noted that part of the site falls under the area of consideration in the Draft Berrimah North, Boulter Road: Developer Contribution Plan for Roadwork and Stormwater Drainage prepared by the City of Darwin, as illustrated by Figure 2.

It is also noted that this site falls under the NT Planning Commission Discussion Paper: Towards an Area Plan for the Knuckey and Ironstone Lagoons Locality-Investigation into Land Use Options.

- Figure 2 Development areas
2. Drainage infrastructure

2.1. General

SKM has undertaken this conceptual design for the management of stormwater within the proposed development based on a desktop review of available topographic information and aerial imagery in conjunction with a visual site inspection. No detailed engineering survey was available. It should be noted that visual inspection was limited to areas that were publically accessible.

2.2. Consultation with City of Darwin

The Draft Developer Contribution Plan for Roadwork and Stormwater Drainage, issued November 2012 indicated that the council intends to undertake the construction of road improvements and associated underground drainage infrastructure along the entire length of Boulter Road. It is understood that the typical cross-section is as shown in Figure 3. Consultation with City of Darwin indicated that the developments within this area will be required to contribute to the cost of this construction.

![Figure 3 Boulter Road-Proposed Typical Section](image)

- **Figure 3 Boulter Road-Proposed Typical Section**

Discussions with the City of Darwin indicated that the timing of the upgrade of the Boulter Road as per the contribution plan is dependent on how quickly lots along Boulter Road are being developed. It is understood that if the developer proposed to construct infrastructure identified in the plan, the amount of money spent by the developer in the construction of this infrastructure, pending agreement by the City of Darwin on the scope and value of the works, may be off-set against the contribution otherwise payable under the Developer Contribution Plan. It is understood that proposed works to be undertaken by City of Darwin are yet to be designed.
An estimate of the contribution payable by this development to the City of Darwin has been provided in Section 9.

2.3. The existing site

The proposed development site spans across three existing lots, portion 2167, section 4279 and section 4278 as shown in Figure 4. Topographic information sourced from the Department of Lands Planning and Environment (DLPE) indicates that the terrain generally falls towards the north-west at about 0.4%.

- Figure 4 Existing catchment plan

Runoff generated in sections 4278 & 4279 discharges section 4280 to the west and to an open unlined drain (OUD) in an existing drainage easement along the northern boundary of sections 4278 & 4279. This OUD directs flow towards the Crera Road OUD, which runs north and connects up to the OUD on the southern side of Boulter Road.

Adjacent sections 3915, 4277 and 3071, to the south-west of the development, fall north-west towards the development. There is an OUD within the drainage reserves along the northern boundary of section 4277 and the eastern boundary of section 4278. These OUDs cut-off the majority of stormwater runoff generated by these lots and lead into the OUD on the northern
boundary of sections 4278 & 4279. However a portion of the stormwater runoff generated by section 4277 sheet flows across the eastern boundary of section 4278 where no drainage easement currently exists.

The northern part of the development, existing section 2167, discharges into the adjacent portion 1908, section 5959 and the OUD on the southern side of Boulter Road (refer to Figure 4).

The Boulter Road OUD falls west, and discharges under Amy Johnston Avenue in a series of box culverts at the end of Boulter Road.

The terrain north of Boulter Road generally falls north-west away from Boulter Road. The terrain south of Bowerlee Road generally falls away Bowerlee Road towards the south west.

The terrain east of Vanderlin Drive falls towards the south-east. Vanderlin Drive has one-way cross-fall towards the east and therefore runoff generated within the road reserve generally goes east away from the development. Some minor runoff enters section 2167 from the shoulder/verge of Vanderlin Drive as no formal drainage was provided on the western side of Vanderlin. A shallow OUD on the western side of Vanderlin Drive may be required prevent runoff from entering the proposed development.

2.4. Stormwater drainage upgrades

To satisfy the City of Darwin, the proposed development will need to meet the following requirements:

- Minor storm (Q2) to be carried in an underground stormwater network
- Major storm (Q100) to be contained within the road reserve

To accommodate flows entering the development from adjacent lots, sections 3915, 4277 and 3071, the existing easement running north along the eastern boundary of section 4278 will need to remain (refer to Figure 4 and Figure 5). A cut-off drain is required up to the north-east corner of section 4278 to capture overland flow before it can be piped underground away from the proposed development site. A possible alternative to an open unlined drain would be a concrete channel with a series of inlet pits connected to an underground pipe running along the eastern boundary of section 4278. A drainage system involving an underground pipe network will increase development costs however this may be offset by the increased developable area. An easement would still be required for maintenance however depending on the depth of the pipe, the easement width required may be reduced from 6.5m to say 3m.

A pipe from the north-east corner of section 4278 to the north/south internal development road is also proposed to replace the existing OUD to maximise developable area. For maintenance the easement will need to remain along the northern boundary of section 4278 and 4279 up to the proposed road reserve, however the easement width required may be reduced from 7.5m to say 3m depending on pipe depths. As outlined above, an underground piped system will be more expensive to construct.
The easement along the northern boundary section of 4279, to the west of the north/south internal development road, may no longer be required. It may be possible to grade section 4279, towards internal roads such that a cut-off drain between section 4279 and 1908 is no longer required.

The existing stormwater infrastructure along Boulter Road nearby the development consists of a shallow OUD. This existing OUD immediately adjacent the development is considered to be of inadequate size to accommodate the flows of the development and increasing the size of the OUD is not possible given proximity of underground services. As outlined in Section 2.2, City of Darwin plans upgrade drainage along Boulter Road to an underground system capable of receiving the proposed development network. It is however unclear from discussions with City of Darwin if these works will be completed prior to the construction of the proposed development.

If development is undertaken prior to the works by City of Darwin, the developer will be required to construct an underground culvert from the outfall of the development along Boulter Road to where the existing OUD is of sufficient size to accommodate the outfall.

- **Figure 5 Stormwater drainage concept layout**

An approximate sizing of the drainage infrastructure described above has been undertaken in accordance with Australian Rainfall and Runoff (IEAust) to determine the cost of required stormwater upgrades along Boulter Road and given an indicative layout for the internal stormwater
layout (see Figure 1). Based on preliminary sizing, the extent of the stormwater drainage required within the subdivision and along Boulter Road is estimate and shown in the table below:

### Table 1 Summary of required stormwater infrastructure

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Network inside development (m)</th>
<th>Headworks along Boulter Road (m)</th>
<th>Total (m)</th>
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<tbody>
<tr>
<td>DN450</td>
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<td>-</td>
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</tr>
<tr>
<td>DN600</td>
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<td>-</td>
<td>350</td>
</tr>
<tr>
<td>DN900</td>
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<td>-</td>
<td>200</td>
</tr>
<tr>
<td>DN1050</td>
<td>60</td>
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</tr>
<tr>
<td>DN1200</td>
<td>140</td>
<td>225</td>
<td>365</td>
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<tr>
<td>DN1500</td>
<td>200</td>
<td>-</td>
<td>200</td>
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<tr>
<td>Manholes</td>
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<td>6</td>
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</table>

A full size concept plan for the drainage infrastructure shown in Figure 5 can be seen in Appendix B.
3. Dwelling densities for sewerage and potable water networks

As per the development concept plan (see Figure 1 or Appendix A), the proposed development is to be a mix of lots zoned for Multiple Dwelling (MD), Medium Density (MR), Commercial (C) and Light Industry (LI) use. In accordance with WSAA guidelines, the EP (equivalent population) for the proposed development was estimated to size the sewerage network. The EP was estimated based on what was considered to be the worst case scenario as it was not yet clear what the densities of the proposed development areas would be. EP generated from the maximum dwelling/unit density allowable as per the NT Planning Scheme and the PWC supplements to the WSAA code was used to determine the following EP (confirmed by MasterPlan as acceptable):

- **Table 2 Generation of EP**

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<th>Zone</th>
<th>Net Area (Ha)</th>
<th>EP/Net Area</th>
<th>EP</th>
<th>Dwelling/Unit Density</th>
<th>Total Dwellings</th>
<th>EP Per Dwelling</th>
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<td>-</td>
<td>-</td>
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<td>C</td>
<td>1.17</td>
<td>35</td>
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<tr>
<td>MR</td>
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<td>136</td>
<td>71</td>
<td>1 per 85m²</td>
<td>61</td>
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<td>MD</td>
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<td>64</td>
<td>460</td>
<td>1 per 300m²</td>
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<td>Total</td>
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DRAFT
4. Sewerage network assessment

The proposed development will result in a significant increase in population density and subsequently an increase in effluent produced from the site. To effectively manage this increase in effluent an underground sewerage network within the development is proposed to directed effluent away from the site and into adjacent networks for offsite treatment.

Initial sewerage network design has been undertaken to prepare a conceptual sewerage management system for the proposed development and associated works to connect to adjacent networks. Preliminary assessment of the sewerage network within the development was undertaken in accordance with the PWC supplement to Water Services Association of Australia (WSAA) guidelines for sewerage network design and densities as outlined in section 3.

4.1. Authority consultation

Consultations with PWC regarding the sewerage network for the proposed development indicated that:

- The Developer will be required for the design and construction of upgrades of the existing DN225 sewerage main to a DN300 sewerage main from maintenance hole M/29 to maintenance hole M/33, both located on Boulter Road.
- Due to capacity constraints only the area adjacent to Boulter Road will be allowed to connect to the existing sewerage main along Boulter Road. The development areas that may connect to the Boulter Road sewerage main are areas A, B, C and D in Figure 6 below. Development on Bowerlee Road (areas E, F and G) will ultimately need to be directed south towards the Berrimah Ponds for treatment.
- A capital contribution will be required by the Developer for the new gravity main to be constructed along Bowerlee Road PWC.
- A temporary/short term solution for treatment of sewerage from areas E, F, and G via existing sewerage infrastructure may be acceptable to PWC. It is understood exiting systems may have capacity in the short term, before anticipated downstream developments occur.
4.2 Sewerage upgrades

For the purpose of preliminary sizing of the sewerage network SKM has assumed the following based on discussions with PWC outlined in Section 4.1:

- Areas A, B, C and D (refer to Figure 6) will be serviced by the existing sewerage main along Boulter Road.
- Areas E, F and G will ultimately be serviced by the future Bowerlee Road gravity main.
- Areas F, F and G will be serviced in the short term by the existing gravity main along Boulter Road.

Preliminary sizing of the sewerage network within the development indicated that two DN225 sewerage outlets at a depth of approximately 4m from the development will be required to discharge into the gravity sewerage main along Boulter Road (see Figure 7). As-Constructed information provided by PWC indicated that there is an existing DN225 gravity sewerage main heading west along Boulter Road at approximately 6.2m deep.

SKM considers the sewerage main along Boulter Road to be deep enough to service the proposed development. However as outlined in Section 4.1, PWC has advised that the existing DN225 main
along Boulter Road does not have capacity for the development and will need to be upgraded to a DN300 by the developer to accommodate the increased effluent. The section of pipe to be upgraded is approximated to be 400m in length.

It is understood that no upgrades to the Boulter Road sewerage in addition to the above mentioned works will be required.

- **Figure 7 Concept sewerage layout**
  A full size concept plan for the sewerage infrastructure as shown in Figure 1 can be seen in Appendix C. A summary of the required sewerage infrastructure is provided below:

- **Table 3 Summary of required sewerage infrastructure**

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<tr>
<td>Manholes</td>
<td>14</td>
<td>4</td>
<td>18</td>
</tr>
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Note: The above table does not include the proposed future Bowerlee gravity main to be constructed by PWC.
5. **Potable water network assessment**

The proposed development will result in increased population density and subsequently will result in a significant increase in potable water demand. To effectively manage the demand of the development a potable water reticulation network will be required. Works outside the development will also be required to connect the reticulation network to main water supplies of sufficient capacity to meet the demands of the development.

Initial potable water network design has been undertaken in order to prepare a conceptual water management system within the subdivision and connection to adjacent networks. Preliminary assessment of the water network within the development was undertaken in accordance with the PWC supplement to Water Services Association of Australia (WSAA) guidelines for water network design and densities as outlined in section 3.

5.1. **Authority consultation**

Consultations with PWC regarding the water network for the proposed development indicated that:

- In response to the Berrimah North Area Plan PWC have plans to upgrade the existing DN150 water main along Boulter Road to a DN300 water main. PWC advised that the developer will be required to contribute to this upgrade at a rate in the order of $630/EP.
- PWC has proposed a 6m wide water main easement, for a 2nd DN300 distribution main into the development, through area E (refer to Figure 6), in line with the proposed road running on the eastern side of area C.
- It is understood that a suitable alternative to the above mentioned easement for a 2nd distribution main would be considered by PWC. PWC advised that the developer’s contribution may be increased if the alternative solution requires additional infrastructure.

5.2. **Potable water upgrades**

To service the proposed development it is anticipated that a potable water network utilising DN225 pipe will be required with two connections onto the main along Boulter Road (see Figure 8). PWC advised that the existing DN150 water main along Boulter Road will need to be upgraded to a DN300 water. Based on discussions with PWC it is anticipated that the new DN300 water main will connect to the existing DN600 water main along Vanderlin Drive and continue the full length of Boulter Road.

It is anticipated that this main will be constructed by PWC prior to the construction of this development. However the developer may need to construct a section of this main to service the development if this is not the case.

As outlined in Section 5.1, PWC has advised that a 2nd distribution main into the development water network will be required. SKM propose that this 2nd distribution main is connected to the development via a main east from the storage tank in section 3915 towards Vanderlin Drive and
then east into the development via the proposed access road off Vanderlin. The developer may need to construct this main at their own expense. Alternatively if PWC construct the main then the developer may be required to pay an additional contribution in place of providing the requested easement.

It is likely that the development network will also be required to connect to the existing DN150 water main along Bowerlee Road. Based on discussions with PWC, the existing DN150 water main will not need to be upgraded.

- **Figure 8 Potable water concept layout**
  A full size concept plan for the potable water infrastructure as shown in Figure 8 Potable water concept layout can be seen in Appendix D. A summary of the required potable water infrastructure is provided below:

- **Table 4 Summary of required potable water infrastructure**

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<th>Pipe Size</th>
<th>Network inside development (m)</th>
<th>Headworks (m)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN300</td>
<td>-</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>DN225</td>
<td>1120</td>
<td>140</td>
<td>1560</td>
</tr>
</tbody>
</table>
6. Electrical power network assessment

The “Basic Supply” for the residential lots is calculated as per PWC Guidelines. As there are no specific PWC guidelines for “Basic Supply” allowances for commercial / light industry lots, we have based load on building sizes (with building sizes confirmed by MasterPlan) and made an allowance of 90VA/sqm.

The total load equates to 3.812MVA. Based on initial advice from PWC, the anticipated load will not be able to be fully supplied from existing PWC HV reticulation, however, there will be approximately 2MVA capacity available in existing HV reticulation (Leanyer Feeder 11BE01) once the new Leanyer Zone Substation is commissioned (currently anticipated in 2015). A separate HV feeder (“headworks”) will need to be installed from Berrimah Zone Substation to provide the additional capacity required for the overall proposed subdivision.

If the development is staged, then the residential lots could possibly be firstly developed (1.922MVA load) with the “headworks” then postponed until the commercial and light industry lots are developed (1.89MVA load).

It should be noted that as there are a number of other developments proposed in the Boulter Road area, the 2MVA capacity may not be available at the time this development proceeds (as some of the developments may have already commenced). This also applies to requirement of the “headworks” (as some of the developments may have already commenced, the separate feeder from Berrimah Zone Substation may already be part of those works – PWC have stated that whichever development happens first that requires the additional capacity will be responsible for “headworks” cost (unless an agreement to commit in combination and agree to share cost can be made by a number of Developers).

The proposed HV reticulation layout for the subdivision can be seen in Figure 9. The new underground HV feeder from Berrimah Zone Substation would extend along Vanderlin Drive to a new Ring Main Unit (RMU No. 1) located as shown. The new underground HV reticulation would then extend throughout subdivision and interconnect with existing overhead HV reticulation in Boulter Road via 2 off new HV termination poles (one pole would include Gas Break Switch) that would be located within vicinity of new intersections with Boulter Road and to a new Ring Main Unit (RMU No.3) in Bowerlee Road (which would then interconnect with existing underground HV reticulation in Vanderlin Drive). A concept plan of the electricity reticulation is provided in Appendix E.

Lots would be serviced via a number of package substations that would be located to suit lot layout. The new underground HV reticulation would generally follow alignment shown but would deviate to connect to package substations and Ring Main Units.

The proposed new Boulter Road/Vanderlin Drive intersection will also require an upgrade of existing street lighting which will need to comply with RND/City of Darwin standards/requirements.
and AS/NZS 1158.1.1 for Category V lighting and AS/NZS1158.3.1 for Category P lighting (would expect Vanderlin Drive to be Category V3 and Boulter Road Category P3).

Figure 9 Power supply concept layout

The budget cost estimates are as follows:

**HV “Headworks”** - $570,000 plus 10% GST.

**Boulter Road/Vanderlin Drive Intersection Upgrade Street Lighting** - $70,000 plus 10% GST.

**HV Reticulation within Subdivision (excluding package substations)** - $735,000 plus 10% GST.
7. **Telecommunications**

Based on policy information available on NBN Co’s website, the proposed development is likely to meet the requirements of NBN Co for optic fibre infrastructure. If the development does meet the requirements then NBN Co will provide optic fibre to the lots within the development.

The developer will be responsible for:

- Application for NBN Co infrastructure via the online process on NBN Co’s website
- Providing at least 3 months’ notice prior to construction works for design of network
- The cost of design and installation of pit and pipe for the optic fibre to NBN Co’s specification and standards
- Transfer of ownership of pit and pipe to NBN Co
8. Traffic assessment

8.1. Traffic generation

An initial traffic generation calculation has been undertaken for the development in order to determine the number peak hour trips. Trip rates have been taken from the RTA Guide to Traffic Generating Developments, October 202, and the subsequent Technical Direction TDT 2013/04: Updated traffic surveys. Residential development densities have been taken from the Northern Territory Planning Scheme. A summary of the peak hour trip rates is provided in Table 5.

Table 5 Summary of peak hour traffic generated by the development

<table>
<thead>
<tr>
<th>Type of development</th>
<th>Trips Veh/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential: multiple dwelling</td>
<td>238</td>
</tr>
<tr>
<td>Residential: medium density</td>
<td>31</td>
</tr>
<tr>
<td>Light industry</td>
<td>17</td>
</tr>
<tr>
<td>Commercial</td>
<td>38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>170</strong></td>
</tr>
</tbody>
</table>

A copy of the calculations is provided in Appendix G. It is noted that this is not a formal traffic impact assessment (TIA). It is expected that a TIA will be required to support any development application, and that a review of the trip rates will be undertaken at that time when further details of the development are available.

8.2. Access arrangements

The proposed development has four access points (refer Figure 10):

1) Western access point on Boulter Road, adjacent to the light industry development.
2) Eastern access point on Boulter Road adjacent to the commercial development and Vanderlin Drive.
3) An access point directly from Vanderlin Drive.
4) An access point from Bowerlee Road

In addition, there are two nearby intersections with the main road network that need to be considered:

a) Vanderlin Drive / Boulter Road intersection
b) Vanderlin Drive / Bowerlee Road intersection.
From a review of the draft Contributions Plan, and a meeting that was held with the Department of Transport’s Road Network Division to discuss Vanderlin Drive, it is expected that the following work may be required for access to the development:

1) Under the current draft Contributions Plan, the western access point on Boulter Road would be part of the roundabout access as described in document, although the roundabout location is not fixed, it is very likely that it would be positioned to suit this access.

However, following discussions with City of Darwin, a roundabout intersection may not be appropriate as there has been recent sub-division of lots, and so instead of a large intersection providing access to large lots/developments, a series of smaller intersections or accesses to smaller lots/developments would be more appropriate. As it is expected that this access will accommodate the majority of traffic from the development and serve the light industry a channelised layout would be appropriate.

2) The eastern access point will need to be a basic type T-intersection and will provide access to the commercial lots and some residential development. The proximity of the existing accesses to the Milkwood Steiner School on the north side of Boulter Road is likely to limit the size of the intersection works. A larger intersection may be possible but would involve significant works to Boulter Road in this area and the intersection with Vanderlin Drive, and reducing the need for a roundabout at the western access.
3) The access point on Vanderlin Drive will need to be limited due to the proximity of adjacent accesses on the eastern side of Vanderlin Drive, the existing intersections at Boulter Road and Bowerlee Road, and the limited width of the road reserve. As there is an existing access point near this location it can be argued that the development is relocating the access point, and that after preliminary discussions with Road Network Division, a left-in / left-out only intersection may be acceptable.

4) As the access point from Bowerlee Road is located towards the end of a cul-de-sac, it is expected to be a simple T intersection.

a) It is expected that the Vanderlin Drive / Boulter Road intersection will need to have improvements to accommodate the proposed wider Berrimah North development along Boulter Road. It is expected that the improvements will consist of a formal right turn lane on Vanderlin Drive, and longer left turn lanes to / from Boulter Road. The proposed development at Bowerlee Road will not require the full intersection works to be undertaken. A contribution towards the overall cost, or the construction of part of the scheme, e.g. a left turn lane, may be required. A formal traffic assessment and intersection analysis will be required to demonstrate what work may be required. Road Network Division favours improvements to the other end of Boulter Road at Amy Johnson Avenue, as this has a wider road reserve than Vanderlin Drive and so can better accommodate any road improvements and large volumes of traffic.

b) It is proposed to limit improvements to the intersection between Vanderlin Drive and Bowerlee Road so that drivers are encouraged to use the improved intersection at Boulter Road, and thus limit “rat-running” through the proposed development. A formal traffic assessment and intersection analysis will be required to demonstrate what work may be required.

The above works as shown in Figure 10 are summarised on the concept drawing DB05892-ECC-SK-005 in Appendix F. It should be noted that the findings above are based on a preliminary assessment only. Any application made will need to have a formal Traffic Impact Assessment undertaken to demonstrate the suitability of intersections and any improvements that are required.

8.3. Internal road layout

The road hierarchy within the development will consist of local/secondary road reserve, with a short section of minor industrial road adjacent to the light industry road reserve, typical sections are detailed on City of Darwin Standard Drawing DCC-101.

The local/secondary road reserve is 17m wide and will typically have a carriageway width of 8m. This width will be suitable for the expected level of traffic and the urban environment. A short section of minor industrial road reserve will serve the light industry zoned land. This will typically have an 11m wide carriageway that will allow larger vehicles to access the light industry units.
9. Developer contributions

As mentioned in previous sections the area around Boulter Road in Berrimah, Darwin, has been identified by the City of Darwin and Power and Water Corporation (PWC) as an area for future increase in density. Both City of Darwin and PWC have identified that upgrades to the existing infrastructure will be required to accommodate the anticipated density increase.

SKM understands that developers will be required to make a contribution to the cost of these upgrades in some form whether through a developer contribution plan or works to be constructed by the developer at their cost.

It is understood that City of Darwin and PWC have development contribution plans in place based on the Berrimah North Area Plan, however these plans do not include allowance for development on Bowerlee Road. Therefore SKM has made a best estimate on contributions from existing contribution plans and preliminary discussions with authorities.

City of Darwin and PWC have advised that infrastructure works outlined in the Development Contribution Plan undertaken by the developer may be offset against the contribution otherwise payable by the developer.

9.1. City of Darwin: roads and drainage

A draft Developer Contribution Plan has been released by the City of Darwin for contribution towards roads and drainage upgrades along Boulter Road. However we understand that this report is currently under review and is likely to be updated shortly. Due deadlines for completion of this report SKM has City of Darwin’s current draft report.

For the purpose of this estimate the contribution for infrastructure payable by the developer for this development it calculated as follows:

\[ DC = \frac{DA \times T}{TDA} \]

Where:

DC=The developer contribution

DA=The total area of the development in square metres being 125,820 square metres

T=Total cost of the infrastructure

TDA=Total developable area within the policy area being 937,840 square metres

Developer contributions payable to City of Darwin can be seen in Section 9.5.
9.2. PWC: sewerage

It is understood that the anticipated future demand from the Berrimah North Plan did not require an upgrade to the existing infrastructure along Boulter Road as such no development contribution plan was created for the sewerage network along Boulter Road.

PWC has advised that upgrades of the existing sewerage infrastructure along Boulter Road as outlined in Section 4, to accommodate the development will be born solely by the developer. An estimate for the cost of these works has been included in 9.5.

In addition to the upgrading of the sewerage network along Boulter Road, PWC has advised that the developer will be required to contribute to the construction of the new gravity sewerage main along Bowerlee Road and connection to the Berrimah Ponds. It is understood that the scope of this gravity main and contributable developments is unclear to PWC and as such an estimate of the contribution is not available. SKM has included a nominal best guess contribution of $500,000 towards this gravity main.

Developer contributions payable to PWC for sewerage works can be seen in Section 9.5.

9.3. PWC: potable water

It is understood that there is an existing developer’s contribution plan in place for potable water upgrades along Boulter Road to accommodate the demand resulting from the Berrimah North Area Plan. PWC advised SKM that lots 2167, 4278 & 4279 were not included in the Berrimah North Area Plan and the contribution plan will need to be revised to include this development. However it is understood the current contribution of $630 per/EP is in the order of the contribution the Developer will be required to pay.

As mentioned in Section 5, PWC has requested that the developer gift a 6m wide easement for a 2nd DN300 distribution main, through area E (refer to Figure 6), in line with the proposed road running on the eastern side of area C. SKM understands that the proposed easement will reduce developable area and as such SKM has proposed an alternative route for the 2nd distribution main for consideration by PWC as outlined in Section 5.

As outlined in section 5, the developer may be responsible for the construction of this alternative route or additional contribution may be payable to PWC if PWC undertakes the works.

The estimated developer contributions for potable water provided in section 9.5 has allowed for this additional infrastructure assuming no easement is gifted to PWC.

9.4. PWC: electricity

As per Section 6, PWC has advised that no contribution plan will be in place for power supply headworks. It is understood that the development that triggers the requirement for headworks will be required to pay for the works. SKM has assumed that the developer will pay for the required
headworks. Developer contributions payable to PWC for power supply works can be seen in Section 9.5.

9.5. Summary of developer contributions payable

The table below is a summary of preliminary estimates for developer contributions to authorities that may be required. The table also includes headworks that may need to be completed as part of this development if the works are not already undertaken by the service authority or another developer. Contributions calculations are been based on the following:

Total EP: 726

Total Development Area: 125,820m²
Table 6 Summary of headworks and developer contributions

<table>
<thead>
<tr>
<th>Authority</th>
<th>Service</th>
<th>Development headworks</th>
<th>Developer contribution to authority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Estimated construction costs</td>
<td>Estimated total construction costs</td>
</tr>
<tr>
<td>City of Darwin</td>
<td>Stormwater drainage</td>
<td>$2,200,000</td>
<td>$2,860,000</td>
</tr>
<tr>
<td></td>
<td>Intersections</td>
<td>$200,000</td>
<td>$260,000</td>
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<tr>
<td>Power and Water Corporation</td>
<td>Sewerage</td>
<td>$400,000</td>
<td>$520,000</td>
</tr>
<tr>
<td></td>
<td>Potable water: Boulter Road upgrade</td>
<td>$250,000</td>
<td>$330,000</td>
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<tr>
<td></td>
<td>Potable water: 2nd distribution main</td>
<td>$150,000</td>
<td>$200,000</td>
</tr>
<tr>
<td></td>
<td>Electricity</td>
<td>$600,000</td>
<td>$780,000</td>
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<tr>
<td>NBN</td>
<td>Telecommunications</td>
<td>$65,000</td>
<td>$75,000</td>
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<tr>
<td>NT Government</td>
<td>Vanderlin Drive intersections</td>
<td>$500,000</td>
<td>$650,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$4,365,000</strong></td>
<td><strong>$5,675,000</strong></td>
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</tbody>
</table>

Notes:
1) Total costs include a nominal allowance for design and consultation costs.
2) The contribution rate for City of Darwin has been adjusted to reflect an estimate of Q2 2013 rates, to allow a more accurate comparison with headwork costs and total costs to developer.
10. Other consideration

10.1. PWC’s water storage tank site

Power and Water Corporation’s Karma Tank Site (Section 3915) includes a pump station and emergency spares store. Although unmanned, Power and Water Corporation personnel and contractors can access the site at any time and the main access road on the site runs along the adjoining boundary of Section 3915 and area E of the proposed development.

Noises caused by pump starts, valves opening and/or closing, Power and Water Corporation personnel and contractors loading emergency spares for emergency repair works, vehicle traffic and operational check/fault finding and even water flowing into the tanks are likely to impact on adjoining residents.

PWC has advised that the developer will need to provide noise abatement and Power and Water Corporation will not modify existing equipment to reduce noise levels/impacts on adjoining properties. PWC has advised that for noise abatement studies, the existing use of the Power and Water Corporation site should be considered. Power and Water Corporation have advised the Victorian EPA NIRV (Noise from industry in regional Victoria – EPA Publication 1411) is a suitable study basis, and should consider adjacent Vanderlin Drive traffic impacts.

In addition, Power and Water Corporation has advised that the long term plans are for additional ground level water storage tank at its site and construction of this tank will increase noise levels/impacts over the expected two year construction period.

Power and Water Corporation has advised that there is microwave and other radio communications systems installed at its tank site to be considered. In addition, Power and Water Corporation may allow mobile phone companies to install third party mobile phone panels/masts at the site.
11. Summary

It is found that based on preliminary investigations, including consultation with relevant authorities, the proposed development can be serviced in terms of:

- Vehicle traffic
- Stormwater drainage
- Potable water supply
- Sewerage
- Power supply

The cost of servicing the proposed development, excluding all internal works, if all headworks are constructed by the developer is estimated to be $5,675,000. However if the development is delayed until such time that all headworks are undertaken by authorities, the minimum developer contribution is estimated to be $2,857,380.
Appendix A  Concept Development Plan
Appendix B  Concept Plan – Stormwater Drainage
Preliminary Investigation
Stormwater Concept Plan
DB05892-ECC-SK-0001 rev C

Bowerlee Road / Boulter Road Development

Section 5959
DN1200 RCP
DN900 RCP
DN600 RCP

Section 3915
DN1200 RCP
DN900 RCP
DN600 RCP

Section 3071
DN1200 RCP
DN900 RCP
DN600 RCP

Section 4277
DN1200 RCP
DN900 RCP
DN600 RCP

Portion 1908
Re-Shape existing drain downstream of culvert outfall

2x1200x900 RCBC 350m

New 3m wide easement proposed.

Proposed removal of existing easement

Existing 6m wide easement to remain

Reduce existing easement width from 7.5m to 3m

Reduce existing easement width from 6.5m to 3m

Catchment boundary

Proposed underground stormwater drainage network

Proposed inlet pit located in concrete cut-off drain

Stormwater runoff-direction of flow

Drainage easement boundary

Existing open drain to remain

RCP- Reinforced concrete pipe

RCBC- Reinforced concrete box culvert

DRAFT
Appendix C Concept Plan – Sewerage Network
Proposed gravity sewerage network

Existing sewerage network

Connect sewerage rising main to gravity sewerage network

Temporary sewerage rising main to be abandoned once future Bowerlee gravity main constructed.

Future Bowerlee Road gravity main to Stuart Highway

Temporary sewerage pump station

Preliminary Investigation
Sewerage Concept Design
DB05892-ECC-SK-0002 rev C

Bowerlee Road / Boulter Road Development

Concept Plan
94 Boulter Road
32 Bowerlee Road
30 Bowerlee Road
BERRIMAH

This plan represents a concept only for development of the sites based on the draft Berrimah North Area Plan. Final development outcomes will be dependent on detailed design and the finalised Area Plan.

Existing DN300 VC Pipe

Existing DN225 VC Pipe

Connect to existing DN300 PVC pipe

Existing DN300 PVC Pipe

Existing DN225 PVC Pipe

Temporary Sewerage Rising Main

DN300 PVC

DN300 PVC

DN225 PVC

DN225 PVC

DN150 PVC

DN150 PVC

DN150 PVC

DN150 PVC

BOWERLEE ROAD

DRAFT
Appendix D  Concept Plan – Potable Water Network
Existing DN150
Existing DN900
Existing DN600
Connect to existing DN600
Connect to existing DN150
DN225 PVC
DN225 PVC
DN225 PVC
DN300 PVC
DN300 PVC
DN300 PVC

Proposed potable water network
Existing potable water network

Preliminary Investigation
Potable Water Concept Design
DB05892-ECC-SK-0003 rev C

Bowerlee Road / Boulter Road Development

6m Wide easement requested by PWC for 2nd distribution main
Alternative distribution main route proposed to the 6m wide easement requested by PWC

Section 3915

DRAFT
Appendix E  Concept Plan – Electricity Network
New HV termination pole for interconnection into existing overhead reticulation

Existing DN600

Proposed underground electrical network

Existing electrical network

Proposed underground electrical network

Proposed ring main unit (not to scale)

Electrical pole

Note:
1. Number/rating of package substations to suit proposed lot layout
2. Underground HV reticulation through subdivision to suit locations of package substations
Appendix F  Concept Plan – Road Network
Intersection upgrade at Boulter Road

Limited access to development. Possibly left-in / left out.

Limited works to Bowerlee Road intersection to encourage use of Boulter Road.
Appendix G  Traffic Trip Calculation

Residential densities taken from NT Planning Scheme.

### Multiple dwellings

- **Density of housing**: 300 units/m²
- **Total area of lots is**: 7.19 ha
- **Therefore number of units is**: 240 units
- **Peak hour trip rates**: 0.99 veh/hr/unit

This is based on TDT 2013/04 for urban low density residential dwellings for evening peak.

- **Total peak hour trips**: 238 veh/hr

### Medium density

- **Density of housing**: 85 units/m²
- **Total area of lots is**: 0.52 ha
- **Therefore number of units is**: 61 units
- **Peak hour trip rates**: 0.5 veh/hr/unit

Based on section 3.3.2 for medium density residential flat building (larger unit)

- **Total peak hour trips**: 31 veh/hr

### Light industry

- **Total overall area**: 1.00 ha
- **Proportion that is GFA**: 30%

This is an estimated amount that allows for car parking, service roads and landscaping

- **GFA**: 30 x 100m²
- **Peak hour trip rates**: 0.56 veh/hr/100m²

Based on TDT 2013/014 for Sydney

- **Total peak hour trips**: 17 veh/hr

### Commercial

- **Total overall area**: 1.17 ha
- **Proportion that is GFA**: 35%

This is an estimated amount that allows for car parking, service roads and landscaping

- **GFA**: 41 x 100m²
- **Proportion that is shop**: 75%
- **Proportion that is office**: 25%
- **Peak hour rate for shop**: 0.66 veh/hr/100m²

Based on 3.6.2 for convenience store (more appropriate for this size of development)

- **Peak hour rate for office**: 1.6 veh/hr/100m²

Based on TDT 2013/04 for office block, morning peak

- **Total peak hour for shop**: 21 veh/hr
- **Total peak hour for office**: 17 veh/hr
- **Total peak hour trips**: 38 veh/hr

### Total

- **Total peak hour trips**: 324 veh/hr

**Comments on calculation record:**

- Based on TDT 2013/04 for office block, morning peak
- Total peak hour trips for office block: 21 veh/hr
- Total peak hour trips for office block: 38 veh/hr
Appendix H   Addendum 1

It is understood that following the completion of SKM’s services assessment report, Masterplan revised the concept development plan (see Figure 11). A summary of the revised features and SKM’s comments has been provided in Table 7.

- **Table 7- Summary addendum 1**

<table>
<thead>
<tr>
<th>Revised feature</th>
<th>SKM’s comments</th>
</tr>
</thead>
</table>
| 1) An increase in the proposed road reserve widths for internal roads from 17m to 20m at the request of City of Darwin. | - A 20m road reserve width is considered suitable for the main development road given the re-zoning application includes provision for light industrial lots. Refer to City of Darwin standard drawing DCC-101.  
  - It may be possible to reduce the 20m road reserve to 17m for the minor roads located in north-eastern corner of the development. Further consultation with City of Darwin will be required through the design process to confirm. |
| 2) Adjustments to proposed developable areas to accommodate the increased road reserve width. The revised areas can be seen in Figure 11. | - The reduction in developable areas will result in a minor reduction in loading on service infrastructure. It is however unlikely that this reduction will trigger significant changes to the required infrastructure. Therefore SKM’s services assessment report is still considered valid. |
Figure 11-Updated concept plan