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INTRODUCTION

Eco Logical Australia (ELA) has been engaged by Hassell Limited to provide preliminary environmental advice into the possible development of the Exmouth Foreshore (the foreshore). The following memorandum provides the results of a preliminary desktop assessment undertaken by ELA of environmental values of the foreshore and provides advice on possible opportunities and constraints for potential development of the foreshore.

Information relating to the environmental setting and values of the foreshore has been sourced from CoastWise (2001), Taylor Burrell Barnett (2011) and from visual interpretation of aerial photography.

LOCATION OF EXMOUTH FORESHORE

The foreshore area subject to this preliminary desktop assessment is located on the eastern coastline of the Cape Range Peninsula (the peninsula) and forms part of the western coastline of the Exmouth Gulf. The foreshore is located approximately 1.6 km to the east of the Exmouth town centre and extends approximately 2.6 km north from the Exmouth Marina. The Exmouth Golf Course and waste water treatment plant are located to the immediate west of the northern end of the foreshore area.

ENVIRONMENTAL SETTING – SUMMARY

Physical Environment

Landform and Geology

- Quaternary sediments make up the beach dunes surrounding the peninsula.
- The foreshore area comprises a primary and secondary dune system, which is dominated by Holocene beach sand and shingle. Behind the secondary dune lies a coastal plain system comprising shallow red clayey sands.

Hydrogeology

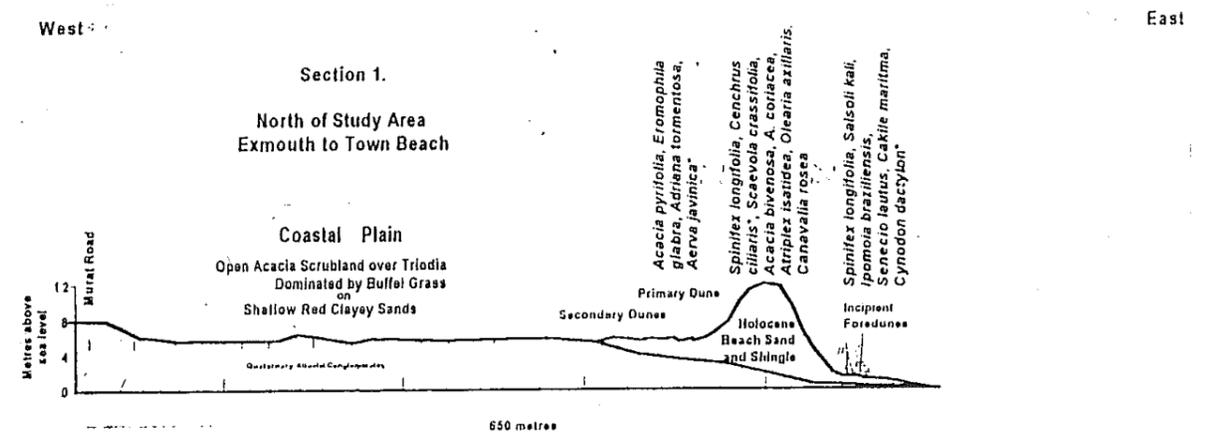
- The groundwater of the peninsula occurs in confined and unconfined aquifers.
- The unconfined aquifer of porous limestone along the eastern slopes of Cape Range between Learmonth and Exmouth contains substantial potable groundwater resources. The Exmouth water supply is sourced from the Cape Range Mound which reaches its maximum depth below the central line of the Cape Range.

- The upper part of the unconfined aquifer is permeable karst, while the underlying limestone is less permeable. In general, a 20 – 30 m thick layer of fresh groundwater overlies a saltwater wedge, with the transition zone located about 5 km from the coast.
- The unconfined aquifer is replenished by direct infiltration of rainfall and runoff from storm events over Cape Range.
- Groundwater discharges into the Exmouth Gulf and, in addition to the effects of seasonal recharge, there is a natural variation in groundwater levels and the extent of saltwater intrusion due to tidal fluctuations in the Gulf.

Biological Environment

Vegetation

- The peninsula is located in the Carnarvon Botanical District of the Eremaean Botanical Province, which extends from Shark Bay northwards to the Exmouth Gulf, and is dominated by arid, perennial shrub associations.
- The distribution of vegetation across the peninsula generally varies with geology and geomorphology, and a number of unique minor vegetation complexes can be found in the areas that are confined to the Cape Range.
- The vegetation of the foreshore area is typical of the coastal dune vegetation found along the eastern coastline of the peninsula. The incipient foredune and primary dune are dominated by *Spinifex longifolia* and the secondary dune by *Acacia pyrifolia*. The coastal plain landward of the dune system consists of an open Acacia scrubland dominated by the weed *Cenchrus ciliaris* (Buffel Grass). A diagrammatic representation of the vegetation occurring on the foreshore is shown in Figure 1.
- A search of the Department of Environment and Conservation's (DEC's) Threatened ecological communities database found no conservation significant vegetation communities (i.e. Priority or Threatened Ecological Communities) listed as occurring in the foreshore area, however a site based vegetation assessment would be required to confirm this.



Source: CoastWise (2001)

Figure 1: Land/vegetation relationships occurring on the Exmouth Foreshore

Flora

- Despite its aridity, the peninsula is very rich in flora with a range of habitat types found.
- A search of DEC's Threatened and Priority flora database identified no Declared Rare Flora (DRF) or Priority flora in the vicinity of the Exmouth Foreshore.
- A search of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Online Search Tool, identified no Threatened flora species in the vicinity of the Exmouth Foreshore.
- Although it is considered unlikely that any conservation significant flora species occur in the foreshore area, it should be noted that the area has not been subject to a flora and vegetation survey and therefore a targeted flora survey would be required to confirm the presence or absence of any such species.

Fauna

- Terrestrial fauna is rich and diverse in the Cape Range Peninsula region, particularly the reptile species.
- A search of the EPBC Act Protected Matters Online Search Tool for the area identified 13 threatened fauna species and 23 migratory species as potentially occurring in the locality of the foreshore. Only two of the 13 threatened fauna species are terrestrial fauna; *Dasyercus cristicauda* (Mulgara) and *Petrogale lateralis lateralis* (Black-flanked Rock-wallaby), and are both unlikely to be present in the foreshore area due to lack of suitable habitat. The remaining 11 threatened fauna species are marine species which are unlikely to be impacted by the proposed development of the foreshore.

Of the 23 migratory species identified, the only group that may utilise habitat in the foreshore area are the migratory bird species listed as follows:

- *Macronectes giganteus* (Southern Giant-petrel)
- *Apus pacificus* (Fork-tailed Swift)
- *Ardea Alba* (Great Egret, White Egret)
- *Ardea ibis* (Cattle Egret)
- *Haliaeetus leucogaster* (White-bellied Sea-eagle)
- *Hirundo rustica* (Barn Swallow)
- *Merops ornatus* (Rainbow Bee-eater)
- *Charadrius veredus* (Oriental Plover, Oriental Dotterel)
- *Glareola maldivarum* (Oriental Pratincole)
- The likelihood of any of the above listed species using the foreshore as roosting or foraging habitat is considered to be low however a fauna assessment would be required to confirm the presence or absence of these species, and/or suitable habitat for these species, in the foreshore area.
- Stygofauna (groundwater dwelling invertebrates), are found in the peninsula area, typically inhabiting the extensive karst formations which have contributed to the possible identification of the region as a World Heritage Site. Two species of stygofauna known to occur in the groundwater resources of the peninsula are listed under the EPBC Act as Threatened species.

- Potential activities likely to impact the stygofauna habitat are excessive pumping of the freshwater lens in which they occur, and groundwater pollution.
- Humpback whales, dugongs and turtles are present in the Gulf seasonally.
- Some turtles have been recorded nesting on the beach of the foreshore however these occurrences are considered to be rare. Turtles prefer nesting sites on the western side of the peninsula and have been recorded on occasion on the eastern side of the peninsula, to the north of the foreshore area.

EXMOUTH FORESHORE DEVELOPMENT – OPPORTUNITIES AND RECOMMENDATIONS

Based on the results of the desktop assessment, the environmental values of the Exmouth Foreshore do not pose a significant constraint to potential development of the area. It should be noted that the published information available at the time of the desktop assessment was limited to CoastWise (2001), and the recommendations provided are based mainly on an analysis of aerial photography. It is recommended that the environmental values of the foreshore area are confirmed through a targeted flora and fauna assessment and an on ground vegetation condition assessment.

The foreshore area appears to support some environmental features which could be considered of conservation value that may require consideration during planning for any development of the foreshore, including:

- It supports areas of vegetation which would appear to be in good condition with limited disturbance.
- It may provide an important ecological linkage north-south along the coastline and an east-west linkage to vegetated areas further inland.
- It may provide habitat for migratory bird species and other native fauna species (noting, this would need to be confirmed by a fauna assessment of the area).

The opportunities identified for consideration during future planning stages are shown on Figure 2 and are outlined as follows:

- Opportunity to retain and rehabilitate representative areas of good quality vegetation within the foreshore area for the possible purpose of creating a 'conservation zone' and retaining other vegetated areas for the possible purpose of 'mixed-use zones'. Retention of vegetation and allowing mixed-use would contribute to maintaining and enhancing ecological linkages and dune vegetation, stabilising dunes, and providing for recreation and access to/across the land.
- Consider designating the vegetation within the north of the foreshore area, over vegetation in other areas, as a priority for retention as a potential conservation zone (minimal development) (Figure 2). This area of vegetation appears to be in good condition with minimal disturbance, compared to other vegetated areas of the foreshore, and may require only minimal rehabilitation efforts.
- Consider designating the central section of the foreshore for a potential low-medium intensity passive recreation zone, which would allow a mix of recreation and conservation use. The vegetation in this area appears to be in a good-degraded condition and has some level of disturbance from vehicle and pedestrian use. It is recommended that rehabilitation of the dune vegetation be undertaken where possible and pedestrian and vehicle access is clearly delineated from areas of vegetation to be retained/rehabilitated.
- Consider designating the southern section of the foreshore for a potential medium-high intensity passive recreation zone, which would allow a mix of recreation activities including areas of Public Open Space (POS) and conservation use. The vegetation in this area appears to be in a degraded condition and has been impacted extensively by vehicle and pedestrian disturbance and by the construction of the Exmouth Marina. It is recommended that rehabilitation of the dune vegetation be undertaken where

possible (and areas of vegetation to be retained/rehabilitated are clearly delineated from recreational/access areas) and incorporated into the design of any proposed POS areas.

- Consider retaining and rehabilitating the ecological link along the drainage line which runs from west to east and then drains towards the Gulf in a northerly direction behind the secondary dune (Figure 2). Rehabilitating the vegetation along this corridor may enhance the visual amenity of the area and retention of the drainage line will maintain the floodway and drainage capacity of the area. Consideration should also be given to developing this as a multi-use corridor, for example, a vegetated drainage swale with a public access track along the bank.
- Consider retaining and enhancing the low-lying vegetated areas where water potentially collects to form wetland areas behind the secondary dune, which appear to be in good condition. These areas form part of the east-west and north-south ecological linkages as described in the dot point above.
- Where possible, dunes should be stabilised through revegetation and rehabilitation and vehicle and pedestrian access clearly delineated from these areas.
- If areas of grassed POS are to be incorporated into the design, care must be taken to ensure grass species do not escape to vegetated areas and establish as weeds. Consideration should also be given to ensuring any groundwater abstraction for irrigation is within the capacity of the aquifer to minimise possible impacts to potential stygofauna populations.

Other recommendations for the foreshore area include:

- Conducting a flora and fauna assessment, including an on-ground vegetation condition assessment to confirm the outcomes of the desktop assessment and to ascertain any additional environmental values of the foreshore area which can only be determined from on-ground observations.
- If and when determining areas of vegetation to be retained, consolidate larger blocks and maintain linkages with other vegetated areas of the dunes (i.e. avoid retaining small isolated 'islands' of vegetation that may have poor long-term viability because of edge effects such as weed invasion, erosion, uncontrolled access).
- Integrating any proposed development with the existing dune vegetation present within the foreshore area (i.e. retain and enhance existing vegetation of the foreshore and incorporate this vegetation into the detailed design rather than clearing and then replanting).
- Using species already present in the foreshore area in rehabilitation planting and dune stabilisation.
- Managing weeds during construction of the foreshore development to prevent further spread to areas of vegetation to be retained or to adjacent areas of vegetation.
- During detailed design of the foreshore development, the passive viewing of marine fauna in the Gulf (e.g. whales, dugongs and turtles) should be promoted through signage and lookout point/s where appropriate.
- Pedestrian and four-wheel drive access to the beach should be restricted where possible by sealing and formalising major tracks and closing off and rehabilitating all other minor tracks.

REFERENCES

CoastWise (2001) *Exmouth Gulf Coastal Plan*: prepared for the Shire of Exmouth and the Exmouth Tourist Bureau, CoastWise Coastal Planning and Management, Subiaco WA.

Taylor Burrell Barnett (2011) *Exmouth Townsite Structure Plan*: prepared for Department of Planning and Shire of Exmouth, Taylor Burrell Barnett Town Planning and Design, Subiaco WA.

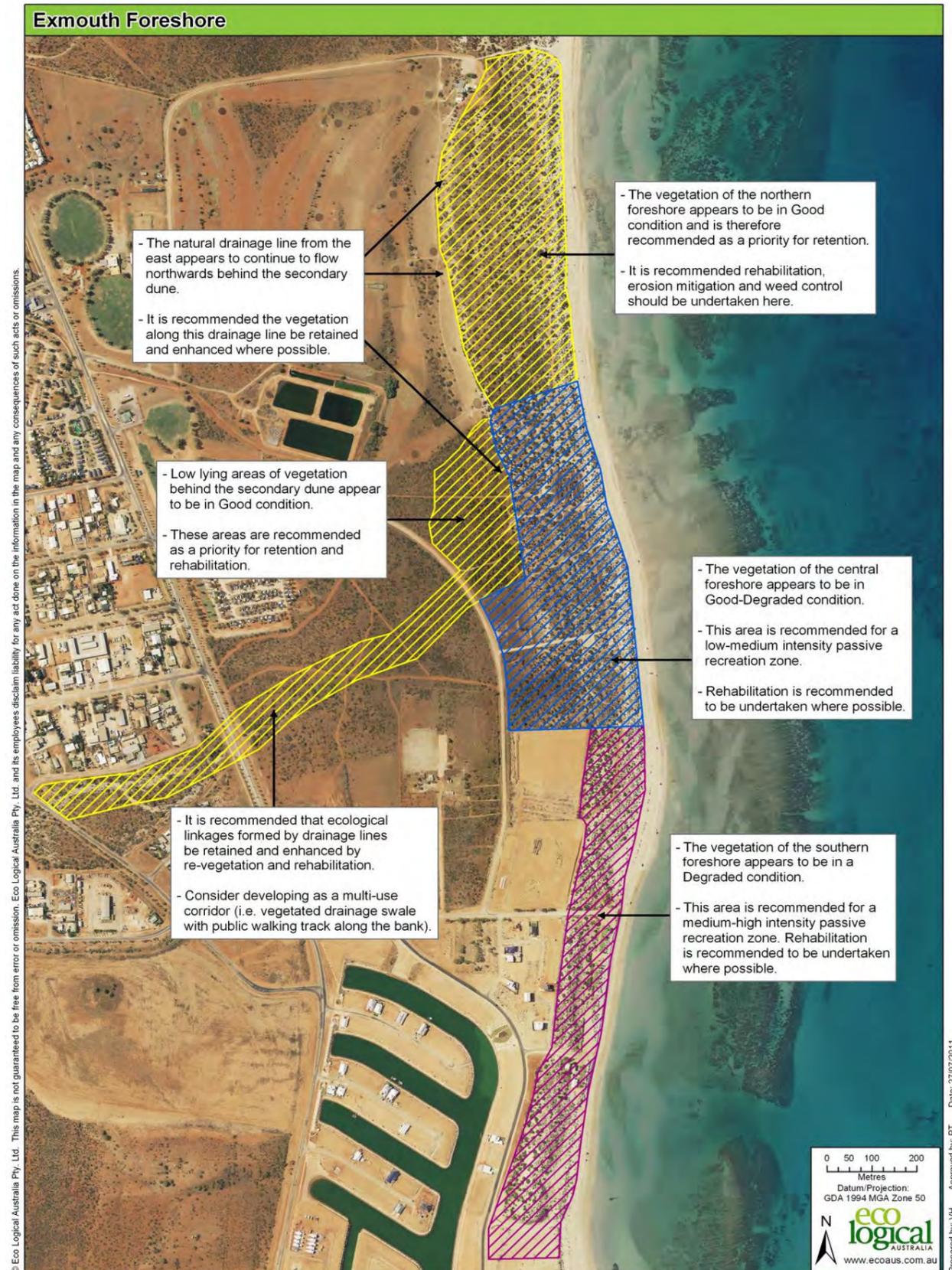


Figure 2: Opportunities and recommendations for the Exmouth Foreshore



1.0 Executive Summary

This report has been prepared by JDSi Consultancy Engineers to assist Hassell with the Exmouth Foreshore Revitalisation Plan.

Currently Exmouth has a stable permanent population in the order of 2,500 where existing infrastructure was largely constructed in conjunction with the original housing in the 1960's. The town's population expands during the tourist season and is enjoying growth from service companies supporting the offshore oil and gas industry.

Exmouth's service and infrastructure ownership includes the normal statutory owners being the Shire of Exmouth (SoE), Horizon Power, Water Corporation and Telstra

The key objectives of this report are to highlight:

- ▶ Existing infrastructure assets.

- ▶ Advice on infrastructure requirements for the revitalisation of the Exmouth Foreshore Revitalisation

- ▶ Advise on the implementation of key infrastructure requirements.

A key issue is that the services are all of c1960 in age and any changes may lead to wider upgrades to meet current servicing requirements, such as the replacement of aerial power with underground systems. It is understood that RBB Construction Cost Consultants have prepared indicative cost estimates for the works.

2.0 Introduction

Exmouth is 1,270 km north of Perth and is the largest town on the North West Cape of Western Australia. It existed as a small isolated town particularly growing during the Second World War and then was expanded under an arrangement between the State and Federal governments to support the communication facility. The Communication facility is a joint operation between the Australian and American governments.

The increasing popularity of the Ningaloo Marine Park is increasing the tourist and sightseeing traffic to the area. The traffic accesses the marine park by travelling through Exmouth.

JDSi was engaged by Hassell who are the lead consultant to the Town Centre Revitalisation and Foreshore Revitalisation Plans. JDSi was commissioned as the Project Teams' Civil Engineering Consultant.

This assessment provides an overview of existing and future servicing requirements to support the Foreshore Revitalisation Plan. It has been based on JDSi's observations, assessment of public information, assumptions and advice from our other partners in the Project Team and discussions with the various infrastructure stakeholders in Exmouth.

3.0 Geographical Characteristics

The Shire of Exmouth has a total land area of 6261 Square Kilometres.

The Town of Exmouth is located on the eastern side of the Cape Range which lies in a north south direction along the North West Cape.

On the western side of North West Cape lies the Ningaloo Marine Park.

The town is situated on the lower slopes of the Cape Range and the Foreshore Revitalisation area is mainly located on the natural dune system. The public open spaces are located away from the natural dune systems and the ground conditions generally comprise a thin covering of sandy soil overlying generally sound limestone. The nature of the limestone provides a sound building foundation, although harder to excavate, and the limited topsoil makes planting and landscaping harder than in other coastal areas with abundant sand layers.

4.0 Roads and Footpaths

4.1 Existing Situation

Roads are owned and maintained by the Shire of Exmouth.

4.2 Current Planning

There is no current planning for new road networks or upgrades except for works devised during the Foreshore Revitalisation Plan.

4.3 Future Requirements

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth "Guidelines and Standards". Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths may also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

The Shire Officers are keen to have good quality footpaths. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and will be considered during detail design.

4.3.1 New Town Beach

A car park is proposed for the New Town Beach. There are some existing tracks in the vicinity, as these are not suitable for reuse; it is proposed that a crowned gravel road with a typical section of a 9m pavement. The selection of this pavement width will allow for any future pavement sealing without too much rework, ie: 6m seal with 1.5m unsealed shoulders. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Car parking shall be designed for one way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus) to allow for all ranges of tourists. As the car parking area will be designed around natural vegetation, it is recommended that wheel stops are installed on the standard bays. (Buses and caravan bays can allow straight through maneuvers and thus no wheel stops.

It is recommended that where pedestrian paths intersections the pavement, a timber bollard (or similar) is installed to prevent any unauthorized beach access. Pedestrian paths will be of similar standard to existing links which is cleared areas.

Drawing JDS11484_C001 shown in Appendix A provides a conceptual roads and drainage layout to the New Town Beach.

4.3.2 Town Beach Upgrade

Car parking upgrade and extensions are proposed for the town beach. The existing car park will be upgraded with minor lighting and drainage services, the existing conditions to remain unchanged. It is recommended at the time of detailed design

that the existing conditions be reviewed to determine any efficiency in implementing maintenance work.

The proposed car park to the North is recommended to be sealed due to the close proximity of the ocean and the possibility of scouring in storm events. Wheel stops are recommended to be installed adjacent the footpath for pedestrian protection. Long vehicle parking bays should be accommodated in the carpark design.

It is assumed the car park level will be raised as part of the revetment wall works.

It is noted that the marina engineer recommendations is for a revetment surrounding the car park and beach access, it is therefore recommended that the shire consult with communities on the removal of beach access or amend the car park and revetment design to allow beach access to remain.

Warne Street is proposed to be resealed and dependant on the detail design, kerbing may be an option. For an un-kerbed road, Warne Street shall have a 9m sealed section width and 1.5m unsealed shoulder. The crest prior to the car park will require investigations into the sight distance requirements. This will need to be checked against typical requirements in the Austroads publications. There may be a requirement to regrade the road and/or install warning signage to meet standard. Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C002 shown in Appendix A provides a conceptual roads and drainage layout to the Town Beach Upgrade.

4.3.3 Yacht Club Beach

A car park is proposed for the Yacht Club Beach. The existing Freedom Way is sealed and kerbed and any improvements can be determined at detail design.

Car parking shall be designed for two way directional traffic and allow for a variety of vehicle sizes (i.e. standard, caravan, bus), to allow for all ranges of tourists. As the car parking area will be designed around a natural dune system, it is recommended that wheel stops are installed on the standard bays.

It is recommended that at proposed pedestrian path intersections a timber bollard (or similar) is installed to prevent any unauthorised beach access.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required. Specific attention will need to be given to the Yacht Club access where larger vehicles will be using the access.

Drawing JDS11484_C003 shown in Appendix A provides a conceptual roads and drainage layout to the Yacht Club Beach Upgrade.

4.3.4 Truscott Crescent

Street upgrade of Truscott Crescent is proposed. It is recommended to re-grade the road, kerb and seal the road for an 8m width. It is expected that culvert crossings will need to be allowed for the drainage.

It is expected that dual use paths (DUP) will be constructed along Truscott Way. The DUP shall be carefully positioned to not impact overhead power poles, drainage swales and crossings.

Reflective guideposts, regulatory signs and typical road furniture shall be installed where required.

Drawing JDS11484_C004 shown in Appendix A provides a conceptual roads and drainage layout to the Truscott Avenue Streetscape Upgrade.

5.0 Sewer

5.1 Current Situation

Exmouth is currently serviced by a series of gravity, pressure and vacuum sewers discharging to a wastewater treatment plant located at the southern area of the golf course.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas. An odor buffer exists over part of the Truscott Crescent and the New Town Beach access road, this does not restrict placement of the access and car park facilities, but odor and prevailing winds should be considered.

5.2 Future Requirements

5.2.1 New Town Beach

The proposed toilet facility is not recommended for connection to the Water Corporation sewer, due to the vicinity of connecting sewer. A standard aerobic treatment unit is recommended for sewer management that is approved by the Department of Health.

5.2.2 Town Beach

A vacuum system located on Osprey Way is the closest Water Corporation sewer asset. Due to the costs involved in connecting to a vacuum system for one toilet block, it is recommended to use a standard aerobic treatment unit that is approved by Department of Health.

6.0 Solid Waste Management

It is recommended that bins are installed at the foreshore revitalisation areas and the Shire implement suitable waste management services.

7.0 Water Supply

7.1 Existing Situation

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporations license area includes the Foreshore Revitalisation Area.

7.2 Future Requirements

7.2.1 Town Beach

It is expected that the extension of the Water Corporation 63MDPE water main located on Warne Street will be sufficient to service the toilet block.

8.0 Power Supply

8.1 Existing Situation

8.1.1 Exmouth Township

Power is generated from a privately owned power station. This is operated by Worley Parsons under an agreement with Horizon Power (HP) as the distributing agency. Any significant increase in power demand is the subject of discussions between Horizon Power and Worley Parsons

Current power distribution is through aerial conductors on poles made from railway line which appear to date from the construction of the town site. The distribution network in Exmouth is 11kV.

An increase in power demand may also entail an upgrade of the connecting infrastructure.

This information has been provided informally by officers of Horizon Power.

8.1.2 New Town Beach

No existing power infrastructure is present in this area. The closest HV and LV power infrastructure is located at the intersection of Murat Road and Truscott Crescent which is 500m away from the start of the entry road to New Town Beach.

8.1.3 Town Beach Upgrade

The closest Horizon Power main LV infrastructure is located approximately 450m from the Town Beach at the intersection of Madaffari Drive and Warne Street. Underground powered street light poles exists adjacent to the Town Beach site. This suggests that street light cables extend to the Town Beach. Further discussions with Horizon Power are required to determine the level of LV infrastructure present on Warne Street.

The Town Beach Entry consisting of Madaffari Drive and Warne Street has been currently lit via Horizon Power's standard underground powered Streetlights. Lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is being lit to however it appears a flag lighting approach has been utilised on Warne Street.

8.1.4 Yacht Club Beach

A Horizon Power transformer exists in the vicinity of Madaffari Drive and Friedman Way intersection. LV underground cabling extends from the transformer to Exmouth Yacht Club on Friedman Way. The number, type and utilised capacity of the cabling are not known at this stage.

Horizon Power's standard underground powered street lighting pole setup has been utilised to light the road reserve of Friedman Way. Further lighting studies are required to confirm the lighting subcategory of AS1158 the road reserve is currently being lit to.

8.1.5 Truscott Crescent

Existing LV overhead aerial lines extends approximately 250m north from the Warne Street intersection along the east side of Truscott Crescent. From there, the single phase LV overhead aerials continue for approximately 350m leaving the remainder km of Truscott Crescent without electrical infrastructure.

Overhead aerial lighting currently provides lighting to Truscott Crescent where electrical infrastructure exists (being some 600m of the 1.6km stretch of road).

8.1.6 Murat Road

Existing HV and LV aerials runs along the eastern side of Murat Road. Three phase 11kV HV aerials run the whole length from the northern intersection of Maidstone Crescent to Madaffari Drive. Three phase LV aerials runs in a 150m section heading south from the northern intersection of Maidstone Crescent intersection, then continues as single phase only to Nimitz Street, then three phase to Maley Street and single phase to Madaffari Drive.

From the northern intersection of Maidstone Crescent to Madaffari Drive, Murat Road is currently lit by lights mounted on HP power poles with the exception of the southern intersection of Maidstone Crescent and between Pelias Street and Welch Street where lighting is provided by a combination of power pole mounted lighting and underground powered 12.5m double outreach poles with 250W high pressure sodium (HPS) luminaires. Southern Maidstone Crescent intersection has been lit to

sub-category V3 of the AS1158. Lighting studies are required to confirm the lighting subcategory of AS1158 for which the remainder of Murat Road is currently being lit to.

8.1.7 Marina Public Open Spaces

Horizon Power owns and maintains underground HV and LV infrastructure currently exists on the western side of Madaffari Drive. An existing Horizon Power transformer is located in the vicinity of the northern Marina Public Open Space. Discussions with Horizon Power are required to determine the capacity utilised of the transformer, as well as that of the HV and LV cabling.

8.2 Future Requirements

8.2.1 Lighting

The foreshore redevelopment creates an opportunity to replace existing streetlights with more environmentally friendly alternative solutions such as LED and solar lighting. Pros and Cons of these alternative solutions are explored below.

It should be noted that any alternative lighting solutions utilised on road reserve will be considered as private lighting by Horizon Power and therefore ownership and maintenance will be the responsibility of the Shire.

| Solar LED Lighting | |
|----------------------------------------------|-------------------------------------------------------------|
| Pros | Cons |
| No power bills | Very high initial costs |
| Low maintenance | High vandal and theft concerns |
| No trenching and cabling between poles | Lights cannot be located in shaded areas |
| Operational during power blackouts | Battery related flood concerns |
| Longer lamp life (up to 5 years) | Battery replacement every 8-10 years |
| Environmental advantages (no grid power use) | Possible black out during extended periods without full sun |

| LED Street Lighting | |
|--------------------------------------------|-------------------------------|
| Pros | Cons |
| Low maintenance | Slightly higher initial costs |
| Less power usage | |
| Longer lamp life (up to 5 years) | |
| Environmental advantages (lower power use) | |

LED Lighting

For slightly higher initial cost compared to Horizon Power standard street lighting, consideration should be given for the utilisation of LED lighting within public open spaces and street lighting. This is on the basis that, pending detail design, lower wattage LED fittings should be able to perform as highly as a higher wattage discharge lamp, therefore reducing power consumption for the life of the asset.

Solar Powered Lighting

Solar lighting's main advantage is that it can operate when it is cost prohibitive to bring grid connected power to the site. It obviously also provides an environmentally solution as it does not use grid power, which is typically non-renewable fuel powered. So, given the high initial costs of installing solar powered lighting and proximity of existing power infrastructure (with the exception of New Town Beach), Solar powered LED lighting will not be as cost effective as distribution connected lighting.

The cost benefits of not using grid connected power are largely offset by the cost of needing to replace batteries of a solar power pole every 8 to 10 years.

Solar panels can be the subject of vandalism, as they are an attractive target for objects to be thrown on to.

Comparison of Direct Lighting and Decorative Reflective Lighting

Comparing Horizon Power's standard lighting (6.5m poles with 1.5m outreach and 42W compact fluoro luminaire) with a typical decorative reflector lighting type, it is evident that a higher quantity of reflector poles are required to obtain the lighting levels of the chosen sub-category, for any given stretch of road. Refer to Drawings 3E11176G-03 and 3E11176G-04 for typical lighting layouts of each lighting setup for Truscott Crescent. In this example, to utilise the reflector type lighting, 50% more poles were needed and 400% more power was used to light the road to sub-category P4.

Reflector lighting can provide vandal resistance over a direct light fitting as the lamp is upward facing and more difficult to damage with a thrown object.

Unless preferred for aesthetic or vandal resistance reasons, a reflector lighting system would not be recommended based on its lighting performance. In addition to this, a reflector lighting setup is not recommended for use in proximity to the beach, on the basis of the methodology provided below for turtle friendly lighting.

Recommendations for Specification of Lighting Poles

Redevelopment sites are within close proximity of the sea and with Exmouth located in the Region D cyclonic zone, lighting poles are to be designed and constructed to handle such conditions (footings, mounting hardware, etc.). Poles would also need a suitable surface treatment, such as hot dip galvanising as well as an aliphatic urethane (or similar) final coating.

Methodology of Turtle Friendly Lighting

Exmouth Gulf is known as a feeding ground and possibly a breeding area for marine turtles. With marine turtles listed as threatened fauna deserving of special protection worldwide and that six of seven species of marine turtles in the world occurring in Western Australian waters, special attention is required when producing a lighting solution for the area. Turtles tend to have preferences for dark beaches for breeding and hatchling turtles primarily rely on their vision to find the sea by orienting towards the brightest direction. Artificial lighting can deter turtles from beaches and may disorientate or mis-orientate hatchlings resulting in death by predation, exhaustion or dehydration. Below is a list of some measures which can be taken to reduce light impacts to marine turtles:

- 1) Avoid lighting where possible (design for minimum number and intensity of lights)
 - a. Weigh up importance of human safety vs. turtle friendly
- 2) Avoid light spill onto beach and sea surfaces
- 3) Lighting control to be designed for operation of lights when required (time control, motion sensor, etc.)
- 4) Usage of screens, vegetation and structures to block direct and indirect light to beach
- 5) Lighting fixtures to be directed downwards to avoid overhead glow on cloudy nights (utilise aero screen type fittings within proximity of the beach)
- 6) Lighting fixtures to use shields and filters (e.g. amber filters on HPS lights) as required
- 7) Lighting fixtures to utilise long wavelengths (550-700 nanometers, orange to red) where possible. Short wavelength (blue) and broad spectrum sources such as metal halide, mercury vapour, fluorescent or halogen lights are not desirable.

- 8) Conduct night inspection and monitor turtle behaviour after installation of lights.
 - a. Remove problem lights as required
 - b. Create shielding as required
 - c. Turn problem lights off at nesting season

No particular level of light intensity has been identified as being safe for turtles therefore a lighting level, or sub-category of AS1158, that would not affect turtle behaviour, cannot be recommended. The above approach aims to limit to the amount of light, particularly the type of light that can affect turtle behaviour, that can be seen from nesting beaches. Our recommendation would be to select lighting sub-categories that have the lowest lighting level while still meeting the criteria for pedestrian safety and crime deterrence (so ignoring higher lighting levels to enhance prestige). The Shire could complete an assessment of whether lighting levels below the recommendations of AS1158 are appropriate, in an attempt to further limit the possible effects on turtle behaviour.

Drawings 3E11176G-02, 3E11176G-03 & 3E11176G-04 shown in Appendix A show possible lighting options for Truscott Avenue and Murat Road.

8.2.2 Power Distribution

Horizon Power requires that all new developments are to be serviced by underground three phase power. In a green-title development, this is implemented by HP owned and maintained URD 3-phase direct buried underground cabling from a spare fuse way at the transformer LV frame to uni and mini-pillars serving each site on the general basis of one pillar serving two adjacent lots. Horizon Power standard streetlights are then supplied from these pillars or an un-metered supply pit supplied off the pillar.

Further discussions with Horizon Power are required to determine the level of infrastructure in the vicinity of development areas, spare capacity available and voltage drop limitation of their network.

8.2.3 New Town Beach

With the closest Horizon Power 3 phase HV and LV network approximately 500m from start of the development area, solar powered lighting could be considered in this area. A cost comparison exercise should be completed to assist in the consideration.

To provide underground power to the area, applications and discussions with Horizon Power are required to determine HV connection points.

As per AS1158, the decision to light a road lies with the authority (in this case, The Shire of Exmouth). Our recommendation would be to light this road to subcategory P4 for entry roads. This lighting category recommendation is based on the presence of pedestrian traffic, expected low vehicle numbers and to provide a link between

Truscott Avenue and the New Town Beach Car Park. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

Solar powered lighting could be considered for the lighting of boardwalks, shelters and pedestrian links to minimise impacts to the natural surroundings.

8.2.4 Town Beach Upgrade

Low voltage network to be extended from Madaffari Drive and Warne Street intersection if no existing LV infrastructure is adjacent to site. Further discussions required with Horizon Power to determine proximity of HV & LV network.

With the presence of pedestrian traffic and expected low vehicle numbers, lighting subcategory P4 of AS1158 is recommended for the entry road. This recommendation is subject to considerations of a compromise on lighting levels due to presence of turtles as discussed in previous sections. Upgrade works to entry roads provides opportunity to amend existing street lighting to provide a more turtle friendly environment.

Car park lighting sub-category recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to consideration of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

8.2.5 Yacht Club Beach

The Yacht Club Beach is currently serviced by underground power infrastructure (the type and level of supply is to be confirmed by Horizon Power). Horizon Power LV network to be extended as required to supply upgraded services. Load calculations to be performed once level of upgrades have been defined and finalised.

Car park lighting subcategory recommendations are subject to Shire requirements of crime deterrence and night time occupancy rates. Typically sub-category P11c would be appropriate for a car park with low night time occupancy rates. This would also be subject to considerations of a compromise on lighting levels due to the presence of turtles as discussed in previous sections.

8.2.6 Truscott Crescent

LV infrastructure should be extended from Gndaroo Road and Warne Street intersection to provide power to proposed lighting on south section of Truscott Crescent. Discussions are required with Horizon Power to determine the proximity of LV network to Warne Street and Truscott Crescent intersection. Extension of power

infrastructure from Murat Road and Truscott Crescent intersection to supply lights on northern section of Truscott Crescent to be explored with Horizon Power.

While new lighting infrastructure is required through the northern section of Truscott Crescent to meet AS1158, the southern section is already lit with occasional power pole mounted luminaires, but not to AS1158 requirements. This lighting could be left in place, until the existing above ground power infrastructure is replaced with new underground infrastructure.

8.2.7 Murat Road

A Horizon Power transformer is located on northern section of Murat Road. A LV network can be extended to service proposed lighting. Street lighting to the south section of Murat Road is to be supplied by extending existing street lighting circuits (subject to voltage drop). Further discussions with Horizon Power required for alternative connection points.

Lighting studies are required to determine current level of lighting of Murat Road. Southern intersection of Maidstone Crescent and Murat Road has been lit to a lighting sub-category V3 of AS1158. Road revitalisation works provides opportunity to upgrade existing lighting to continue same lighting standards. Refer to Drawings 3E11176G-02 for typical lighting layout for Murat Road utilising HP Standard fixtures and poles. Lighting calculations and detailed design can be performed once road layouts and lot boundaries have been confirmed and finalised. Existing HP power poles may cause possible constraints to road works and new light pole locations.

8.2.8 Marina Public Open Spaces

Marina public open spaces are currently supplied via underground infrastructure (to be confirmed by Horizon Power). Power infrastructure to be extended and upgraded as required to supply electrical services. Where electrical load requirements, comprises of lighting only and single barbecue, standard 3 phase pillar supplies may suffice pending input from Horizon Power. Lighting recommendations and calculations to be completed once path layout and electrical equipment requirements have been confirmed and finalised.

9.0 Gas Supply

ATCO Gas has advised that there is no gas network available for the Town of Exmouth.

10.0 Telecommunications

No further communication assets are expected for the Town Beach Integration.

11.0 Drainage

11.1 Existing Situation

The existing Town is drained through a combination of pipe network, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area on the west side of the dune system. The dune system acts as a natural storage bund and the only relief to the flooding extents is outlets to the North of the town centre and the southern inlets.

Rainfall events have led to flooding in parts of the Town Site and this have been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods and summarises the area east of the inlets to be relatively immune to major flooding and the area to the north of the inlets experiencing flooding.

11.2 Current Planning

There is no current planning for new drainage networks or upgrades except for redevelopment works resulting from the town centre revitalization study and the outcomes of the Cardno drainage analysis.

11.3 Future Requirements

11.3.1 New Town Beach

The car park appears to be situated on the dune system ridge line and should not experience any flooding. Car park drainage can be controlled via road side swales and median basins.

The access road will experience flooding in major events, and depending on the level of service, filling the road and/or flood ways may be considered. Minor storm events can be catered for via road side swales with turnout's being constructed where possible.

11.3.2 Town Beach

The town beach access and car park is protected from major flooding from the nearby inlets.

The car park can be controlled via road side swales, and any overflow can be via the revetment. It is recommended to consider the existing drainage along Warne Road (west side of dune system) in the detailed design to ensure flow paths are maintained.

11.3.3 Yacht Club Beach

The Yacht Club car park and access should be well protected from flooding from the inlets.

The car park can be controlled via road side swales, and any overflow via revetment and dune system.

Freedman Way is currently kerbed and sealed. On the approach to the carpark it is recommended to install drainage pits to direct water to road side swales via pipe and scour protection.

11.3.4 Truscott Crescent

Truscott Crescent is situated in a flood prone area due to the flows from the creek crossing of Lot 501 and Lot 868 Murat Road. The dune system to the east creates a natural storage area on Lot 1456 (including Truscott Crescent). The only discharge to this flooding is North of the town site or the inlets to the south.

The shire should determine a level of service for Truscott Crescent and fill the road accordingly to prevent major flooding.

Truscott Crescent shall control drainage via road side swales, these swales can also act as conveyance swales for larger events, directing stormwater to the north of the site where flood ways or culvert crossings will need to be installed.

12.0 Key Drivers and Pressures

To identify the Foreshore as an attraction, population increase, tourism growth, oil and gas industry support and associated increases in transport, the following are key drivers that need to be considered;

Drainage

- Overland flood paths currently exist through Truscott Crescent and proposed assess roads. The level of service needs to be identified to determine the protection requirements.

Protecting existing Assets

- All existing services locations will need to be confirmed prior to any works to protect these assets.

- The adequacy of current as constructed information will be verified during detailed design.

Asset Life

- Advice will be needed from the asset owners in regard to the service life of the current assets.
- Any relocation would be with new materials to current standards.
- Selection of material shall be based on coastal and cyclone conditions.

Roads

- Adequate road networks should be constructed and well maintained.
- Car bays should be provided to suit the tourists and lighting provisions to suit security.

Amenity

- Facility such as toilets and bins shall be suitably selected to suit the environmental impacts and well maintained

13.0 Implementation Plan

This final section of this Revitalisation Plan concentrates on the short term requirements for implementing infrastructure within the Foreshore Areas.

Due to the locality of the foreshore revitalisation areas, the Shire can bring on infrastructure works to any area without any dependence on other areas to support this. The areas are mutually exclusive.

Table 13.1 lists the actions recommended to progress the infrastructure for the Foreshore Revitalisation Areas. The timeframes for staging are as follows:

Table 13.1 Implementation Actions for Staged Infrastructure Development of the Town Centre.

Short Term - 0 to 6 months

Medium Term - 6 months to 1 year

Long Term - 1 year plus

| No | Action | Lead Stakeholder and stakeholders | Staging | Comments |
|----|---------------------------------------------------|------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Field and Cadastral Survey | Shire of Exmouth | Short Term | Survey required for planning and engineering. |
| 2 | Secure Unallocated Crown Land for Public Purposes | Shire of Exmouth Department of Regional Development and Lands | Short Term | Shire needs to seek the necessary approvals (native title etc.) for existing areas of unallocated Crown Land within and adjacent the Town Centre to be secured for purposes identified in the Revitalisation Plan. |
| 3 | Design Guidelines | Shire of Exmouth | Short Term | Design guidelines should be prepared to guide development within the Town Centre. |
| 4 | Geotechnical Investigations | Shire of Exmouth | Short Term | Geotechnical advice required for infrastructure and structures. |
| 6 | Lighting Strategy | Shire of Exmouth Horizon Power | Medium Term | Shire should discuss the lighting options with the consultant team and any relevant stakeholders to prepare a strategy for the areas. |
| 7 | Beach Access Strategy | Shire of Exmouth | Medium Term | Shire to review current beach access locations and determine if these are to remain and any upgrades required. |

14.0 Disclaimer

This report has been prepared from preliminary planning and informal discussions with service authorities. Information will be confirmed as the land use planning and detailed studies progress.

This report is JDSi's interpretation of the information provided.



Foreshore Revitalisation Plan
Infrastructure Report

APPENDIX A – DRAWINGS

100



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CLIENT:
PROJECT:
EXMOUTH TOWN CENTRE REVITALISATION
DRAWING TITLE:
EXMOUTH FORESHORE NEW TOWN BEACH

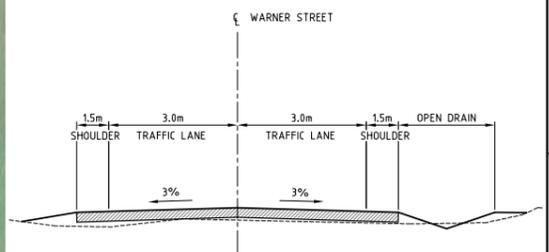
DRAWN:
S. MACLAREN
DESIGNED:
G. COFFEY
PROJECT MANAGER:
J. GRAY
JDSI PROJECT No.:
JDS11484

WAPC No.
SCALE: A1
AS SHOWN
DATUM: AHD
CO-ORDS
DRAWING No:
C001
REVISION:
A

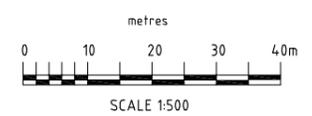
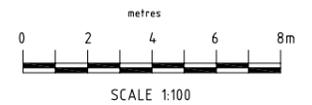


- LEGEND**
- PROPOSED ROAD
 - PROPOSED DRAINAGE SWALE
 - PROPOSED DRAINAGE STORAGE
 - PROPOSED CARBAY WHEEL STOPS

SHIRE TO CONSIDER
REVETMENT DESIGN AND
THE CLOSURE OF BEACH
ACCESS



SECTION A
SCALE 1:100



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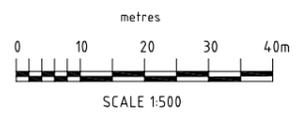
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PROJECT:
**EXMOUTH TOWN CENTRE
REVITALISATION**
DRAWING TITLE:
**EXMOUTH FORESHORE
TOWN BEACH UPGRADE**

| | |
|--------------------------------------|------------------------|
| DRAWN S. MACLAREN | WAPC No. |
| DESIGNED G. COFFEY | SCALE @ A1 AS SHOWN |
| PROJECT MANAGER J. GRAY | DATUM AHD |
| JDSI PROJECT No.: JDS11484 | CO-ORDS C002 |
| | REVISION A |



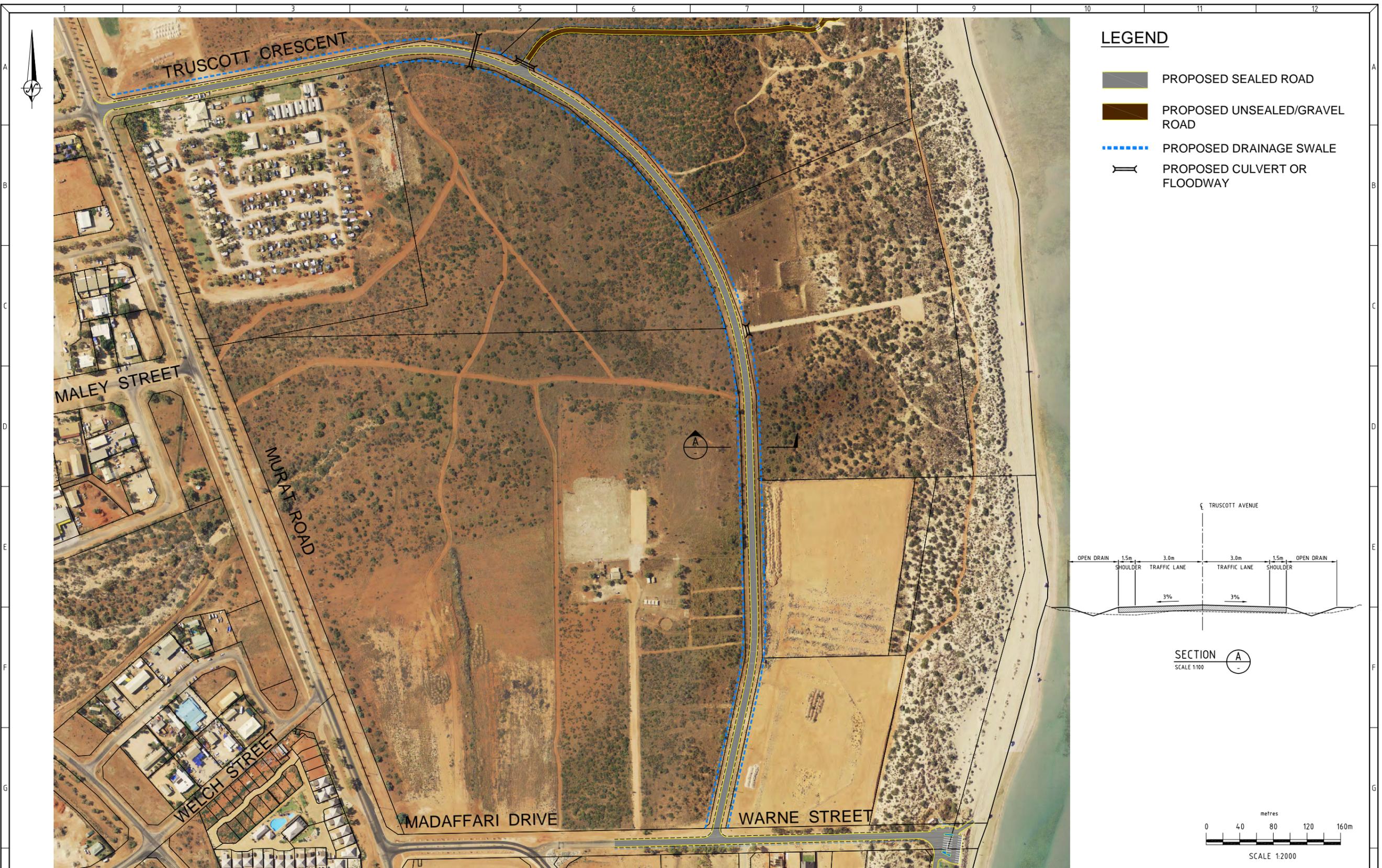
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PROJECT:
**EXMOUTH TOWN CENTRE
REVITALISATION**

DRAWING TITLE:
**EXMOUTH FORESHORE
YACHT CLUB BEACH UPGRADE**

| | | |
|-------------------------------|---------------------|---------------|
| DRAWN S. MACLAREN | WAPC No. | |
| DESIGNED G. COFFEY | SCALE: A1 1:500 | |
| PROJECT MANAGER J. GRAY | DATUM AHD | CO-ORDS |
| JDSI PROJECT No.: JDS11484 | DRAWING No. C003 | REVISION A |



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CLIENT:

PROJECT:
**EXMOUTH TOWN CENTRE
REVITALISATION**

DRAWING TITLE:
**EXMOUTH FORESHORE
TRUSCOTT AVENUE STREETScape
UPGRADE**

| | |
|-------------------------------|---------------------|
| DRAWN S. MACLAREN | WAPC No. |
| DESIGNED G. COFFEY | SCALE AS SHOWN |
| PROJECT MANAGER J. GRAY | DATUM AHD |
| JDSI PROJECT No.: JDS11484 | DRAWING No. C004 |
| | REVISION A |

- NOTES:**
1. ALL LIGHT POLE LOCATIONS ARE INDICATIVE ONLY. NO LIGHTING CALCULATIONS HAVE BEEN PERFORMED. PURPOSE OF DRAWING IS TO SHOW INDICATIVE NUMBER OF LIGHTING POLES REQUIRED
 2. ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE
 3. TRANSFORMER SIZES TO BE CONFIRMED WITH HORIZON POWER
 4. LIGHTING LAYOUT ARE PRELIMINARY ONLY AND NOT FOR CONSTRUCTION USE

- LEGEND**
- EXISTING HORIZON POWER PADMOUNTED TRANSFORMER
 - 12.5m HP STANDARD POLE + 3m SOR BRACKET WITH 250W STANDARD HPS LUMINAIRE
POLES POWDER COATED HAWTHORN GREEN AND CYCLONE RATED
 - 12.5m HP STANDARD POLE + 3m DOR BRACKET WITH 2x250W STANDARD HPS LUMINAIRE
POLES POWDER COATED HAWTHORN GREEN AND CYCLONE RATED
 - EXISTING 12.5m HP STANDARD POLE + 3m SOR BRACKET WITH 250W STANDARD HPS LUMINAIRE
POLES POWDER COATED HAWTHORN GREEN AND CYCLONE RATED
 - EXISTING 12.5m HP STANDARD POLE + 3m DOR BRACKET WITH 2x250W STANDARD HPS LUMINAIRE
POLES POWDER COATED HAWTHORN GREEN AND CYCLONE RATED



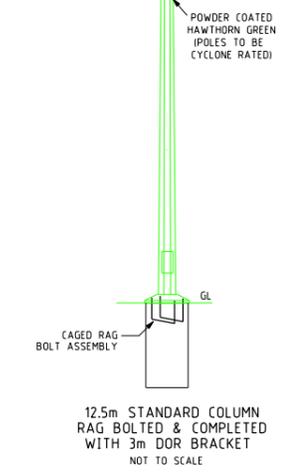
NOTE: HORIZON POWER LIGHTING
(ALL POLES TO BE POWDER COATED HAWTHORN GREEN & CYCLONE RATED)

STANDARD 12.5m POLE WITH 3m SOR BRACKET & 250W HPS LUMINAIRE

OR

STANDARD 12.5m POLE WITH 3m DOR BRACKET & 250W HPS LUMINAIRES

ALL STREETLIGHT CABLE TO BE IN CONDUITS IF OUTSIDE HP ALIGNMENT.

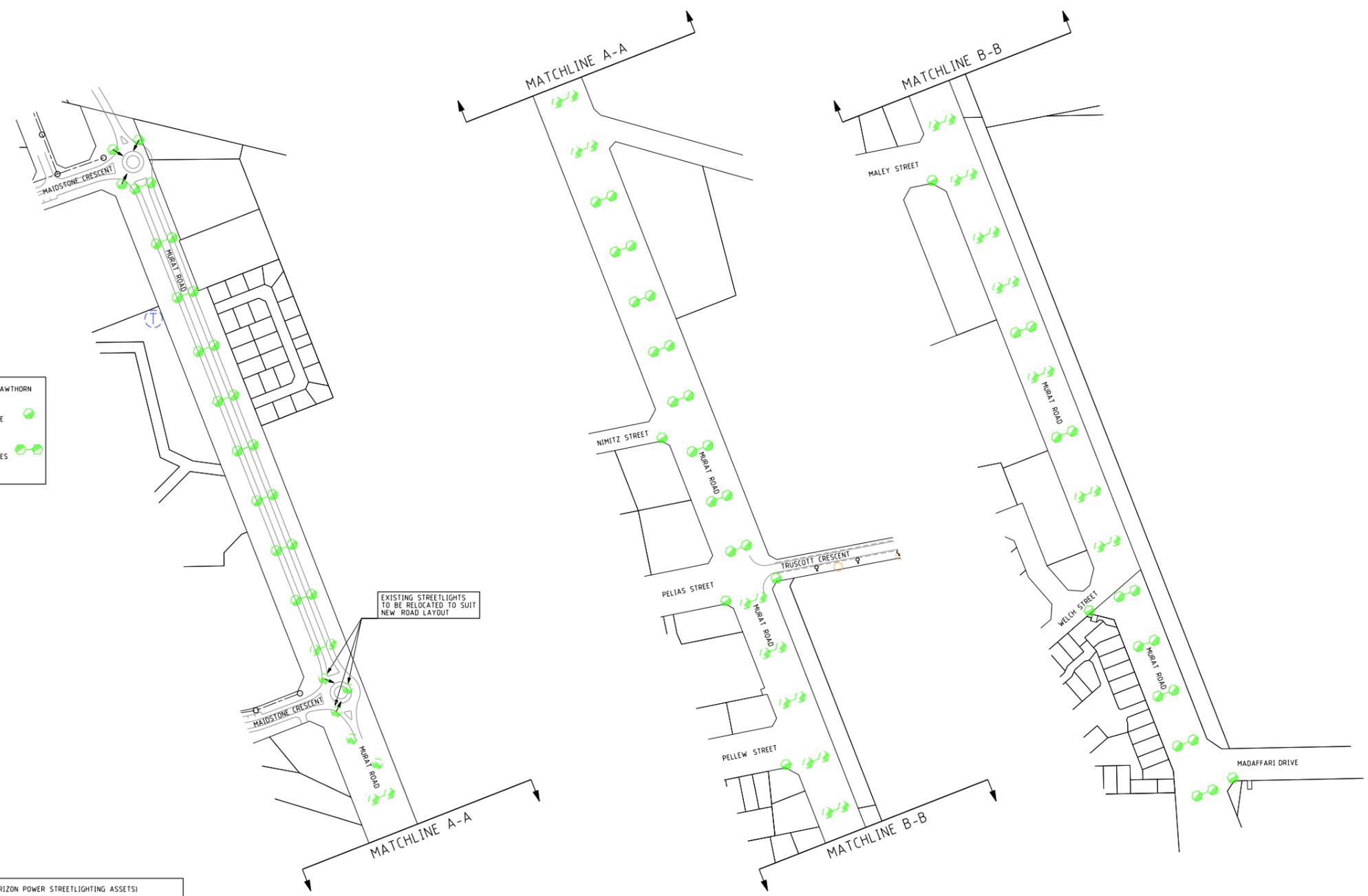


NOTE: ALL UNMETERED SUPPLIES (INCLUDING CUSTOMER AND HORIZON POWER STREETLIGHTING ASSETS)

| TYPE OF EQUIPMENT (POLES & LUMINAIRES HAWTHORN GREEN) | NO of UNITS | UNIT WATTAGE | TOTAL WATTAGE | DAILY HRS OPERATION | HP Asset Yes / No |
|---------------------------------------------------------------------------|-------------|--------------|---------------|---------------------|-------------------|
| 12.5m HP STANDARD POLE + 3m SOR BRACKET WITH 250W STANDARD HPS LUMINAIRE | 10 | 250W | 2500W | DUSK/DAWN | YES |
| 12.5m HP STANDARD POLE + 3m DOR BRACKET WITH 250W STANDARD HPS LUMINAIRES | 24 | 2x250W | 12000W | DUSK/DAWN | YES |

NOTE: ALL UNMETERED SUPPLIES and STREETLIGHTS MUST BE INCLUDED IN DESIGN DRAWING

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| Base File Date | 21-02-2012 | Design Date 21-02-2012 |
| Designed | VH | Drawn BR |
| Checked | VH | Approved DLJ |
| Horizon Power Reference No. | TBA | WAPC No. TBA |
| Local Authority | SHIRE OF EXMOUTH | |
| Civil Consultant | JDSi | |

EXMOUTH FORESHORE REVITALISATION EXMOUTH
MURAT ROAD INDICATIVE HP STANDARD LIGHTING LAYOUT

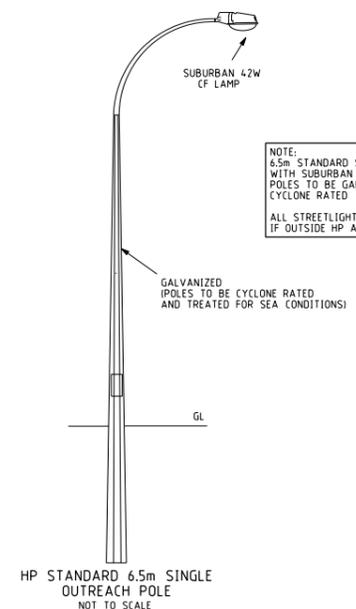
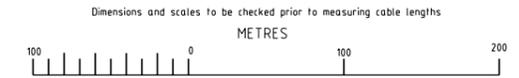
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NOTES:

1. ALL LIGHT POLE LOCATIONS ARE INDICATIVE ONLY. PURPOSE OF DRAWING IS TO SHOW INDICATIVE NUMBER OF LIGHTING POLES REQUIRED. POLE SPACING CALCULATED ACCORDINGLY TO SATISFY LIGHTING SUBCATEGORY P4 OF AS1158
2. ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE
3. LIGHTING LAYOUT ARE PRELIMINARY ONLY AND NOT FOR CONSTRUCTION USE

LEGEND

- 6.5m STANDARD SINGLE OUTREACH POLE WITH SUBURBAN 42W CF LAMP. POLES TO BE GALVANIZED AND CYCLONE RATED



NOTE:
6.5m STANDARD SINGLE OUTREACH POLE WITH SUBURBAN 42W CF LAMP. POLES TO BE GALVANIZED AND CYCLONE RATED.

ALL STREETLIGHT CABLE TO BE IN CONDUIT IF OUTSIDE HP ALIGNMENT.

NOTE: ALL UNMETERED SUPPLIES (Including CUSTOMER AND HORIZON POWER STREETLIGHTING ASSETS)

| TYPE OF EQUIPMENT (POLES GALVANIZED & LUMINAIRES) | NO of UNITS | UNIT WATTAGE | TOTAL WATTAGE | DAILY HRS OPERATION | HP Asset Yes / No |
|---------------------------------------------------|-------------|--------------|---------------|---------------------|-------------------|
| 6.5m HP STANDARD POLE + 42W CF SUBURBAN LUMINAIRE | 25 | 42W | 1050W | DUSK/DAWN | YES |

NOTE: ALL UNMETERED SUPPLIES and STREETLIGHTS MUST BE INCLUDED IN DESIGN DRAWING

| REV | DESCRIPTION | DATE | DRAWN | CHKD | REV | DESCRIPTION | DATE | DRAWN | CHKD |
|-----|------------------------------|----------|-------|------|-----|-------------|------|-------|------|
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| Designed | VH | Drawn BR |
| Checked | VH | Approved DLJ |
| Horizon Power Reference No. | TBA | WAPC No. TBA |
| Local Authority | SHIRE OF EXMOUTH | |
| Civil Consultant | JDSI | |

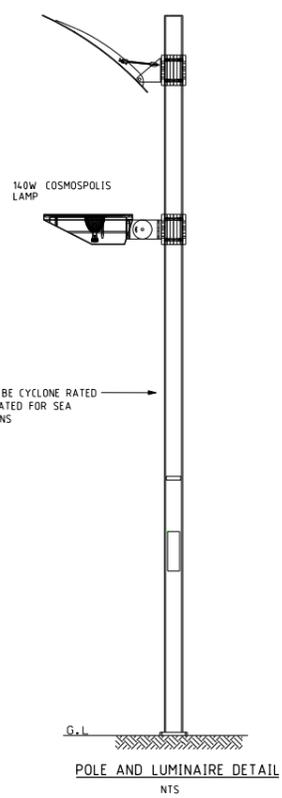
EXMOUTH FORESHORE REVITALISATION EXMOUTH
TRUSCOTT AVENUE INDICATIVE STANDARD HP LIGHTING LAYOUT

| | | | |
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| Sheet | Of | 3E Drawing Number | Revision |
| 1 | 1 | 3E11176G-03 | 1 |

- NOTES:**
1. ALL LIGHT POLE LOCATIONS ARE INDICATIVE ONLY. PURPOSE OF DRAWING IS TO SHOW INDICATIVE NUMBER OF LIGHTING POLES REQUIRED. POLE SPACING CALCULATED ACCORDINGLY TO SATISFY LIGHTING SUBCATEGORY P4 OF AS158
 2. ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE
 3. LIGHTING LAYOUT ARE PRELIMINARY ONLY AND NOT FOR CONSTRUCTION USE

LEGEND

○ WE-EF 118-B210 REFLEKTA-D SOR WITH 6m REFLEKTA-SAIL POLE (140W) (POLES TO BE CYCLONE RATED)



NOTE: ALL UNMETERED SUPPLIES (Including CUSTOMER AND HORIZON POWER STREETLIGHTING ASSETS)

| TYPE OF EQUIPMENT (POLES & LUMINAIRES) | NO of UNITS | UNIT WATTAGE | TOTAL WATTAGE | DAILY HRS OPERATION | HP Asset Yes / No |
|-----------------------------------------------------------------|-------------|--------------|---------------|---------------------|-------------------|
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NOTE: ALL UNMETERED SUPPLIES and STREETLIGHTS MUST BE INCLUDED IN DESIGN DRAWING

| REV | DESCRIPTION | DATE | DRAWN | CHKD | REV | DESCRIPTION | DATE | DRAWN | CHKD |
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| Checked | VH | Approved DLJ |
| Horizon Power Reference No. | TBA | WAPC No. TBA |
| Local Authority | SHIRE OF EXMOUTH | |
| Civil Consultant | JDSi | |

EXMOUTH FORESHORE REVITALISATION EXMOUTH
TRUSCOTT AVENUE INDICATIVE REFLEKTA LIGHTING LAYOUT

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|-------|----|-------------------|----------|
| Sheet | Of | 3E Drawing Number | Revision |
| 1 | 1 | 3E11176G-03 | 1 |

D

1.0 Executive Summary

This report has been prepared by JDSi to assist Hassell with the Exmouth Town Centre Revitalisation and Town Foreshore Revitalisation and alignment study.

Currently Exmouth has a stable permanent population in the order of 2,500 where existing infrastructure was largely constructed in conjunction with the original housing in the 1960s. The town's population expands during the tourist season and is enjoying growth from service companies supporting the offshore oil and gas industry.

Exmouth's service and infrastructure ownership includes the normal statutory owners being the Shire of Exmouth (SoE), Horizon Power, Water Corporation and Telstra

The key objectives of this report are to highlight:

- ▶ Existing infrastructure assets.
- ▶ Advice on infrastructure requirements for the revitalisation of the Exmouth Town Centre.
- ▶ Advice on potential staging of works.
- ▶ Preparation of preliminary estimates of construction costs.
- ▶ Advise on the implementation of key infrastructure requirements.

A key issue is that the services are all of c1960 in age and any changes may lead to wider upgrades to meet current servicing requirements, such as the replacement of aerial power with underground systems.

2.0 Introduction

Exmouth is 1,270 km north of Perth and is the largest town on the North West Cape of Western Australia. It existed as a small isolated town particularly growing during the Second World War and then was expanded under an arrangement between the State and Federal governments to support the communication facility. The Communication facility is a joint operation between the Australian and American governments.

The increasing popularity of the Ningaloo Marine Park is increasing the tourist and sightseeing traffic to the area. All this traffic accesses the marine park by travelling through Exmouth.

JDSi was engaged by Hassell who are the lead consultant to the Town Centre Revitalisation and Town Beach Integration study. JDSi was commissioned as the Project Teams' Civil Engineering Consultant.

This assessment provides an overview of existing and future servicing requirements to support the Exmouth Town Centre Revitalisation. It has been based on JDSi's observations, assessment of public information, assumptions and advice from our other partners in the Project Team and discussions with the various infrastructure stakeholders in Exmouth.

Refer drawing JDS11484-TC01 for Location of the Town Centre Study Area.

3.0 Geographical Characteristics

The Shire of Exmouth has a total land area of 6261 Square Kilometres.

The Town of Exmouth is located on the eastern side of the Cape Range which lies in a north south direction along the North West Cape.

On the western side of North West Cape lies the Ningaloo Marine Park.

The town is situated on the lower slopes of the Cape Range and is set back from the coast line of the Exmouth Gulf. The area immediately behind the coastal dunes becomes inundated with runoff from storms and is largely used for recreational activities. The town is impacted by rainfall events, usually cyclonic, which flow off the Cape Range very quickly and cause short term flooding on the several creek lines which pass through the town. The flooding has been extensively studied by Sinclair Knight Merz in conjunction with the Department of Water so that impacts and risks related to flooding can be understood and managed.

The ground conditions comprise a thin covering of sandy soil overlying generally sound limestone. This material provides a firm base for the water flow in the creek lines that prevents excessive scouring and washouts during storm events.

The nature of the limestone provides a sound building foundation, although harder to excavate, and the limited topsoil makes planting and landscaping harder than in other coastal areas with abundant sand layers.

4.0 Sewer

4.1 Current Situation

The Town Centre is currently serviced by a gravity sewer discharging to a DN225 sewer located in Murat Road. This sewer gravitates to the south and then east down Willesdorf Road. A short distance eastwards in Willesdorf Road lies the Exmouth Wastewater Treatment plant.

Existing sewer assets are generally located within road reserves and in alignments in private property. Alignments appear in most cases to be non standard when compared with current requirements. Most lots are served by sewers on alignments in the rear of properties.

Water Corporation owns and maintains the sewerage reticulation system in Exmouth including the Waste Water Treatment Plant. Some use is made of recycled water in the Town for watering recreational areas.

Water Corporations operating sewer license area currently includes the residential component of the Town site which includes the Town Centre Revitalisation area.

Refer drawing JDS11484-TC02 for the Existing Sewer Reticulation Plan.

4.2 Current Planning Town Site

The Water Corporation has advised that they will not be able to provide any advice in relation to the planning for the growth of Exmouth until land use planning is defined. Their current planning considers the town site growth on an annual rate of 2%; any substantial development would require a planning review.

4.3 Future Requirements

The Town Centre Revitalisation is not constrained by the existing sewer main capacities as any increment in commercial floor space generally only generates low additional sewage flows.

Any sewer mains that are, or become within lots following land use changes, may need to be relocated depending on the final growth plan adopted. Any relocation can be matched to the particular development.

5.0 Solid Waste Management

The town's landfill site is located approximately 5km south of the town site along Murat Road.

The landfill site is not constrained by space and has sufficient airspace for landfill operations to cater for the proposed commercial space growth.

6.0 Water Supply

6.1 Existing Situation

The supply of water and its treatment to potable quality is undertaken by the Water Corporation within their license area. The Water Corporations license area includes the town site and the town centre

The supply of water comes from a bore field situated on the western side of the town site with a connecting main to the town distribution system.

The Town site is reticulated from road reserves with water mains approximately on the standard Water Corporation alignments. Water distribution and reticulation mains are predominantly asbestos cement, and any adjustment would result in these being replaced with PE pipe materials.

Water Corporation has advised that they have undertaken minimal planning of the existing reticulation network with regard to expansion. The current Water License area covers the existing Town Centre so that services will have to be provided

6.2 Current Planning Town Site

The Water Corporation has advised that they will not be able to provide any advice in relation to the planning for the growth of Exmouth until land use planning is defined. Their current planning considers the town site growth on an annual rate of 2%; any substantial development would require a planning review.

6.3 Future Requirements

The Town Centre Revitalisation comprises relatively low water demand sites which will need to be individually addressed. To provide service an additional 150 DN looping main from the existing main near the intersection of Learmonth / Maidstone to the existing 150DN main in Payne Street may be required

Refer drawing JDS11484-TC03 for Town Centre Water Reticulation Plan

7.0 Power Supply

7.1 Introduction

Power is generated from a privately owned power station. This is operated by Worley Parsons under an agreement with Horizon Power as the distributing agency. Any significant increase in power demand is the subject of discussions between Horizon Power and Worley Parsons. Current power distribution is through aerial cables on poles made from railway line which appear to date from the construction of the town site. An increase in power demand may also entail an upgrade of the connecting infrastructure.

This information has been provided informally by officers of Horizon Power.

7.2 Town Centre Current Planning

The proposed revitalisation project consists of upgrades to roadways, creation of new road links, development of new landscape features and expansion of land usage within the Exmouth Town Centre. Areas where land usage can be expanded are highlighted below:



| Medium Term Retail (potential floor area) | Longer Term Retail (potential floor area) |
|-------------------------------------------|-------------------------------------------|
| 2,759 m ² | 3,600 m ² |
| Total | 6,359 m² |

We understand that the new IGA complex (Site 7) with associated roadway and lighting upgrade is to be built within the next 3 years. The extension of the existing IGA Complex (Sites 1-3) with associated streetscape to Kennedy Street is to commence within 3 to 5 years. All remaining Revitalisation upgrade works is to follow equally within period of 5 to 15 years.

This report investigates the electrical site servicing infrastructure and advises of the network reinforcement works required. In order to investigate the technical constraints/requirements with the electrical services for the proposed Revitalisation development, the following key objectives have been addressed in this report.

- Existing Electrical Services and Power Distribution Network
- Likely Load
- Power Supply Scenario

7.3 Existing Electrical Services and Power Distribution Network

Based on information obtained from Horizon Power (HP) DFIS (Distribution Facilities Information System) and Feasibility Study Report, the existing Horizon Power HV distribution infrastructure in the vicinity of the sites comprises of three-phase 11kV high voltage (HV) aerial conductors along the western side of Payne Street (Feeder EX1) and eastern side of Kennedy Street (Feeder EX3). Horizon Power has advised that after running some basic modeling, each feeder appears to have the capability to supply another 1MVA without reinforcements subject to no other load connections prior this project. A full modeling assessment will need to be conducted to confirm this.

We understand that Site 1 currently consists of a car park with no electrical services. An existing pad mounted 500kVA transformer is located on the adjacent lot to the south. Sites 2, 3, 5 and 6 also comprises of car parks, with Site 4 as a vacant lot. Horizon Power low voltage (LV) overhead aerials currently running through Site 5 and consumer overhead aerials through proposed Sites 2 and 3. Within Site 7, there are a number of lots with each lot supplied by their own overhead consumer connections.

Please refer to the extracts of HP DFIS plans and the drawing [3E11176G-01 Exmouth Town Centre Revitalisation, Exmouth (Rev 2).pdf] in the attachments section of this report.

Street lighting of the Exmouth Town Centre consists of a mixture of overhead aerial lighting and underground powered street lighting. Heritage Green 12.5m poles have been erected in the last few years for the lighting of Murat Road and Maidstone Crescent southern intersection. There are Heritage Red street light poles within the town centre on Maidstone Crescent.

7.4 Load Assessment

The estimated After Diversity Maximum Demand (ADMD) loads for this development have been assessed based on the method defined in AS3000: Wiring Rules and are as follows:

| | Orange Zone (Med. Term Retail) | Red Zone (Long Term Retail) |
|-----------------------------|------------------------------------------|---------------------------------------|
| Potential Floor Area | 2760 | 3600 |
| Total Area | 4000 | 8000 |
| % Land Use | 69 | 45 |

| Orange Zone | Area | 70% Usage | VA / m2 | Estimated Load (kVA) |
|--------------------|-------------|------------------|----------------|-----------------------------|
| 1 | 658 | 460.6 | 140 (1) | 65 |
| 2 | 520 | 364 | 140 (1) | 51 |
| 3 | 220 | 154 | 140 (1) | 22 |
| 4 | 684 | 478.8 | 140 (1) | 68 |
| 5 | 1920 | 1344 | 140 (1) | 189 |
| | | | Total | 395 |

| Red Zone | Area | 45% Usage | VA / m2 | Estimated Load (kVA) |
|-----------------|-------------|------------------|----------------|-----------------------------|
| 1 | 500 | 225 | 140 (1) | 31.5 |
| 2 | 7500 | 3375 | 140 (1) | 472.5 |
| | | | Total | 504 |

(1) Based on 140VA/m² for non-domestic installations (Retail shops)

It should be noted that Sites 4 and 5 may be fully utilised as car park areas and therefore the above loadings may not apply for these sites.

Based on the estimated load, location of the sites and proximity of each site to the main HV feeders (EX1 Lefroy Feeder & EX3 Kennedy Feeder), there are no constraints for staging. Where additional capacity is required, reinforcement upgrade works are needed on each HV feeder. Please refer to HV DFIS plan in the attachments section for level of reinforcement works required.

7.5 Power Supply Scenario

Horizon Power requires that all new developments be serviced by underground three phase power where three phase power is available. In a commercial development scenario, this would be by traditional HP owned and maintained URD 3-phase direct buried underground cabling from spare fuse way at the transformer's LV frame to Uni-pillars servicing each site on the general basis of one Uni-pillar serving each commercial lot. Where the customer's supply request exceeds 250 amp per phase, 3 phase, Horizon Power requires a transformer on site with the Site Main Switchboard to be contiguous (i.e. adjacent to the transformer site). This applies to Site 5 and 7 for the case where these sites are considered as single lots.

Due to the anticipated loads, it is unlikely that existing transformers in the vicinity will be capable of servicing these sites.

Horizon Power requires any existing HV and LV aerials or assets adjacent to or within the land being subdivided or amalgamated to be undergrounded. Along with this requirement, WA Electrical Requirements (WAER) also requires that each lot is to be serviced only by a single point of supply. Existing lots which are currently serviced by multiple points of supply do not need to satisfy this condition unless either one of their supply points is to be modified or upgraded.

The likely servicing scenarios for each site are as follows:

Site 1

- Upgrade existing pad mounted 500kVA transformer adjacent to site to 630kVA
- Upgrade transformer fuse on HV aerial network
- Install new Uni-pillar on Site 1
- Install new LV cable from upgraded transformer to new Uni-pillar
- Install new 2+1 HV Switchgear
- Underground LV & HV aerials through proposed mall
- Install new lighting through proposed mall

Site 2-6

- Install a new 2+1 HV Switchgear on Site 5 (to be supplied off EX3 Feeder)
- Install 630kVA non MPS transformer on Site 5
- Install new contiguous site main switchboard on Site 5
- Install new Uni-Pillar on Site 4 or 5 (If site is dedicated to car park)
- Install new Uni-pillars on Sites 2-4 & 6
- No pillar required on Site 4 if Site 4 & 5 is considered as one single lot, power has been installed on site 5 and both sites are dedicated for car park use
- Install new LV cable from transformer on Site 5 to new Uni-pillars on Sites 2-4 & 6
- Remove overhead consumer connections to Lots adjacent Sites 2 & 3
- Install new Uni-pillars for lots adjacent to Sites 2 & 3 and reconnect consumer mains
- Underground HV aerials adjacent to Site 2 & 3 with the use of Switchgear on Site 5
- Underground LV aerials running through proposed Site 5 and resupply existing consumer connections as required
- Install new streetlights for new Road Link of Learmonth Street and Kennedy Street
- Remove LV aerials on Maidstone Crescent adjacent to Site 6
- Relocate/replace street lighting on Maidstone Crescent to suit amended Road Link
- Upgrade lighting of Thew Street

Site 7

- Install a new 2+1 HV Switchgear on Site 7 adjacent to Payne Street (to be supplied by either EX1 feeder)
- Install 630kVA non MPS transformer on Site 7
- Install new contiguous site main switchboard on Site 7
- Remove existing overhead consumer connections
- Underground HV aerials on Payne Street adjacent to Site 7 to suit new link road
 - Install HV switchgear in Federation Park to assist underground of HV aerials
 - Resupply HV network on Bonefish Street
- Remove LV aerials (from Christie Street) running through proposed link road of Payne Street
 - Resupply LV connections as required
- Install Uni-pillar on Federation Park
 - Install LV cable & Supply Uni-pillar from new transformer on Site 7

Maidstone Crescent & Payne Street Upgrade

- Relocate/replace existing street lighting to suit new road layouts
- Realign/relocate/underground existing aerial network to suit new road layouts

Bonefish Street and Thew Street Upgrade

- Upgrade existing lighting to suit new road layouts

Assumptions and Exclusions

More certainty with respect to Horizon Power capacity could be readily determined by the application to and provision of a Design Quotation Application (DQA) from HP at the time of development. Horizon Power does not provide the option of reserving spare capacity in their network and therefore capacity is utilised on a first come first serve basis.

Each Site has been considered as a separate single lot. Power calculations and upgrade requirements have been considered on this basis. More accurate

assessment can be made once Lot Boundaries and Road Layouts have been defined / confirmed.

7.6 Lighting Options

Street lighting of the Exmouth Town Centre currently consists of a mixture of overhead aerial lighting and underground powered street lighting. Heritage Green 12.5m poles complete with High Pressure Sodium (HPS) luminaires have been erected in the last few years for the lighting of Murat Road and Maidstone Crescent southern intersection. There are Heritage Red streetlight poles within the town centre on Maidstone Crescent. The township redevelopment creates an opportunity to replace existing streetlights with alternative solutions such as LED and solar lighting. Pros and Cons of these alternative solutions are explored below.

| Solar LED Lighting | |
|----------------------------------------|------------------------------------------|
| Pros | Cons |
| No Power Bills | Very high initial costs |
| Low maintenance | High vandal and theft concerns |
| No trenching and cabling between poles | Lights cannot be located in shaded areas |
| Operational during power blackouts | Battery related flood concerns |
| Longer lamp life (up to 5 years) | Battery replacement every 8-10 years |
| Environmental advantages | |

| LED Street Lighting | |
|----------------------------------|--------------------------------|
| Pros | Cons |
| Low maintenance | Slightly higher initial costs |
| Less power usage | |
| Longer lamp life (up to 5 years) | |
| Environmental advantages | Battery related flood concerns |

Alternative lighting solutions utilised on road reserve will be considered as private lighting by Horizon Power and therefore will need to be owned and maintained by the Shire.

For slightly higher initial cost compared to Horizon Power standard street lighting, consideration should be given for the utilisation of LED lighting within public open spaces and street lighting. Given the high initial costs and proximity of existing power infrastructure, Solar LED lighting will not be as cost effective as distribution connected lighting.

8.0 Gas Supply

Alinta Gas has advised that there is no gas network available for the Town of Exmouth.

9.0 Telecommunications

9.1 Existing Situation

Exmouth is primarily serviced by fibre optic cable in the Exmouth Road (Murat Road) reservation and mobile service. The Town site is reticulated with both fibre optic and cable.

Telstra have advised that the current communications system is performing within specified requirements. The system has the necessary capacity to manage the projected 2% per annum growth. Any large development of an area may require some upgrades and Telstra believe that early advice of these projects would enable them to carry out any necessary upgrades and maintain services.

Refer drawing JDS11484-TC06 for existing Telstra Services.

9.2 Current Planning

As part of the investigation processes for the Town Centre Revitalisation, Telstra have been made aware of the Town Site and Town Centre's future growth plans.

Telstra has completed a desktop network planning study based on the advised growth and while results may vary following field data investigations the network is capable of managing the likely demand.

9.3 Future Requirements

Existing Telstra assets are currently on various alignments. As staged works progress in the Town Centre, Telstra alignments and service points may need to be relocated. Planning for this work can only proceed once land uses and land planning has been completed.

10.0 Roads and Footpaths

10.1 Existing Situation

Roads are owned and maintained by the Shire of Exmouth.

The majority of the roads within the Town Centre are typically sealed and kerbed. All roads are in average condition. Any new roads or upgrades will require to be constructed to similar standards as existing.

Pedestrian pathways within the Town Centre are typically in-situ grey concrete broom finish paths. Within the existing mall area two types of footpath have been constructed, one a segmental pavement using brick paving, and one using a locally mixed light colour concrete. The opinion expressed was that the light concrete provides easier cleaning and maintenance than the masonry blocks. Cleaning and appearance is an important consideration in the road infrastructure.

Refer drawing JDS11484-TC04 for Town Centre Road Layout Plan.

10.2 Current Planning

There is no current planning for new road networks or upgrades except for works devised during the Town Centre Revitalisation Planning.

10.3 Future Requirements

Roads will need to be constructed in accordance with the IPWEA Subdivision Guidelines and in conjunction with the Shire of Exmouth [Guidelines and Standards]. Road widths will be derived in accordance with the planning layout and traffic requirements. Footpaths may also be required in accordance with the guidelines from the Department for Planning and Infrastructure.

The Shire Officers are keen to have good quality footpaths, particularly around the Town centre commercial area. A preference was expressed for the use of the locally mixed light colour aggregate concrete. This provides an acceptable finish and appearance and will be considered during detail design.

In consultation with the project team and the Shire of Exmouth representatives, the following road and car park construction works areas are proposed:

- Construction of the new Payne Street link to the north and east of the aquatic centre from Maidstone Crescent to existing Payne Street. Existing Payne Street between Federation Park and aquatic centre to be closed and pavements removed. On street parking to be maximised as per road plan.
- Construction of a new southern link road from Maidstone Crescent to Kennedy Street and finishing at Learmonth Street. This will see the need for

the Town Creek to be realigned to the south west of Kennedy Street to accommodate this new road link.

Bonefish Road will need to be closed at the Town Creek crossing. All pavements and drainage structures will need to be removed and the creek rehabilitated to natural levels.

On Street parking will be maximised to the east of Kennedy Street along new road link.

- Maidstone Crescent to be merged to its eastern carriageway and median removed between the new southern link road and the Learmonth Street intersection. The western carriageway pavements to be removed and area rehabilitated. On street parking will be maximised.
- A northern link road and laneway between Maidstone Crescent and Payne Street. On street parking will be maximised along the new link road.
- Roundabouts are proposed at the Murat Road and Maidstone Crescent intersections.
- A new western car park to be constructed the west of the shopping centre and north of the new southern link road. The new car park will include accommodation for approximately 15 long vehicle bays. Existing pedestrian links will be maintained.
- The existing car bays to the east of the shopping centre off Maidstone Crescent will be redesigned and reconstructed allowing for more formalised and motorist / pedestrian friendly parking.
- A car park to be constructed between Bonefish Street and the Town Creek. Pedestrian links will need to be maintained to the Towns shopping area.
- The current road plans show streetscapes and on road car parking improvements along Maidstone Crescent and Payne Street. It is envisaged these works will occur as required, as the Town Centre develops.

11.0 Drainage

11.1 Existing Situation

The existing Town is drained through a combination of culvert networks, open drains and creek lines. These connect to open drains which are natural creek lines that discharge into the low lying area behind the dunes along the Exmouth gulf coast. Some sections of these creek lines remain in their original condition although the majority have been modified through realignment and widening/deepening to suit development and increase capacity.

Rainfall events have led to flooding in parts of the Town Site and this has been extensively modelled by the Department of Water (DoW) and Sinclair Knight Merz (SKM). The resulting report identifies the extent of flooding for various storm events and return periods.

The Shire of Exmouth have commissioned Cardno Consultants to examine the drainage systems and to give advice on improvement works to reduce the time that sections of the town are threatened by floodwaters. Cardno are currently working on this study.

Isolated flooding occurs in the Town Centre following storm and cyclone events. Flooding occurs along the creek line next to Thew Street and in Bennett Street with surface flows from the drainage off the Hospital site affecting some commercial properties. The extent of the flood plain and flood fringe is shown on the drainage drawing and has been extracted from the DoW / SKM report.

Stormwater Flows generated in the creek line north of Snapper Loop and south of Reid Street carry the remainder of the stormwater flows around the central town area.

11.2 Current Planning

There is no current planning for new drainage works or upgrades except for redevelopment works resulting from the Town Centre Revitalisation study and the outcomes of the Cardno drainage analysis.

11.3 Future Requirements

It is proposed to continue with the development of the Town Centre adopting existing practices utilising roadways and open drains for the majority of any stormwater conveyance.

The following Design Criteria is proposed to be adopted:

- Piped drainage system to accommodate 1 in 5 year ARI rainfall events.
- Open drain system to accommodate a minimum of 1 in 10 Year ARI rainfall events.
- Road culvert crossings to be designed to accommodate a minimum of 1 in 10 year ARI rainfall events.
- Overland flood paths are to be established to accommodate 1 in 100 year events and new properties are to be elevated to be protected from this event.

For the implementation of the Town Centre Revitalisation Plan the following drainage upgrades are recommended:

- Upgrade of the Kennedy Street Town Creek crossing. Due to the proximity to public use amenities it is recommended to design the culvert crossing to accommodate 1 in 25 year ARI rainfall events.

Kennedy Street would be required to be designed to direct flows towards the Town Creek and reduce existing inundation to the south of the shopping centre. The culvert crossing will be designed to accommodate overtopping during more serious rainfall events.

Culvert sizes will need to take into consideration the minimum cover on site.

- Maintain the over land flow path from Exmouth Hospital down Learmonth Street.
- Reduce existing flood prone area at the Learmonth Street / Maidstone Crescent intersection via directing the stormwater into a new open drain on the east side of Maidstone Crescent.

This new open drain will be designed to accommodate a minimum of 1 in 10 year ARI rainfall events. The drain will be directed down the north side of Federation Park and into a new culvert crossing at Payne Street. Additional culvert crossings will be required for future driveways from Maidstone Crescent.

The provision of the new open drain will remove the need for an overland drainage route down the proposed laneway between Maidstone Crescent and Payne Street. This will allow for improved interface between the two proposed super lots.

The new culvert crossing at Payne Street will be designed to accommodate a minimum of 1 in 10 year ARI rainfall events. The existing undersized culvert crossing at Payne Street is to be removed.

Provisions will need to be made for the other major events i.e. Building levels above 1 in 100 year flood level freeboard requirements, shaping POS to direct larger flows.

- Consideration should be given to reducing the restraints within Town Creek by removing the existing culvert structures at Bonefish Street and re-establishing natural creek levels.
- Current overland flood paths are to be maintained or new flood paths created.

Refer drawing JDS11484-TC05 for the Town Centre Drainage Plan.

12.0 Staging and Construction Implications

12.1 General Approach

The revitalisation of the Town Centre is achievable by progressively building on the existing lots and road layout. The proposed works can be constructed in a variety of sequences to suit associated commercial activity, community preferences, and available funding. This flexibility is unique amongst revitalisation projects as it provides a wide range of choice without other service constraints.

Provisions for potable water, sewer, power and communications will be installed as required during construction of the staged works areas. No major servicing extensions or upgrades were identified in the Town Centre Revitalisation investigations.

The most crucial service element is the electric power supply and street lighting circuits which will be placed underground in accordance with current authority criteria. As a minimum this will require a design plan and the building of conduits under any pavements being constructed to avoid later disturbance of newly constructed works. Major power infrastructure items such as transformers will be designed to be implemented as developer funded items where possible.

Existing pedestrian pathway networks will be required to be maintained during all stages of works. Temporary pathways will be made available for public use where construction impacts on these existing networks. Permanent pathways will be included in all stages of works.

Refer drawing JDS11484-TC07 for Town Centre Staging Plan

12.2 Stage 1 □ New Southern Link

Construction of a new southern link road includes the following infrastructure:

- Roadworks
New southern link road from Maidstone Crescent to Kennedy Street to Learmonth Street.
- Town Creek Realignment
To accommodate the new road link between Learmonth Street and Kennedy Street the Town Creek will need to be realigned. This section of road will be staged after completion of these works.
- Drainage
Major Town Creek culvert crossing under Kennedy Street. The existing Bonefish Road creek crossing will ultimately be required to be removed. Staging of this works will only occur once the new Kennedy Street culvert crossing has been completed and opened for public use.
- Car park
The upgrade of existing off street car parking and additional on street parking. Timing of construction works within this contract will need to be managed in order to meet public car parking requirements.

12.3 Stage 2 □ Upgrade of Maidstone Crescent

- Roadworks
Maidstone Crescent to be upgraded between the new southern link road and the Learmonth Street intersection to suit the Town Centre Master planning.
- Drainage
Open drain and driveway culverts to be constructed as required.
- Car Park
The upgrade of existing off street car parking and additional on street parking. Timing of construction works within this contract will need to be managed in order to meet public car parking requirements.

- **Water Reticulation**
Installation of a DN150 water main extension may be required to provide diversity in the immediate water reticulation network.

12.4 Stage 3 and 4 □ Upgrade of Federation Park and New Payne Street Link

- **Roadwork**
Construction of the new Payne Street link including on street parking to the north and east of the aquatic centre.
- **Drainage**
Open drain and culvert crossing.

12.5 Stage 5 - Kennedy Street Partial Mall

- **Roadwork**
This Revitalisation Plan recognises the Shire's desire for a mall as part of Kennedy Street. The existing street layout could be modified to create a part mall against the existing commercial premises on the west side. There is a fall across the road reserve which would permit a small retaining wall to divide the mall/pedestrian zone and the trafficked zone. This creates a mall area approximately 9 metres wide which could have planting and seating improvements to make a community area. The trafficked section can also be closed for special events such as street market days. In our opinion this should not be fully closed until the Thew Street / Learmonth Street connecting road is constructed to create a functional traffic movement around the Town Centre.

12.6 Stage 6 □ Northern Road Link and Laneway

- **Roadwork**
A northern link road and laneway between Maidstone Crescent and Payne Street to be constructed. On street parking will be maximised along the new link road.
- **Drainage**
Existing open drain can be reclaimed for other use due to redirection of overland flows through Federation Park.

12.7 Stage 7 □ Bonefish Street Car Park

- **Roadwork**
New long vehicle car park off Bonefish Road. This stage is unconstrained and not reliant on any other staged works and can be completed as required by the Shire.

12.8 Stage 8 □ Western Car Park

- **Car Park**
A new western car park to be constructed the west of the shopping centre and north of the new southern link road.

12.9 Stage 9 - Creation of an Entry Identity.

- **Roadwork**
To meet the advised concern that motorists driving on Murat Road do not easily recognise the location of the Town Centre various ideas such as intersection upgrades and signage were considered. The simplest way may be the creation of an entry type location at the intersection of Murat Road and Maidstone Drive. It is proposed that these intersections are roundabouts.

As the main approach traffic direction was seen to be from the south it is proposed to enhance the southern intersection only at this stage. The southern intersection is also in the vicinity of pedestrian movements across Murat Road to the recreation facilities on the east side of the road. The intersection has the space to include entry walls with signage or motif possibly selected using a public competition process.

The northern intersection could also be similarly treated and this can be a separate decision.

This stage is unconstrained and not reliant on any other staged works and can be completed as required by the Shire.

13.0 Implementation Plan

This final section of this Revitalisation Plan concentrates on the short term requirements for implementing infrastructure within the Town Centre.

The intention is to build the works at a rate that encourages town site development and the ongoing upgrading of existing privately owned commercial buildings. The nature of the individual work items is such that a large degree of flexibility exists in building the works, and that some items can be completed ahead of other parts while making a continuous improvement.

Table 15.7 lists the actions recommended to progress the infrastructure for the staged development of the Town Centre. The timeframes for staging are as follows:

Table 15.7 Implementation Actions for Staged Infrastructure Development of the Town Centre.

- Short Term - 0 to 6 months*
- Medium Term - 6 to 1 year*
- Long Term - 1 year plus*

| No | Action | Lead Stakeholder and stakeholders | Staging | Comments |
|----|---------------------------------------------------|------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Field and Cadastral Survey | Shire of Exmouth | Short Term | Survey required for planning and engineering. |
| 2 | Secure Unallocated Crown Land for Public Purposes | Shire of Exmouth Department of Regional Development and Lands | Short Term | Council needs to seek the necessary approvals (native title etc.) for existing areas of unallocated Crown Land within and adjacent the Town Centre to be secured for purposes identified in the Revitalisation Plan. |
| 3 | Design Guidelines | Shire of Exmouth | Short Term | Design guidelines should be prepared to guide development within the Town Centre. |
| 4 | Geotechnical Investigations | Shire of Exmouth | Short Term | Geotechnical advice required for infrastructure and structures. |
| 5 | Sewer and Water Strategy | Shire of Exmouth Water Corporation | Medium Term | Council should prepare a submission to the Water Corporation supported by a civil engineering feasibility and costing, based on staged implementation. |
| 6 | Power and Lighting Strategy | Shire of Exmouth Horizon Power | Medium Term | Council should prepare a submission to Horizon Power supported by a civil engineering feasibility and costing, based on staged implementation. |

14.0 Disclaimer

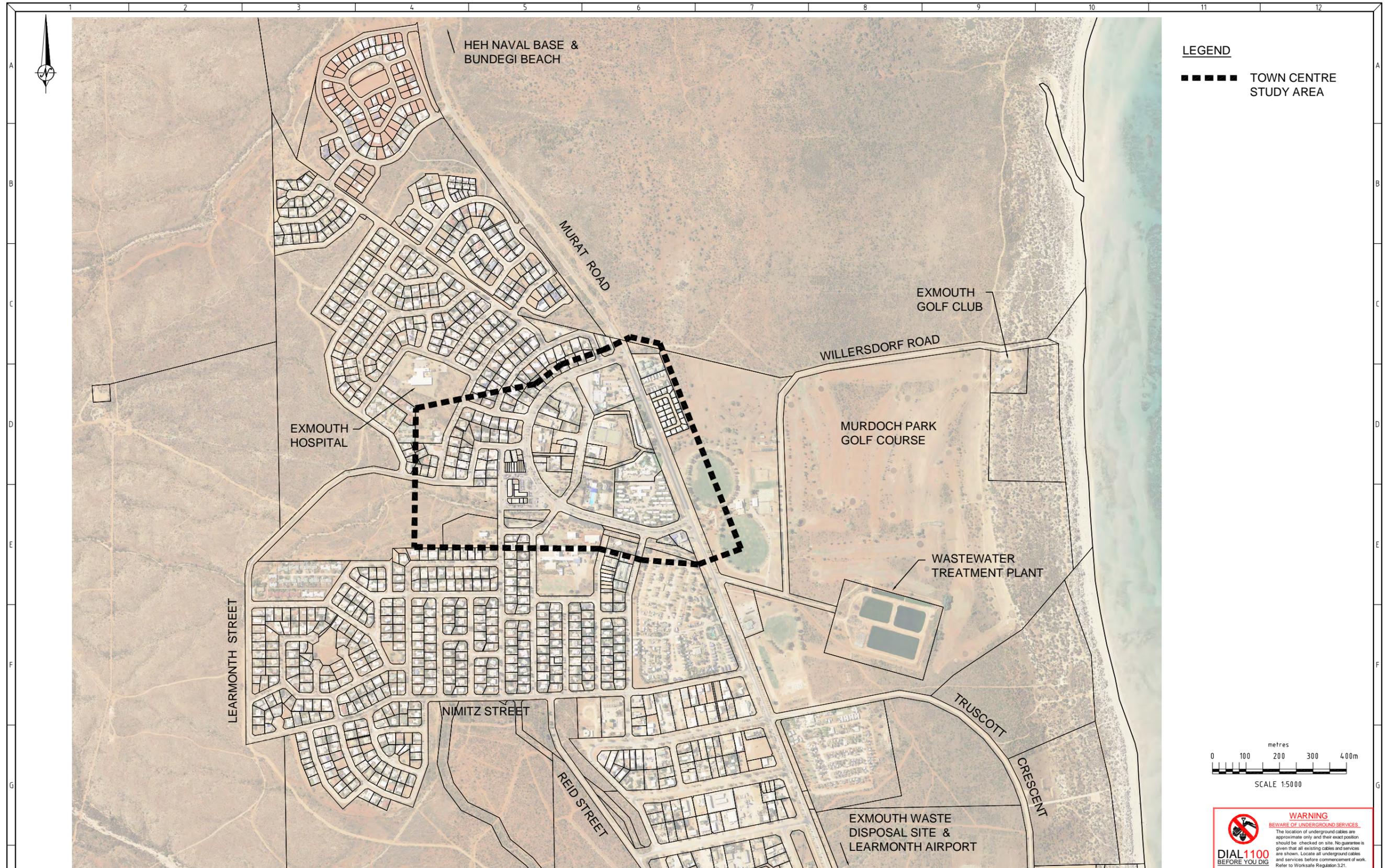
This report has been prepared from preliminary planning and informal discussions with service authorities. Information will be confirmed as the land use planning and detailed studies progress.

This report is JDSi's interpretation of the information provided.

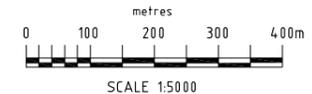


Exmouth Revitalisation Plan
Infrastructure Report

APPENDIX A □ DRAWINGS



LEGEND
 ■■■■■ TOWN CENTRE STUDY AREA



WARNING
BWARE OF UNDERGROUND SERVICES
 The location of underground cables are approximate only and their exact position should be checked on site. No guarantee is given that all existing cables and services are shown. Locate all underground cables and services before commencement of work. Refer to Worksafe Regulation 3.21.
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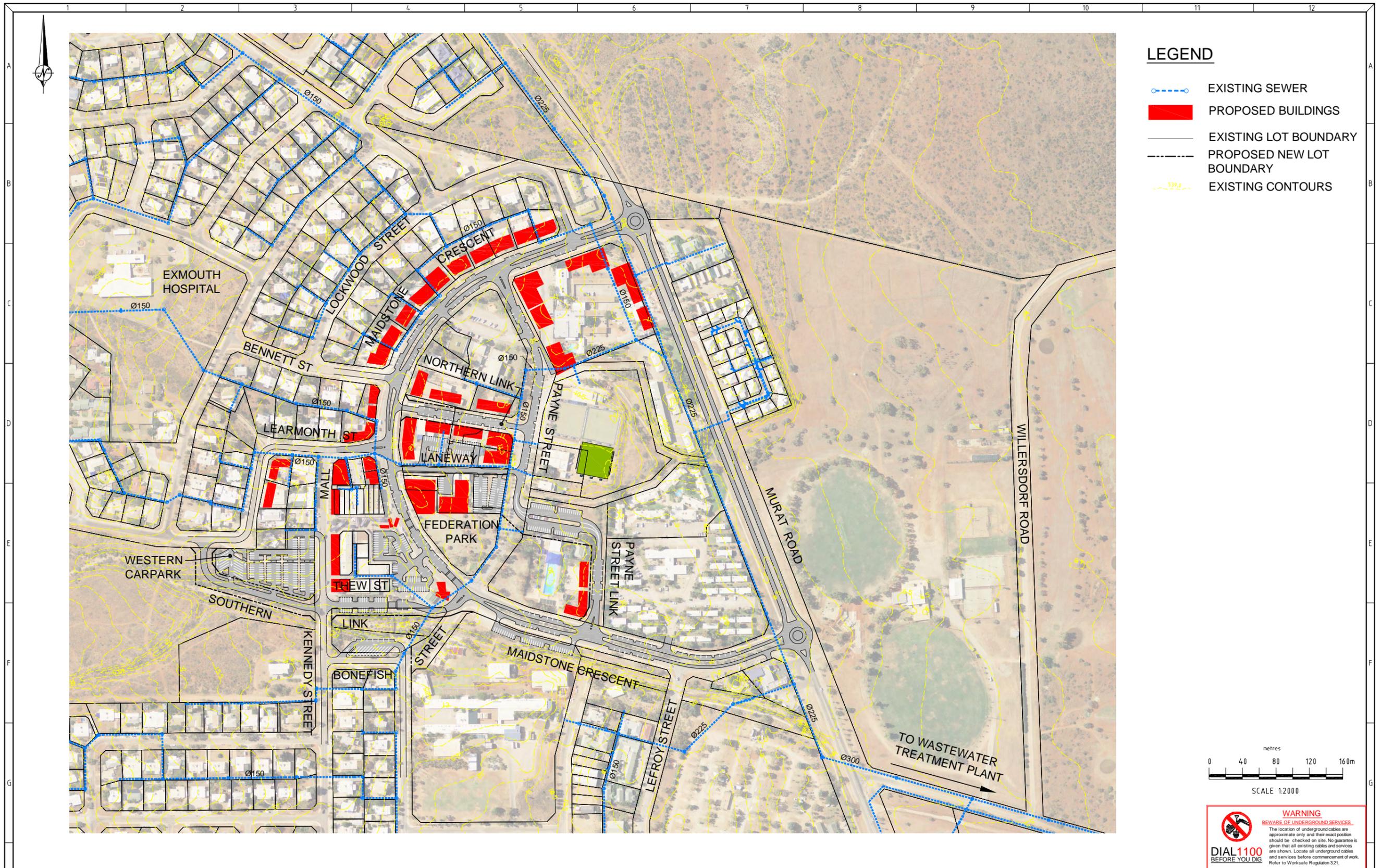
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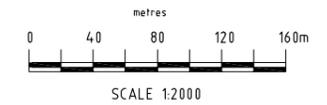
PROJECT:
EXMOUTH TOWN CENTRE REVITALISATION
 DRAWING TITLE:
EXMOUTH TOWN CENTRE LOCALITY PLAN

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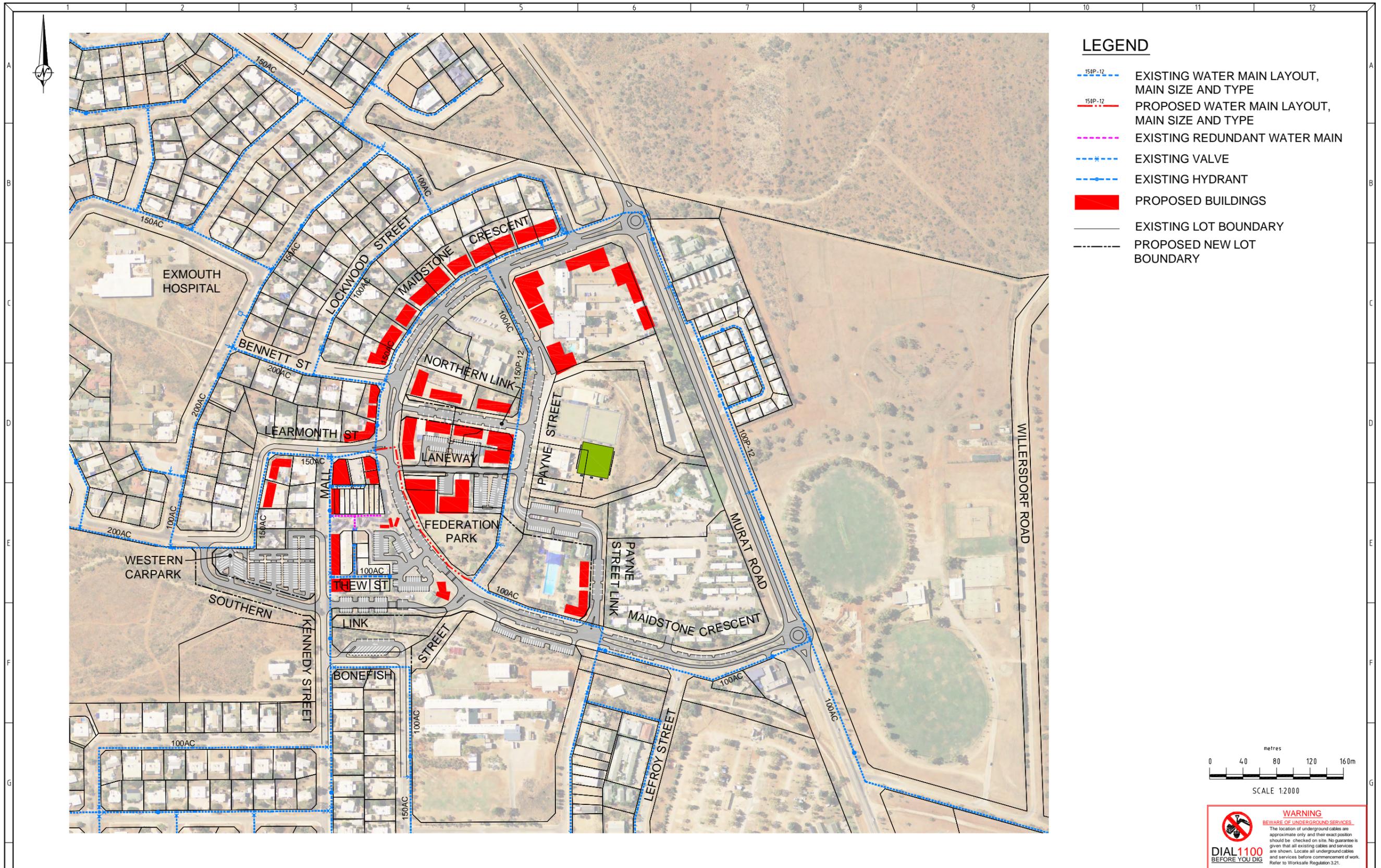
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- PROPOSED NEW LOT BOUNDARY
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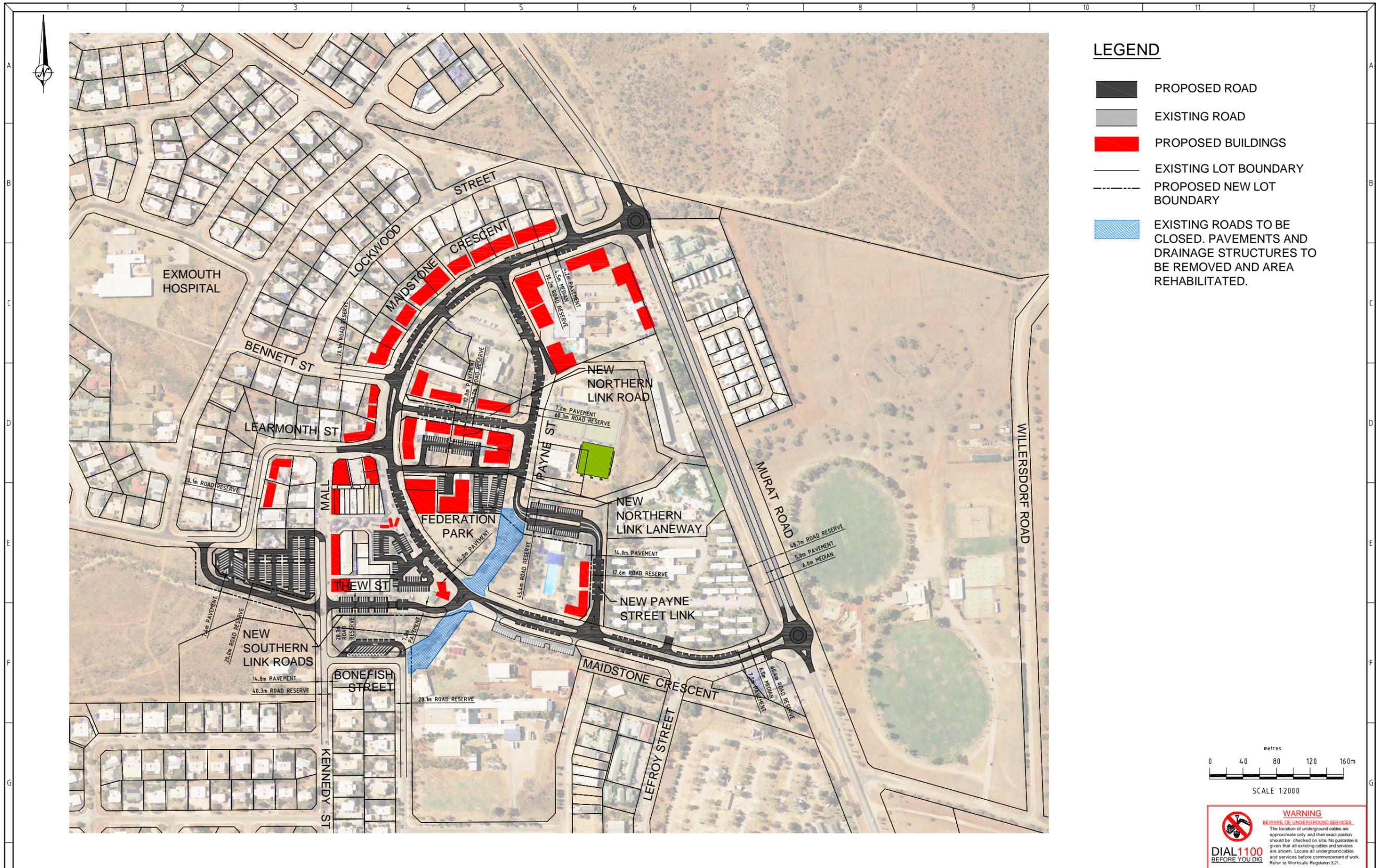
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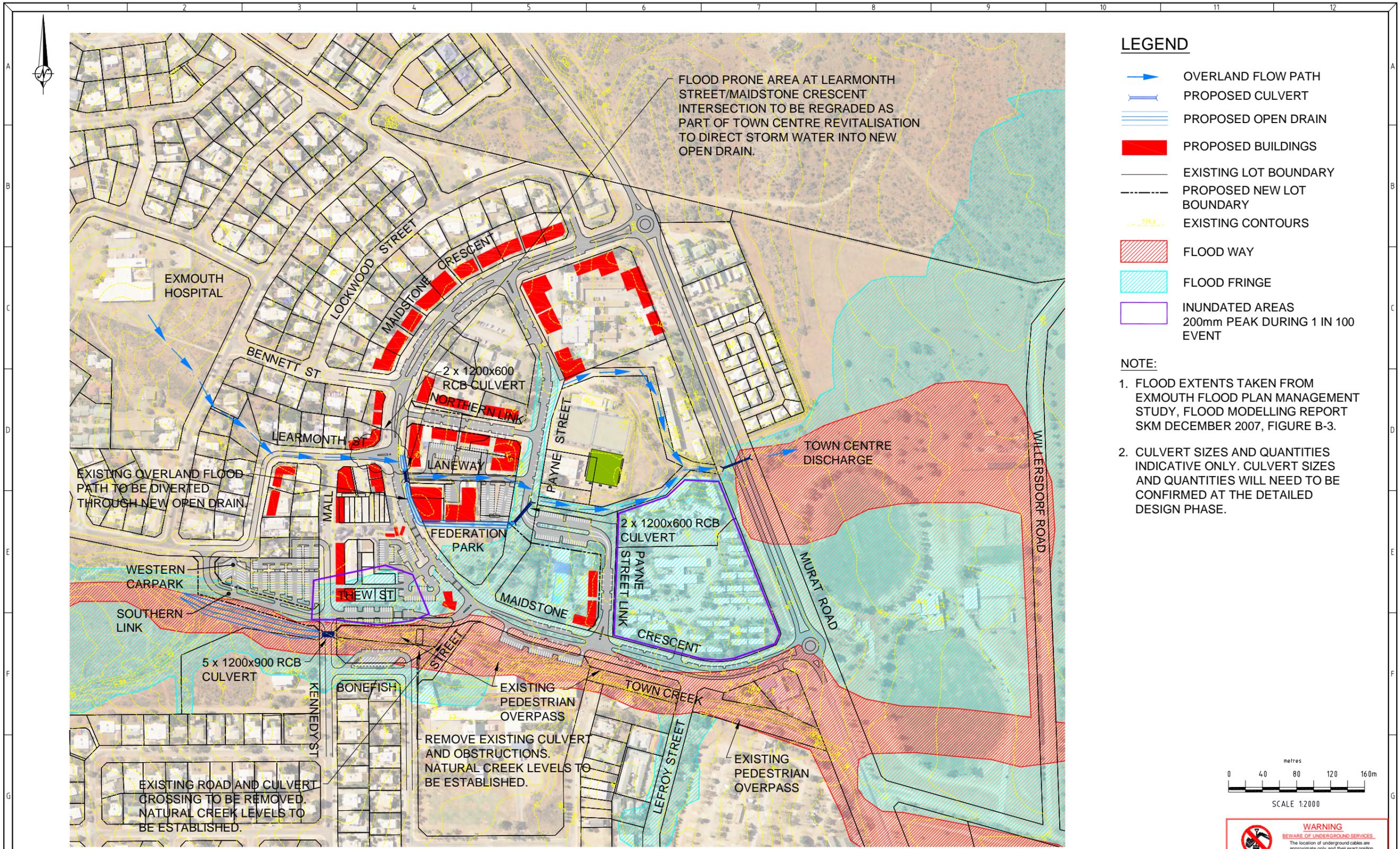
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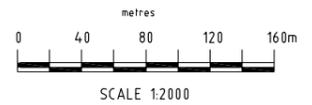


LEGEND

- OVERLAND FLOW PATH
- PROPOSED CULVERT
- PROPOSED OPEN DRAIN
- PROPOSED BUILDINGS
- EXISTING LOT BOUNDARY
- PROPOSED NEW LOT BOUNDARY
- EXISTING CONTOURS
- FLOOD WAY
- FLOOD FRINGE
- INUNDATED AREAS 200mm PEAK DURING 1 IN 100 EVENT

NOTE:

1. FLOOD EXTENTS TAKEN FROM EXMOUTH FLOOD PLAN MANAGEMENT STUDY, FLOOD MODELLING REPORT SKM DECEMBER 2007, FIGURE B-3.
2. CULVERT SIZES AND QUANTITIES INDICATIVE ONLY. CULVERT SIZES AND QUANTITIES WILL NEED TO BE CONFIRMED AT THE DETAILED DESIGN PHASE.



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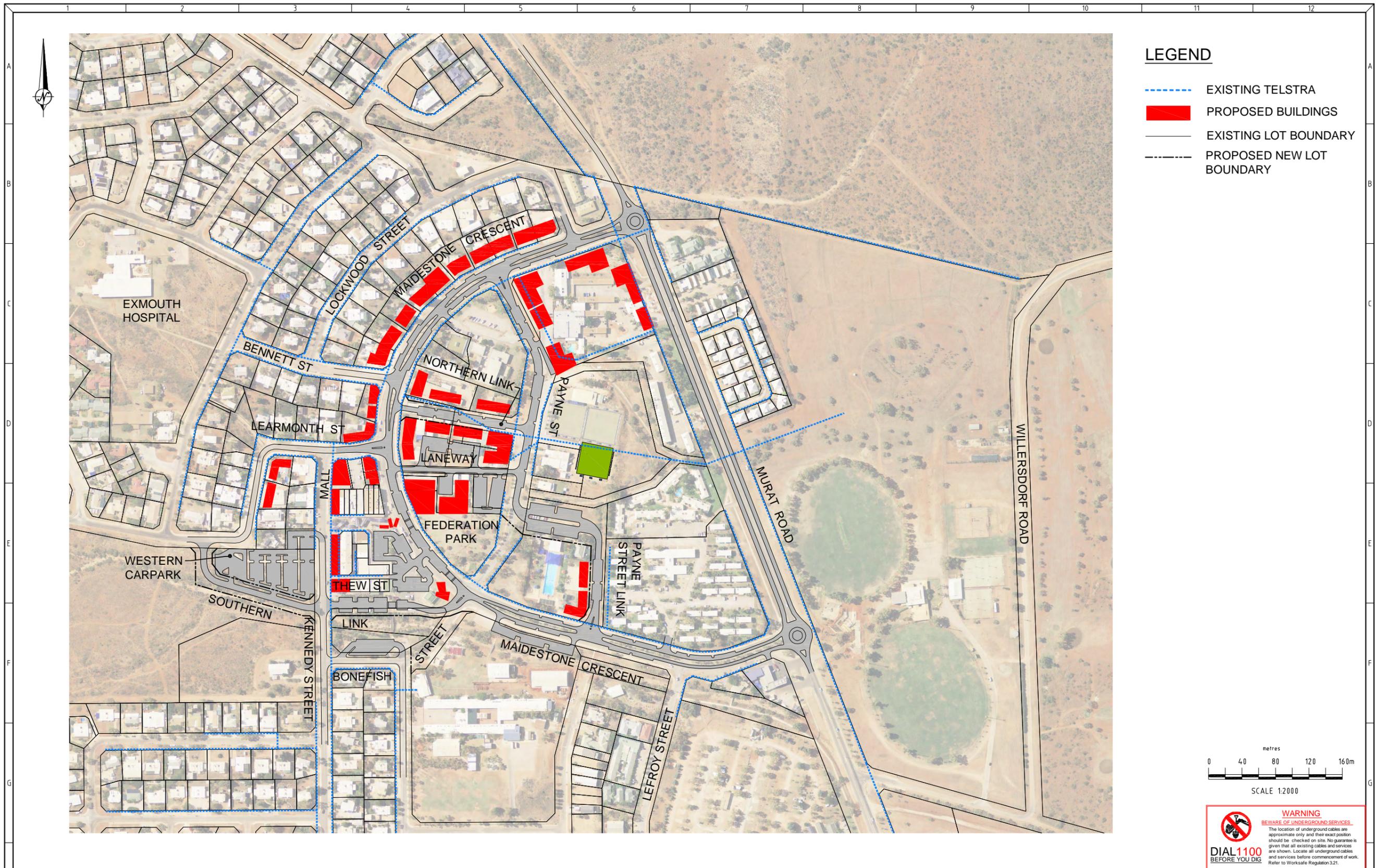
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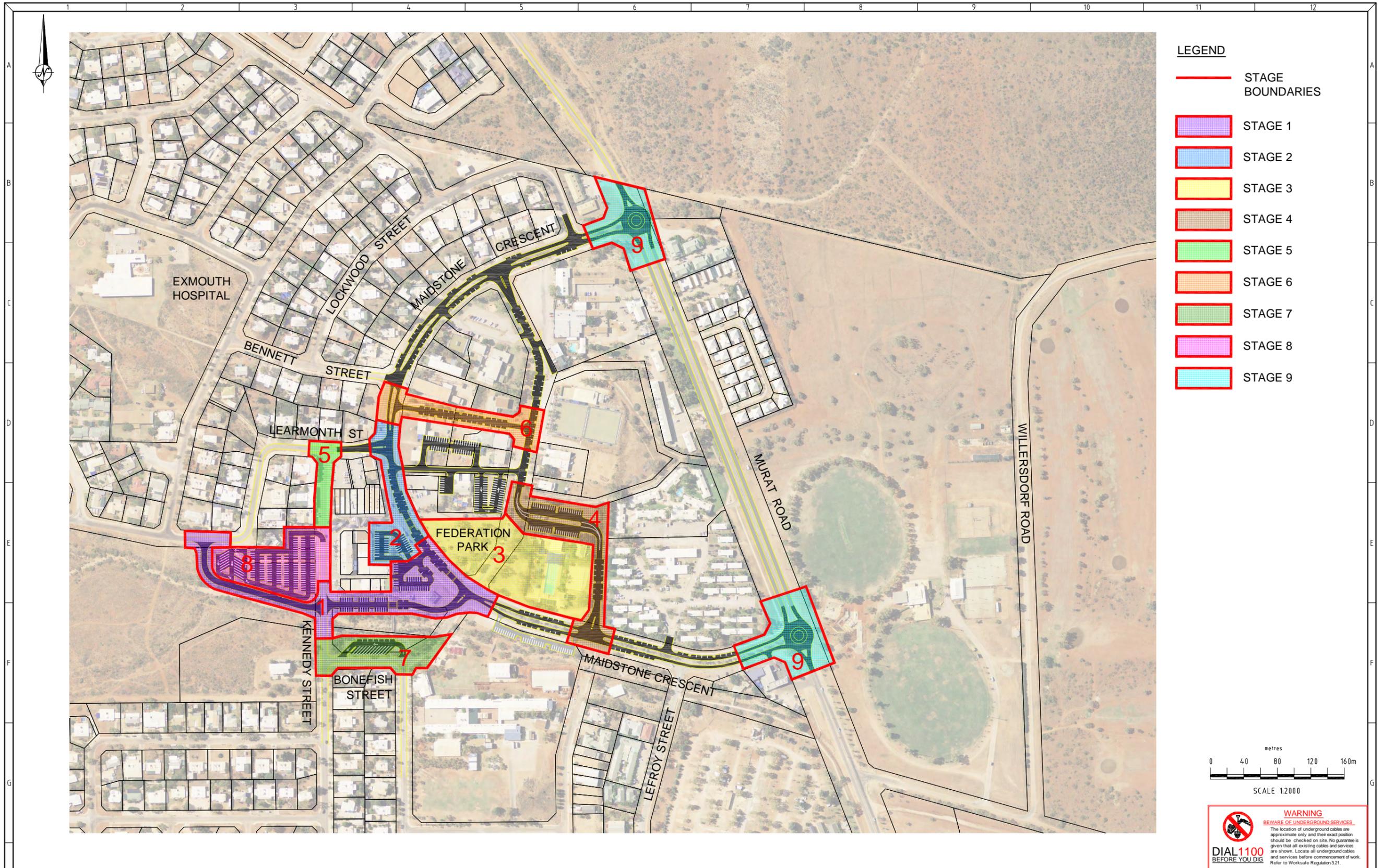
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SHIRE OF EXMOUTH

PROJECT:
EXMOUTH TOWN CENTRE REVITALISATION
DRAWING TITLE:
EXMOUTH TOWNCENTRE EXISTING STORMWATER DRAINAGE SYSTEM

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| <p>PROJECT MANAGER B. KEAY</p> | <p>DATUM AHD</p> |
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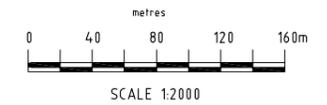


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LEGEND

- STAGE BOUNDARIES
- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- STAGE 8
- STAGE 9



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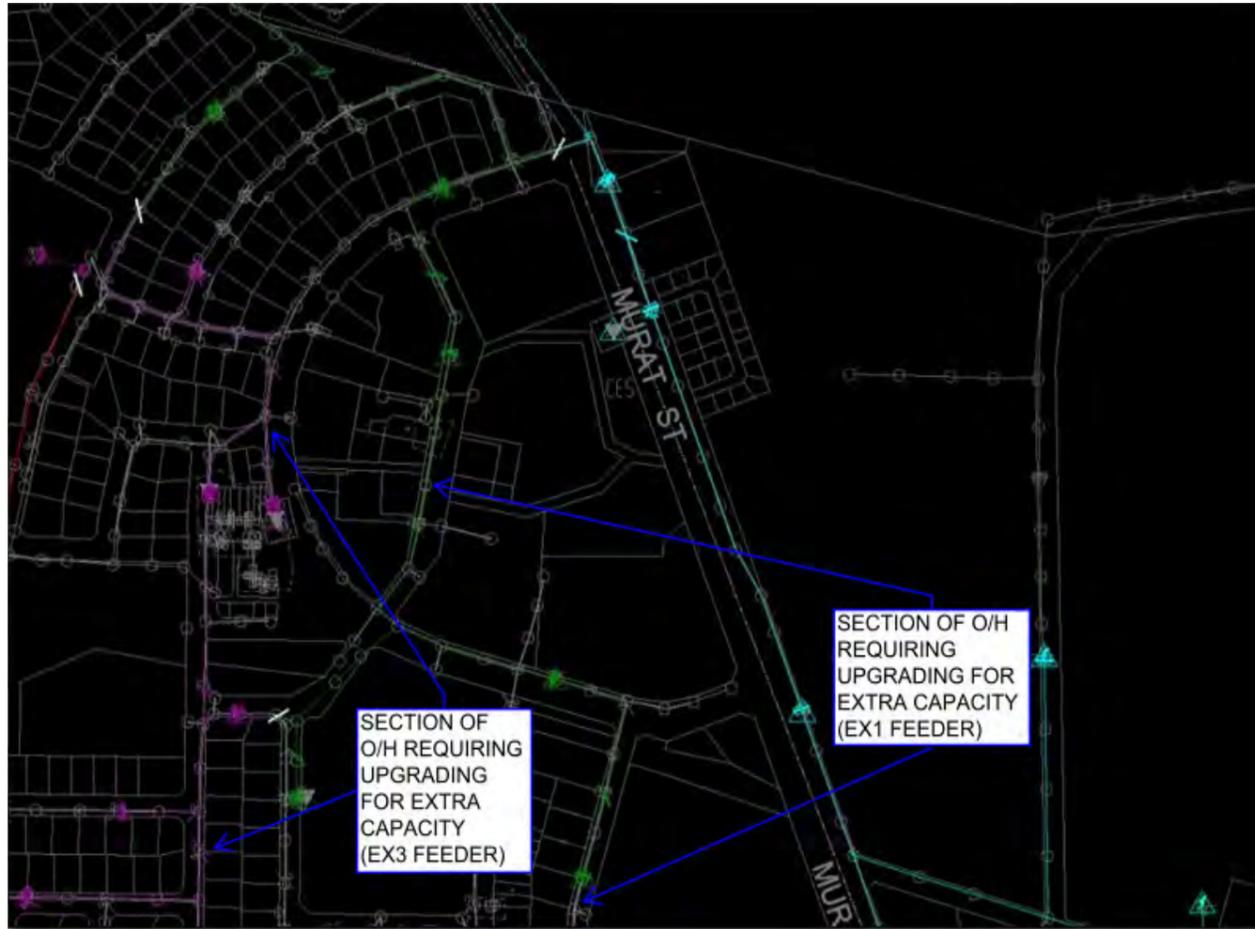
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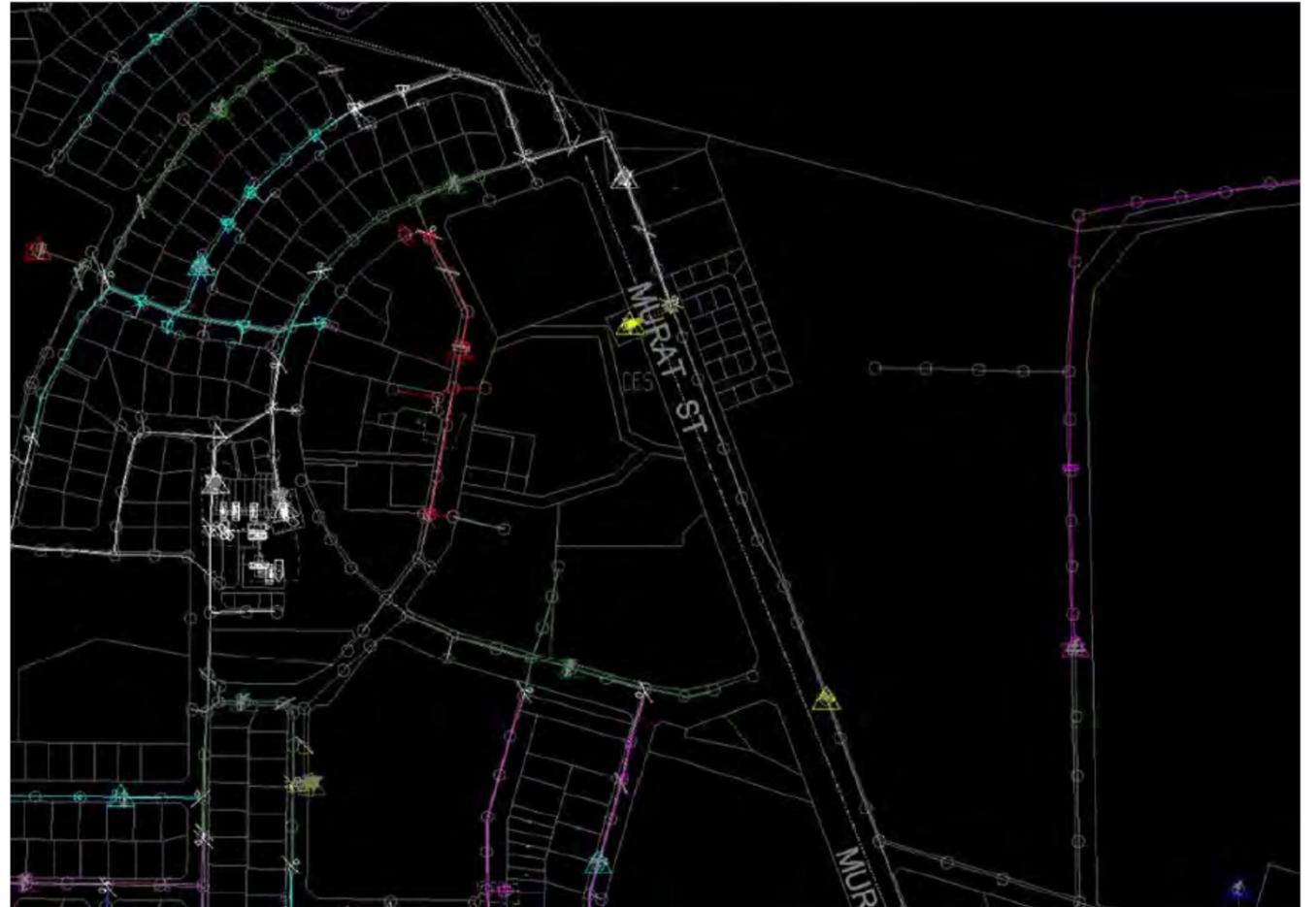
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Exmouth Town Centre, Exmouth – DFIS HV Map



Exmouth Town Centre, Exmouth – DFIS LV Map



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1. ALL POLES AND TRANSFORMER LOCATIONS HAVE BEEN OBTAINED FROM HP'S DISTRIBUTION FACILITIES INFORMATION SYSTEM (DFIS)
ALL INFRASTRUCTURE ARE TO BE SURVEYED AND VERIFIED ON SITE

2. TRANSFORMER SIZES TO BE CONFIRMED WITH HORIZON POWER

LEGEND

-  EXISTING HORIZON POWER PADMOUNTED TRANSFORMER
-  EXISTING HORIZON POWER POLE TOP AERIAL TRANSFORMER
-  AERIAL POLE
-  AERIAL CONDUCTOR
-  MEDIUM TERM RETAIL
-  LONG TERM RETAIL
-  PROPOSED MALL
-  REHABILITATED EXISTING ROADS

Dimensions and scales to be checked prior to measuring cable lengths



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| Horizon Power Reference No. | TBA | WAPC No. TBA |
| Local Authority | SHIRE OF EXMOUTH | |
| Civil Consultant | JDSI | |

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1 Introduction

The purpose of this analysis is to understand the future demand for retail and commercial floorspace in the Exmouth town centre according to different population scenarios. The aim is to ensure that the centre develops in a successful manner and can accommodate an increased scale and quality of sustainable employment.

This preliminary economic analysis by Pracsys is intended to inform the Town Centre Revitalisation Strategy for Exmouth currently being developed by Hassell and is expected to provide guidance on the planning of the optimal quantum and configuration of retail and commercial floorspace in the town centre into the future.

The analysis does not test the viability of suggested population scenarios. It should be considered as an indicator of scale for use in planning for intense, diverse activity centres.

2 Exmouth Economic Profile

With a relatively stable residential population Exmouth's economy is dominated by tourism which accounts for an estimated \$44 million of expenditure annually in the area. Other key industries include fishing, the nearby defence communications installations and the developing offshore oil and gas sector.

The population of Exmouth is anecdotally reported to be in the order of 2,500, however The 2006 ABS census data indicated the total population of the Shire was just over 2,000 persons of which 1,844 were resident in the Exmouth town site. The ratio of resident workforce to resident population was a relatively high 55% and it is suggested that a long term strategy towards sustained population growth might reasonably expect to see that ratio decline to around 42%-45%.

2.1 Drivers of Growth

The growth of Exmouth is dependent on generating strategic employment in key export oriented industries and infrastructure projects in the region. Under this scenario, Exmouth would become home to a residential workforce that may service infrastructure projects such as defence bases and the offshore oil and gas industry.

With the State's intention to establish Pilbara cities in Port Hedland and Karratha of notionally 50,000 plus residents, and a further significant centre in Newman, it is possible that Exmouth could position itself as a residential source community for the Pilbara. Under this scenario, workers may choose residency in Exmouth owing to a perceived higher lifestyle amenity than the Pilbara and choose to fly into the Pilbara from their base in Exmouth. For example, with the Carnarvon Basin located only 50km offshore, Exmouth is ideally located to provide supporting infrastructure and services to the offshore resources industry.

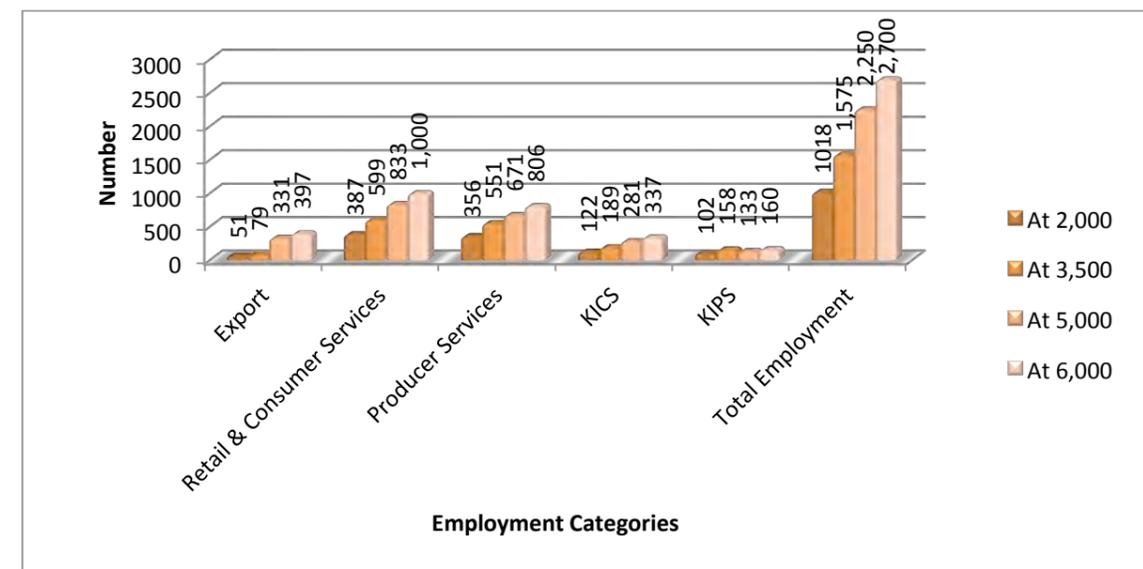
3 Population Growth Scenarios

The Exmouth Town Structure Plan reports that the Town of Exmouth has the physical capacity to cater for population growth of approximately 5,500 to just over 7,000 depending on land constraints. This assumes a more or less business as usual approach to land use and residential densities.

3.1 Employment Implications of Population Growth

Pracsys modelling posits population scenarios of 3,500, 5,000 and 6,000 permanent residents notionally by 2031 for the purposes of determining optimal floorspace.

Figure 1. Exmouth Employment Requirements at Variable Population Points



Source: Pracsys 2011

An increase in population to 3,500 presupposes a 55% increase in residential workforce to around 1,575 jobs. Moreover, this would require a disproportionate growth in the areas of strategic employment such as export / driver jobs and producer services jobs.

It should be noted that, Exmouth's population has not grown significantly over the past census period and it is suggested that any substantial growth of the type modelled here would require an intervention strategy designed to attract industry, businesses and residents over the longer term.

The main driver of growth, particularly in regional areas, is the generation of employment. When assessing employment it is important to consider not only the quantum of jobs being created but also the quality of jobs. The generation of population driven employment will occur in response to the growth in population, which occurs as a result of the generation of strategic employment.

Exmouth needs to focus greater attention on assessing their workforce distribution to ensure they reach an optimal mix of strategic as well as population driven employment. Without the strategic employment generated by major driver and infrastructure projects in the regions, the demand for population driven services would be a fraction of that evidenced by current service provision levels.

4 Floorspace Demand

The following assumptions were used to analyse several possible population scenarios for the Shire of Exmouth. The analysis does not assess the likelihood of the various population scenarios occurring. It is only intended to provide guidance on the planning of the optimal quantum and configuration of retail and commercial floorspace in the town centre into the future.

4.1 Assumptions

4.1.1 Population Scenarios

Population scenarios considered in the analysis are the 2006 baseline population of 1,844 residents and the hypothesized future populations of: 3,500 residents, 5,000 residents and 6,000 residents (Note: the later estimates are not associated with any point in time but rather provide an indication of the floorspace requirements at increasing population points).

4.1.2 Calculating the Number of Households in Exmouth

The population and average household size of Exmouth were taken from the last available census (2006 ABS census, <www.abs.gov.au>); at which time there were 1,844 residents and an average household size of 2.3 persons per household, yielding 802 households in Geraldton. This differs from number of ABS reported occupied private dwellings (1,245) but is more consistent with the use of the household expenditure survey, which is based on the average expenditure of households, instead of the average expenditure per occupied private dwellings; therefore to avoid confusion, the derived 802 households is referred to as the 'effective' number of households.

The household assumptions considered in the analysis do not consider the potential changes in demographic distribution of households at the various population points. Further detailed analysis would be required to determine how households are likely to change in the event of population growth and what impact this would have on the types of goods and services which need to be provided. For example if Exmouth's population growth resulted in an aging population there would be greater demand for related services such as aged care. Similarly growth in the number of children under the age of 18 may require greater education facilities.

4.1.3 Retail Categories under Analysis

Retail demand has been divided into the broad categories of convenience retail, comparison retail, and restaurant, bar and café – it is felt that these three categories appropriately reflect the majority of retail types demanded, in Exmouth.

4.1.4 Household Expenditure

Households will consume a range of goods and services in order to meet the needs, or wants, of the individual which comprise it; everything from food to clothing, medicine, appliances, bottled gas and so on, constitute the households demand function. The household demand function is empirically measured in the Household Expenditure Survey (HHES) produced by the Australian Bureau of

Statistics (Household Expenditure Survey, Australia: Summary of Results, 2009-10, <www.abs.gov.au>).

Items in the HHES are then sorted into groups that correspond to the above mentioned retail categories. Expenditure, by household, on the three categories of retail (convenience retail, comparison retail, and restaurant, bar and café) is then calculated. (Note: household expenditure is directly related to household income. The HHES segments households into income quintiles; Exmouth has an average income in third quintile).

The 'effective' number of households is multiplied by the average spend per household to estimate the total residential expenditure.

Expenditure estimates used in the modelling and analysis is expressed in terms of 2011 values. No adjustment has been made to account for future changes in value.

4.1.5 Workers

Workers are excluded from this analysis, not because we believe either: that they are unimportant, or that there aren't any workers in Exmouth, but because Exmouth is a comparatively closed environment (geographically isolated) and that portraying a distinction between expenditure from households and expenditure from workers is unnecessary.

That is, as all workers, at some stage, constitute part of a household and as the isolation of Exmouth renders regular commuting from outside prohibitive, distinguishing between the two only risks double counting residents; therefore, for the purpose of this analysis, all 'worker' expenditure is assumed to be captured through the measurement of residential expenditure and the HHES.

4.1.6 Tourism

Tourism Statistics were sourced from Tourism WA (Shire of Exmouth Overnight Visitor Fact Sheet: Years Ending December 2008/09/10, <<http://www.tourism.wa.gov.au>>). Tourism figures are used to represent the number of visitors to Exmouth, per annum. Visitor expenditure was calculated as a function of total visitor nights; whereby each visitor night has an associated daily spend across the three retail categories discussed above.

Anecdotally the Exmouth population can swell from 2,000 residents up to 6,000 at the height of the tourist season with an influx of senior and backpacker visitors in particular. Tourism WA statistics show that occupancy rates for accommodation are generally at their highest points in the middle of the year (e.g. April to August). Pracsys demand modeling for Exmouth considers the fluctuations in visitor numbers at different times of the year and the effect this has on expenditure and floorspace demand (refer to section 4.1.7 for an explanation of how expenditure is related to floorspace demand).

4.1.7 Floorspace Productivity

Floorspace productivity is the mechanism by which expenditure is related back to floorspace demand. Floorspace productivity is defined as the turnover per square meter of floorspace, per year; the greater the productivity the more efficiently the floorspace is being used to create revenue.

Anecdotal evidence and Industry data has placed the productivity of retail floorspace in the Perth metropolitan area around \$7000/m². Exmouth is assumed to have lower floorspace productivity than the metropolitan area because land (floorspace) is not as scarce and consequently, productivity per square meter will be lower.

The assumptions in Figure 4 were used when calculating retail floorspace productivity for Exmouth. A range for turnover per square metre has been defined to demonstrate possible floorspace demand given higher or lower productivities.

Figure 2. Floorspace Productivity Assumptions

| Floorspace type | Turnover/m ² |
|-----------------------------|----------------------------------|
| Convenience retail | \$5,000 - \$5,500/m ² |
| Comparison retail | \$4,000 - \$4,500/m ² |
| Restaurants, bars and cafés | \$3,500 - \$4,000/m ² |

Source: Pracsys 2011

Floorspace demand is derived by dividing the sum of expenditure, from residents and visitors, by the floorspace productivity (for each retail category). Estimates of future floorspace demand are also influenced by:

- The nature, size and trends in user groups of residents, workers, visitors and enterprises;
- The pool of available expenditure in the town; and
- The extent of expenditure leakage from the town.

Each of these factors is incorporated into the Pracsys modelling and analysis of future floorspace demand for Exmouth town centre.

4.1.8 Expenditure Leakage

Expenditure leakage refers to the amount of money consumers spend outside of the local market. It is important to take leakage into account when estimating future floorspace demand as it directly affects the amount available in each expenditure pool. For Exmouth the extent of leakage was calculated using a dynamic assumption based on anecdotal evidence and industry data (Figure 3).

Figure 3. Expenditure Leakage Assumptions

| Expenditure type | Leakage rate per year |
|-----------------------------|-----------------------|
| Convenience retail | 10% |
| Comparison retail | 40% |
| Restaurants, bars and cafés | 30% |

Source: Pracsys 2011

Overall the leakage rates for Exmouth were set lower than those expected in the Perth metropolitan area as the town's relative isolation reduces resident's ability to spend outside their local area. In the Perth metropolitan area we would expect leakage rates to be higher as there is greater opportunity for residents to shop outside their local catchment. Conversely residents in regional communities are not as likely to travel outside of their local area for convenience retail however some restaurant, bar and café spend will be leaked when residents travel for work, holidays etc. Residents may choose to have some comparison goods shipped in from other areas, particularly given the increasing attraction of online shopping. To reflect these conditions in the modeling the lowest leakage rate was assigned to convenience retail (10%) followed by restaurant, bar and café (30%) and then comparison retail (40%).

4.2 Analysis

The following analysis was undertaken using Pracsys modelling of Exmouth's expenditure pools and other assumptions including floorspace productivity and leakage rates. Figure 4 outlines the average expenditure pools across a number of key categories for residents in Exmouth at different population scenarios.

Figure 4. Residential Expenditure Estimates

| Population | Current | 3,500 | 5,000 | 6,000 |
|--------------------------------------|---------------------|---------------------|---------------------|---------------------|
| Convenience Retail | \$7,789,441 | \$14,784,730 | \$21,121,043 | \$25,345,252 |
| Comparison Retail | \$9,947,921 | \$18,881,630 | \$26,973,757 | \$32,368,508 |
| Restaurant, Bar, Café | \$1,079,490 | \$2,048,924 | \$2,927,035 | \$3,512,442 |
| Total residential expenditure | \$18,816,853 | \$35,715,284 | \$51,021,835 | \$61,226,202 |

Source: Pracsys 2011

Figure 5 outlines the average expenditure pools across a number of key categories for visitors to Exmouth at different growth scenarios.

Figure 5. Visitor Expenditure Estimates

| Annual visitors | Current | 721,500 | 725,000 | 728,500 |
|----------------------------------|---------------------|---------------------|---------------------|---------------------|
| Convenience Retail | \$9,332,700 | \$9,379,364 | \$9,426,260 | \$9,473,392 |
| Comparison Retail | \$3,589,500 | \$3,607,448 | \$3,625,485 | \$3,643,612 |
| Restaurant, Bar, Café | \$14,358,000 | \$14,429,790 | \$14,501,939 | \$14,574,449 |
| Total visitor expenditure | \$27,280,200 | \$27,416,601 | \$27,553,684 | \$27,691,452 |

Source: Pracsys 2011

It is important that the expenditure be broken down into separate pools for residents and visitors. This helps to highlight how changes to each expenditure pool will translate to floorspace demand in Exmouth. Figure 4 shows that most of the retail expenditure for residents is on comparison (53%) and convenience goods (41%). Figure 5 indicates that visitors to Exmouth spend most at restaurants, bars and cafés (53%) followed by convenience goods (34%).

Exmouth residential expenditure increases at the same rate as population growth in each of the scenarios. This leads to an increase in the pool of available expenditure in the town for each of the retail categories. However the number of visitors to Exmouth does not grow at the same rate as demonstrated in the population scenarios. This is because annual visitor numbers vary and may rise or fall irrespective of population growth. Therefore the expenditure pools for visitors to Exmouth do not increase at the same rate as the pool for residents.

Figure 6 shows that as residential population grows expenditure on convenience and comparison goods increases at a greater rate than expenditure on restaurants, bars and cafés.

Figure 6. Total Combined Expenditure

| Population & Annual Visitors | Current | 3,500 population/ 721,500 visitors | 5,000 population/ 725,000 visitors | 6,000 population/ 728,500 visitors |
|------------------------------|---------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Convenience Retail | \$17,122,141 | \$24,164,094 | \$30,547,304 | \$34,818,644 |
| Comparison Retail | \$13,537,421 | \$22,489,077 | \$30,599,241 | \$36,012,120 |
| Restaurant, Bar, Café | \$15,437,490 | \$16,478,714 | \$17,428,974 | \$18,086,890 |
| Total expenditure | \$46,097,053 | \$63,131,885 | \$78,575,519 | \$88,917,654 |

Source: Pracsys 2011

5 Implications for Floorspace and Centre Planning

Based upon the above assumptions and analysis an estimate of retail floorspace demand was derived. Figure 7 outlines the floorspace requirements for Exmouth across a number of key categories at different population scenarios.

Figure 7. Floorspace Estimates

| Population & Annual Visitors | Current | 3,500 population/ 721,500 visitors | 5,000 population/ 725,000 visitors | 6,000 population/ 728,500 visitors |
|-----------------------------------------|-----------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Convenience Retail (m ²) | 3,100 – 3,420 | 4,390 – 4,830 | 5,550 – 6,110 | 6,330 – 6,960 |
| Comparison Retail (m ²) | 3,000 – 3,380 | 5,000 – 5,620 | 6,800 – 7,650 | 8,000 – 9,000 |
| Restaurant, Bar, Café (m ²) | 3,850 – 4,410 | 4,100 – 4,700 | 4,360 – 4,980 | 4,520 – 5,170 |
| Total floorspace (m²) | 9,950 – 11,210 | 13,490 – 15,150 | 16,710 – 18,740 | 18,850 – 21,130 |

Source: Pracsys 2011

- At its current population Exmouth can support between 9,950 – 11,210 sqm nla.
- At a population of 3,500 the total floorspace demand estimate is between 13,490 – 15,150 sqm nla. This equates to an increase of 3,540 – 3,940 sqm nla (approximately 35%) when compared to current retail floorspace estimates.
- At a population of 5,000 the total floorspace demand estimate increased to between 16,710 – 18,740 sqm nla. This equates to an increase of between 6,760 – 7,530 sqm nla (approximately 67%) when compared to current retail floorspace estimates.
- At a population of 6,000 total floorspace demand estimate increased to between 18,850 – 21,130 sqm nla. This equates to an increase of between 8,900 – 9,920 sqm nla (approximately 89%) when compared to current retail floorspace estimates.

In all scenarios the largest increase in demand for floorspace is in comparison retail. This is a result of lower productivity per square metre and a large expenditure pool when compared to the other retail types. Comparison retail also generally consumes more floorspace due to the size of the goods being sold. The increase in demand for comparison retail demonstrated in Figure 7 does not have major implications for the Exmouth town centre. Generally increases in comparison floorspace occur in large increments. Smaller increases in demand for comparison goods, such as the increases seen in Figure 7, will generally be satisfied by increased expenditure leakage. Only when demand for comparison retail has reached a suitably high level will it warrant a major increase in floorspace (e.g. attraction of a discount department store).

The next largest increase is seen in convenience retail floorspace estimates. Increased demand for convenience retail will have an additional impact upon existing retailers as population approaches

5,000 people. In general terms, a population of 5,000 people will start to generate the sales turnover per square metre required to attract a major retailer such as a Coles or Woolworths. These larger retailers would be expected to cannibalise some of the expenditure at existing convenience outlets such as IGA and other smaller retailers. This would change the current structure of shopping centre development in the town as the larger retailers became the focus.

Demand for floorspace will vary throughout the year as a result of the high and low tourist seasons. As visitor numbers swell so will demand, particularly for convenience retail and restaurant, bar, café floorspace as these uses attract most visitor expenditure. Generally this will be reflected by an oversupply of floorspace in the low season and an undersupply in the high season. This situation is common in many metropolitan and regional centres although the effects are often more noticeable in the regions.

When assessing floorspace demand there is no certain way of providing adequate permanent floorspace in the high visitor season that does not result in an oversupply in the low season. The key to alleviating floorspace demand pressures is adaptability. Seasonal variations in floorspace demand are commonly reflected by changes to high and low season trading hours. Other methods used to balance this out include allowing for temporary floorspace (e.g. outdoor market pavilions) and adaptable premises capable of increasing their floorspace during the high season.

Figure 8 shows the amount of floorspace attributed to visitor demand in Exmouth and also highlights this as a percentage of total floorspace demand.

Figure 8. Floorspace Demand for Exmouth Visitors

| Annual Visitors | Current | 721,500 visitors | 725,000 visitors | 728,500 visitors |
|-----------------------------------------|------------------------|------------------------|------------------------|------------------------|
| Convenience Retail (m ²) | 1,700 – 1,870 (55%) | 1,700 – 1,875 (39%) | 1,715 – 1,885 (31%) | 1,720 – 1,895 (27%) |
| Comparison Retail (m ²) | 798 – 897 (27%) | 802 – 902 (16%) | 806 – 906 (12%) | 810 – 911 (10%) |
| Restaurant, Bar, Café (m ²) | 3,590 – 4,100 (93%) | 3,600 – 4,120 (88%) | 3,625 – 4,140 (83%) | 3,644 – 4,164 (81%) |
| Total floorspace (m ²) | 6,080 – 6,860 (61%) | 6,110 – 6,90 (45%) | 6,145 – 6,935 (37%) | 6,176 – 6,970 (33%) |

Source: Pracsys 2011

As shown in Figure 8 the visitor user group represents a comparatively small and diminishing proportion of overall demand for floorspace in Exmouth, particularly in the context of overall population growth. It is therefore unlikely that fluctuations in visitor numbers throughout the year will result in significant supply gaps and will be able to be managed through the above methods for flexibility and adaptability.

6 Conclusion

The floorspace demand analysis suggests that the Exmouth town centre could support between 13,490 and 21,130 sqm nla of total retail floorspace assuming a population scenario of between 3,500 and 6,000 residents. This equates to an increase of between 35% and 90% when compared to current retail floorspace estimates.

The Shire of Exmouth should consider this range achievable at baseline productivity only. A sound strategy contemplating spatial and economic development will be required if the Shire is to achieve its population growth targets and for the centre to mature accordingly.





**COST PLAN NO 1
INDICATIVE COST ESTIMATE REV 3**

**EXMOUTH FORESHORE
REVITALISATION PLAN**

8 February 2012

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE**

8-Feb-12

| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
|------------|---------------------------------------------------------|------|-------|-----------|------------|--------------|
| 1 | TOWN BEACH | | | | | |
| 1.1 | TOWN BEACH (STAGE 1) | | | | | |
| | <i>Beach Upgrade</i> | | | | | |
| | Car park | m2 | 2,105 | 105.00 | 221,025.00 | |
| | Bitumen seal | m2 | 2,105 | 15.00 | 31,575.00 | |
| | Linemarking | Item | 1 | 2,105.00 | 2,105.00 | |
| | Kerb | m | 401 | 40.00 | 16,040.00 | |
| | Beach cross over | Item | 1 | 1,800.00 | 1,800.00 | |
| | Concrete path | m2 | 140 | 70.00 | 9,800.00 | |
| | Stabilised gravel path | m2 | 165 | 50.00 | 8,250.00 | |
| | Stabilised gravel paving (around toilet block) | m2 | 145 | 50.00 | 7,250.00 | |
| | Refurbish existing toilet block (7m x 5m) | Item | 1 | 20,000.00 | 20,000.00 | |
| | Board walk | m2 | 192 | 1,200.00 | 230,400.00 | |
| | Showers (boardwalk) | Item | 1 | 3,000.00 | 3,000.00 | |
| | Seating (boardwalk) | Item | 1 | 5,000.00 | 5,000.00 | |
| | Limestone sea wall | | | | | |
| | - excavation | m3 | 1,070 | 10.00 | 10,700.00 | |
| | - sub layer | m3 | 195 | 35.00 | 6,825.00 | |
| | - filter cloth | m2 | 324 | 20.00 | 6,480.00 | |
| | - retaining wall | m2 | 263 | 750.00 | 197,250.00 | |
| | - limestone rock armour | m3 | 875 | 65.00 | 56,875.00 | |
| | Concrete stair (beach access) | No | 1 | 5,000.00 | 5,000.00 | |
| | Irrigated turf | m2 | 2,439 | 69.60 | 169,754.40 | |
| | Allowance for tree planting | No | 25 | 500.00 | 12,500.00 | |
| | Allowance for shelters | No | 5 | 25,000.00 | 125,000.00 | |
| | Allowance for BBQ's | No | 3 | 12,000.00 | 36,000.00 | |
| | Allowance for benches, bins and sundry street furniture | Item | 1 | 50,000.00 | 50,000.00 | |
| | Allowance for water supply to BBQ areas | m | 200 | 150.00 | 30,000.00 | |
| | Allowance for revegetation | m2 | 5,962 | 15.00 | 89,430.00 | |
| | Barriers to formalise beach entry | m | 90 | 200.00 | 18,000.00 | |
| | Signage | Item | 1 | 5,000.00 | 5,000.00 | |
| | Car park lighting | m2 | 2,105 | 8.31 | 17,500.00 | |
| | Lighting to boardwalk area | m2 | 192 | 10.00 | 1,920.00 | |
| | Lighting to shelters | No | 5 | 1,000.00 | 5,000.00 | 1,399,479.40 |

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

8-Feb-12

| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
|------------|---------------------------------------------------------|------|-------|-----------|----------------|--------------|
| 1.2 | TOWN BEACH (STAGE 2) | | | | | |
| | <i>Beach Upgrade</i> | | | | | |
| | Car park | m2 | 2,292 | 105.00 | 240,660.00 | |
| | Bitumen seal | m2 | 2,292 | 15.00 | 34,380.00 | |
| | Linemarking | Item | 1 | 2,292.00 | 2,292.00 | |
| | Kerb | m | 458 | 40.00 | 18,320.00 | |
| | Beach cross over | Item | 1 | 1,800.00 | 1,800.00 | |
| | Stabilised gravel path | m2 | 882 | 50.00 | 44,100.00 | |
| | Limestone sea wall | | | | | |
| | - excavation | m3 | 4,297 | 10.00 | 42,970.00 | |
| | - sub layer | m3 | 782 | 35.00 | 27,370.00 | |
| | - filter cloth | m2 | 1,302 | 20.00 | 26,040.00 | |
| | - retaining wall | m2 | 912 | 750.00 | 684,000.00 | |
| | - limestone rock armour | m3 | 3,516 | 65.00 | 228,540.00 | |
| | Concrete stair (beach access) | No | 4 | 5,000.00 | 20,000.00 | |
| | Irrigated turf | m2 | 2,940 | 69.60 | 204,624.00 | |
| | Allowance for tree planting | No | 12 | 500.00 | 6,000.00 | |
| | Allowance for shelters | No | 3 | 25,000.00 | 75,000.00 | |
| | Allowance for BBQ's | No | 2 | 12,000.00 | 24,000.00 | |
| | Allowance for benches, bins and sundry street furniture | Item | 1 | 20,000.00 | 20,000.00 | |
| | Allowance for water supply to BBQ areas | m | 90 | 150.00 | 13,500.00 | |
| | Allowance for revegetation | m2 | 4,480 | 15.00 | 67,200.00 | |
| | Barriers to formalise beach entry | m | 60 | 200.00 | 12,000.00 | |
| | Signage | Item | 1 | 5,000.00 | 5,000.00 | |
| | Car park lighting | m2 | 2,292 | 9.16 | 21,000.00 | |
| | Lighting to boardwalk area | m2 | 882 | | refer car park | |
| | Lighting to shelters | No | 3 | 1,000.00 | 3,000.00 | 1,821,796.00 |
| | <i>Access Road & Gravel Overflow Car Park</i> | | | | | |
| | Upgrade road | m2 | 875 | 105.00 | 91,875.00 | |
| | Bitumen seal | m2 | 875 | 15.00 | 13,125.00 | |
| | Linemarking | Item | 1 | 875.00 | 875.00 | |
| | Kerb | m | 250 | 40.00 | 10,000.00 | |
| | Path | m2 | 500 | 70.00 | 35,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 10,000.00 | 10,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 25 | 500.00 | 12,500.00 | |
| | Gravel overflow car park | m2 | 1,624 | 60.00 | 97,440.00 | |
| | Path to overflow carpark | m2 | 520 | 70.00 | 36,400.00 | |
| | Signage to overflow car park | Item | 1 | 1,000.00 | 1,000.00 | |
| | Trees to overflow car park | No | 20 | 500.00 | 10,000.00 | 319,215.00 |
| | <i>Link to Novotel</i> | | | | | |
| | Composite boardwalk | m2 | 915 | 1,000.00 | 915,000.00 | |
| | Entry feature rammed earth wall | Item | 1 | 25,000.00 | 25,000.00 | |
| | Entry gravel mulch | m2 | 420 | 35.00 | 14,700.00 | |
| | Entry planting allowance | Item | 1 | 10,000.00 | 10,000.00 | |
| | Revegetation | m2 | 5,600 | 15.00 | 84,000.00 | |
| | Existing path - no work | Note | | | n/a | 1,048,700.00 |

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE

8-Feb-12

| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
|------------|------------------------------------------------|------|--------|------------|------------|--------------|
| 2 | STREETSCAPE /INTERSECTION UPGRADES | | | | | |
| 2.1 | MURAT ROAD (Part A) (500m) | | | | | |
| | Upgrade road | m2 | 3,500 | | | not required |
| | Bitumen seal | m2 | 3,500 | | | not required |
| | Linemarking | Item | 1 | | | not required |
| | Kerb | m | 1,000 | | | not required |
| | Form v drain | m | 1,000 | 5.00 | 5,000.00 | |
| | Path | m2 | 2,000 | 70.00 | 140,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 50,000.00 | 50,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 100 | 500.00 | 50,000.00 | 246,000.00 |
| 2.2 | MURAT ROAD (Part B) (650m) | | | | | |
| | Upgrade road | m2 | 4,550 | | | not required |
| | Bitumen seal | m2 | 4,550 | | | not required |
| | Linemarking | Item | 1 | | | not required |
| | Kerb | m | 1,300 | | | not required |
| | Form v drain | m | 1,300 | 5.00 | 6,500.00 | |
| | Path | m2 | 2,600 | 70.00 | 182,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 65,000.00 | 65,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 130 | 500.00 | 65,000.00 | 319,500.00 |
| 2.3 | MURAT ROAD (Part C) (900m) | | | | | |
| | Upgrade road | m2 | 6,300 | | | not required |
| | Bitumen seal | m2 | 6,300 | | | not required |
| | Linemarking | Item | 1 | | | not required |
| | Kerb | m | 1,800 | | | not required |
| | Form v drain | m | 1,800 | 5.00 | 9,000.00 | |
| | Path | m2 | 3,600 | 70.00 | 252,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 90,000.00 | 90,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 180 | 500.00 | 90,000.00 | 442,000.00 |
| 2.4 | TRUSCOTT AVE (1,650m) | | | | | |
| | Upgrade road | m2 | 11,550 | | | not required |
| | Bitumen seal | m2 | 11,550 | | | not required |
| | Linemarking | Item | 1 | | | not required |
| | Kerb | m | 3,300 | | | not required |
| | Form v drain | m | 3,300 | 5.00 | 16,500.00 | |
| | Path | m2 | 6,600 | 70.00 | 462,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 165,000.00 | 165,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 330 | 500.00 | 165,000.00 | 809,500.00 |

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE**

8-Feb-12

| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
|------------|----------------------------------------------------------|------|--------|-----------|--------------|--------------|
| 2.5 | WARNE STREET (and part of Madaffari Drive) (550m) | | | | | |
| | Upgrade road | m2 | 3,850 | | not required | |
| | Bitumen seal | m2 | 3,850 | | not required | |
| | Linemarking | Item | 1 | | not required | |
| | Kerb | m | 1,100 | | not required | |
| | Form v drain | m | 1,100 | 5.00 | 5,500.00 | |
| | Path | m2 | 2,200 | 70.00 | 154,000.00 | |
| | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| | Upgrade street lighting | Item | 1 | 55,000.00 | 55,000.00 | |
| | Tree planting to verge (assume 1 tree per 10m) | No | 110 | 500.00 | 55,000.00 | 270,500.00 |
| 2.6 | MADAFFI DRIVE | | | | | |
| | No works | Note | | | | |
| 3 | MARINA POS | | | | | |
| 3.1 | MARINA POS (Part 1) | | | | | |
| | Gravel mulch / planting mix areas | m2 | 3,943 | 50.00 | 197,150.00 | |
| | Native revegetation to detention basin | m2 | 2,358 | 10.00 | 23,580.00 | |
| | Rammed earth retaining walls | m | 215 | 500.00 | 107,500.00 | |
| | New shelters | No | 5 | 25,000.00 | 125,000.00 | |
| | BBQ's | No | 2 | 12,000.00 | 24,000.00 | |
| | Water supply to BBQ area | Item | 1 | 15,000.00 | 15,000.00 | |
| | Seating, bins and sundry street furniture | Item | 1 | 20,000.00 | 20,000.00 | |
| | Allowance to upgrade existing paths | Item | 1 | 5,000.00 | 5,000.00 | |
| | Allowance to upgrade playground | Item | 1 | 5,000.00 | 5,000.00 | |
| | Signage and way finding | Item | 1 | 5,000.00 | 5,000.00 | |
| | Lighting | Item | 1 | 35,000.00 | 35,000.00 | 562,230.00 |
| 3.2 | MARINA POS (Part 2) | | | | | |
| | Note: existing facility - minor upgrade works only) | | | | | |
| | Gravel mulch / planting allowance | m2 | 2,588 | 50.00 | 129,400.00 | |
| | Upgrade lighting | Item | 1 | 17,500.00 | 17,500.00 | 146,900.00 |
| 4 | NEW TOWN BEACH | | | | | |
| | Gravel road | m2 | 4,291 | 105.00 | 450,555.00 | |
| | Gravel car bays | m2 | 776 | 70.00 | 54,320.00 | |
| | Pcc wheelstops | No | 45 | 200.00 | 9,000.00 | |
| | Concrete flush kerb | m | 530 | 40.00 | 21,200.00 | |
| | Stabilised gravel paving | m2 | 894 | 50.00 | 44,700.00 | |
| | Upgrade of existing path | m2 | 1,110 | 10.00 | 11,100.00 | |
| | New gravel path | m2 | 1,774 | 50.00 | 88,700.00 | |
| | Composite boardwalk | m2 | 898 | 1,200.00 | 1,077,600.00 | |
| | Stair | m | 53 | 1,000.00 | 53,000.00 | |
| | Viewing platform (4 No) including shelter | m2 | 128 | 3,000.00 | 384,000.00 | |
| | Shelter / way finding - main station | No | 1 | 25,000.00 | 25,000.00 | |
| | Shelters | No | 3 | 25,000.00 | 75,000.00 | |
| | Seatings, bins and sundry street furniture | Item | 1 | 10,000.00 | 10,000.00 | |
| | Revegetation | m2 | 28,933 | 15.00 | 433,995.00 | |
| | Signage and way finding | Item | 1 | 5,000.00 | 5,000.00 | |
| | Lighting | Item | 1 | 50,000.00 | 50,000.00 | 2,793,170.00 |

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
FORESHORE
CONCEPT ESTIMATE**

8-Feb-12

| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
|----------|---------------------------------------|------|-------|-----------|-----------|----------------------|
| 5 | EXISTING GRAVEL PATH | | | | | |
| | Upgrade of existing path | m2 | 5,010 | 10.00 | 50,100.00 | |
| | Lighting | Item | 1 | 50,100.00 | 50,100.00 | 100,200.00 |
| | Sub-Total | | | | | 10,279,190.40 |
| | Preliminaries | 6% | | | | 620,809.60 |
| | Net Construction Cost | | | | | 10,900,000.00 |
| | Design Contingency | 7% | | | | 770,000.00 |
| | Construction Contingency | 3% | | | | 350,000.00 |
| | Professional fees & Disbursements | 9% | | | | 980,000.00 |
| | Client Costs | | | | | excluded |
| | Land Costs | | | | | excluded |
| | Headworks | | | | | excluded |
| | Public Art | | | | | excluded |
| | Gross Project Cost (at current costs) | | | | | 13,000,000.00 |
| | Escalation to Tender | | | | | excluded |
| | Total | | | | | 13,000,000.00 |
| | GST | | | | | 1,300,000.00 |
| | Total | | | | | 14,300,000.00 |

Notes

- All figures exclude GST unless noted otherwise
- These estimates are based on preliminary information and should be considered indicative only
- These estimate are based on the following documentation. Only those works shown on those documents have been included herein:
 - Sketch drawing 1:1000 Existing Town Beach Upgrade
 - Sketch drawing 1:1000 Existing Town Beach Upgrade (Yacht Club)
 - Sketch drawing 1:1000 Novotel to Yacht Club
 - Sketch drawing 1:1000 New Town Beach
 - Exmouth - Marina POS sketch
- Refer to estimate breakdowns for scope of work included
- This estimate is for the Foreshore only and does not include for Town Centre Works
- No allowance has been made for:
 - Golf Club Access Upgrade
 - Golf Club Foreshore Upgrade
 - Area north on Marina POS 1
 - Foreshore connection (Private Development)
 - Madaffi Drive
 - Upgrade of road surfaces



**COST PLAN NO 1
INDICATIVE COST ESTIMATE REV 3**

**EXMOUTH TOWN CENTRE
REVITALISATION PLAN**

11 January 2012

**EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE**

| | | | | | 11-Jan-12 | |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|--------|------------|------------|--------------|
| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
| 1 THREW STREET REDEVELOPMENT | | | | | | |
| <i>Road</i> | | | | | | |
| 1.01 | Break out existing culvert crossing | Item | 1 | 30,000.00 | 30,000.00 | |
| 1.02 | New/ reconstructed road | m2 | 3,158 | 105.00 | 331,590.00 | |
| 1.03 | Asphalt seal | m2 | 3,158 | 40.00 | 126,320.00 | |
| 1.04 | Kerb | m | 785 | 40.00 | 31,400.00 | |
| 1.05 | Footpath | m2 | 702 | 70.00 | 49,140.00 | |
| 1.06 | Verge treatment | m2 | 1,950 | 10.00 | 19,500.00 | |
| 1.07 | Road markings | Item | 1 | 3,000.00 | 3,000.00 | |
| 1.08 | Signage | Item | 1 | 3,000.00 | 3,000.00 | |
| <i>Parking</i> | | | | | | |
| 1.09 | Break out existing car park | m2 | 3,441 | | included | |
| 1.10 | Sundry demolition | Item | 1 | 30,000.00 | 30,000.00 | |
| 1.11 | Site strip, clear and level (landscape areas) | m2 | 1,068 | 4.50 | 4,806.00 | |
| 1.12 | New car parking formation | m2 | 3,441 | 105.00 | 361,305.00 | |
| 1.13 | Bitumen seal | m2 | 3,441 | 15.00 | 51,615.00 | |
| 1.14 | Kerb | m | 652 | 40.00 | 26,080.00 | |
| 1.15 | Landscaping | Item | 1 | 85,000.00 | 85,000.00 | |
| 1.16 | Signage | Item | 1 | 10,000.00 | 10,000.00 | |
| 1.17 | Lighting | Item | 1 | 25,000.00 | 25,000.00 | 1,187,756.00 |
| 2 MAIDSTONE CRESCENT BETWEEN BONE FISH AND LEARMONTH | | | | | | |
| 2.01 | Remove trees from central reserve | No | 11 | 500.00 | 5,500.00 | |
| 2.02 | New/ reconstructed road | m2 | 2,099 | 105.00 | 220,395.00 | |
| 2.03 | Asphalt seal | m2 | 1,952 | 40.00 | 78,080.00 | |
| 2.04 | Pedestrian crossing paving | m2 | 420 | 225.00 | 94,500.00 | |
| 2.05 | Kerb | m | 467 | 40.00 | 18,680.00 | |
| 2.06 | Footpath | m2 | 927 | 70.00 | 64,890.00 | |
| 2.07 | Verge treatment (irrigated) | m2 | 2,076 | 75.00 | 155,700.00 | |
| 2.08 | Road markings | Item | 1 | 9,000.00 | 9,000.00 | |
| 2.09 | Signage | Item | 1 | 9,000.00 | 9,000.00 | |
| 2.10 | Lighting | Item | 1 | 20,000.00 | 20,000.00 | 675,745.00 |
| 3 FEDERATION PARK REDEVELOPMENT | | | | | | |
| 3.01 | Demolition of existing park structures | Item | 1 | 45,000.00 | 45,000.00 | |
| 3.02 | Generally clearing debris and vegetation not to be retained including in drainage channel | m2 | 20,404 | 3.00 | 61,212.00 | |
| 3.03 | Allowance for regrading drainage channel and minor earthworks | Item | 1 | 35,000.00 | 35,000.00 | |
| 3.04 | Feature paving | m2 | 2,115 | 120.00 | 253,800.00 | |
| 3.05 | Foot paths | m2 | 1,100 | 70.00 | 77,000.00 | |
| 3.06 | Paving outside pool | m2 | 1,190 | 70.00 | 83,300.00 | |
| 3.07 | Pedestrian bridge approx 10m span | No | 1 | 30,000.00 | 30,000.00 | |
| 3.08 | Landscaped area (dryland) | m2 | 15,848 | 15.00 | 237,720.00 | |
| 3.09 | Irrigated feature landscaping | Item | 1 | 75,000.00 | 75,000.00 | |
| 3.10 | Dryland landscaped features | Item | 1 | 75,000.00 | 75,000.00 | |
| 3.11 | Amenities building with screening area | m2 | 150 | 4,500.00 | 675,000.00 | |
| 3.12 | Water feature / interactive park | Item | 1 | 450,000.00 | 450,000.00 | |
| 3.13 | Street furniture | Item | 1 | 175,000.00 | 175,000.00 | |
| 3.14 | Shade structures | Item | 1 | 175,000.00 | 175,000.00 | |
| 3.15 | Wayfinding | Item | 1 | 30,000.00 | 30,000.00 | |
| 3.16 | Lighting | Item | 1 | 65,000.00 | 65,000.00 | 2,543,032.00 |

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE

| | | | | | | 11-Jan-12 |
|--------------------------------------------------------------------------------------------|---------------------------------------------|------|-------|---------------------|------------|------------|
| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
| 4 REALIGNMENT OF PYNE STREET & REDEVELOPMENT OF POOL CARPARK | | | | | | |
| 4.01 | New/ reconstructed road | m2 | 2,804 | 105.00 | 294,420.00 | |
| 4.02 | Asphalt seal | m2 | 2,804 | 40.00 | 112,160.00 | |
| 4.03 | Kerb | m | 613 | 40.00 | 24,520.00 | |
| 4.04 | Footpath | m2 | 483 | 70.00 | 33,810.00 | |
| 4.05 | Verge treatment | m2 | 1,964 | 10.00 | 19,640.00 | |
| 4.06 | Road markings | Item | 1 | 3,000.00 | 3,000.00 | |
| 4.07 | Signage | Item | 1 | 3,000.00 | 3,000.00 | |
| 4.08 | Lighting | Item | 1 | 15,000.00 | 15,000.00 | 505,550.00 |
| 5 REDEVELOPMENT OF KENNEDY STREET MALL Note: Between Learmonth and Threw Street) | | | | | | |
| 5.01 | New/ reconstructed road (to receive paving) | m2 | 756 | 105.00 | 79,380.00 | |
| 5.02 | Paving (trafficable - base included above) | m2 | 756 | 100.00 | 75,600.00 | |
| 5.03 | Paving (pedestrian) | m2 | 1,244 | 70.00 | 87,080.00 | |
| 5.04 | Kerb | m | 212 | 40.00 | 8,480.00 | |
| 5.05 | Street furniture | Item | 1 | 15,000.00 | 15,000.00 | |
| 5.06 | Landscaping | Item | 1 | 15,000.00 | 15,000.00 | |
| 5.07 | Signage | Item | 1 | 15,000.00 | 15,000.00 | |
| 5.08 | Lighting | Item | 1 | 20,000.00 | 20,000.00 | 315,540.00 |
| 6 REDEVELOPMENT OF RIGGS STREET | | | | | | |
| 6.01 | New/ reconstructed road | m2 | 1,591 | 105.00 | 167,055.00 | |
| 6.02 | Asphalt seal | m2 | 1,591 | 40.00 | 63,640.00 | |
| 6.03 | Kerb | m | 434 | 40.00 | 17,360.00 | |
| 6.04 | Footpath | m2 | 450 | 70.00 | 31,500.00 | |
| 6.05 | Verge treatment | m2 | 1,120 | 10.00 | 11,200.00 | |
| 6.06 | Road markings | Item | 1 | 1,000.00 | 1,000.00 | |
| 6.07 | Signage | Item | 1 | 1,000.00 | 1,000.00 | |
| 6.08 | Lighting | Item | 1 | 10,000.00 | 10,000.00 | 302,755.00 |
| 7 REDEVELOPMENT OF BONEFISH CARPARK & NEW LINK TO MAIDSTONE CRESCENT | | | | | | |
| 7.01 | New culvert and headwall (drain crossing) | Item | 1 | 100,000.00 | 100,000.00 | |
| 7.02 | New/ reconstructed road | m2 | 1,795 | 105.00 | 188,475.00 | |
| 7.03 | Asphalt seal | m2 | 1,795 | 40.00 | 71,800.00 | |
| 7.04 | Kerb | m | 617 | 40.00 | 24,680.00 | |
| 7.05 | Footpath | m2 | 549 | 70.00 | 38,430.00 | |
| 7.06 | Median paving | m2 | 304 | 70.00 | 21,280.00 | |
| 7.07 | Verge treatment | m2 | 651 | 10.00 | 6,510.00 | |
| 7.08 | Road markings | Item | 1 | 2,000.00 | 2,000.00 | |
| 7.09 | Signage | Item | 1 | 3,000.00 | 3,000.00 | |
| 7.10 | Lighting | Item | 1 | 10,000.00 | 10,000.00 | 466,175.00 |
| 8 REDEVELOPMENT OF CARPARK BETWEEN KENNEDY & LEARMONTH STREETS | | | | | | |
| 8.01 | New / reconstructed car park base | m2 | 4,556 | 105.00 | 478,380.00 | |
| 8.02 | Bitumen seal | m2 | 4,556 | 15.00 | 68,340.00 | |
| 8.03 | Kerb | m | 426 | 40.00 | 17,040.00 | |
| 8.04 | Footpath | Note | | included with Roads | | |
| 8.05 | Landscaping | m2 | 2,148 | 40.00 | 85,920.00 | |
| 8.06 | Road marking | Item | 1 | 5,000.00 | 5,000.00 | |
| 8.07 | Signage | Item | 1 | 3,000.00 | 3,000.00 | |
| 8.08 | Lighting | Item | 1 | 25,000.00 | 25,000.00 | 682,680.00 |

EXMOUTH TOWN CENTRE & FORESHORE REVITALISATION PLAN
TOWN CENTRE
CONCEPT ESTIMATE

| | | | | | | 11-Jan-12 |
|--------------------------------------------------------|---------------------------------------------|------|-------|-----------|--------------|----------------------|
| Ref | Scope | Unit | Qty | Rate | Sub-Total | Total |
| 9 NEW ROUND ABOUTS ON MURAT ROAD ENTRIES (2 No) | | | | | | |
| 9.01 | Note: no requirement for bypass roads | Note | | | | |
| 9.02 | Remove trees / palms | No | 10 | 500.00 | 5,000.00 | |
| 9.03 | New/ reconstructed road | m2 | 1,221 | 105.00 | 128,205.00 | |
| 9.04 | Asphalt seal | m2 | 1,221 | 40.00 | 48,840.00 | |
| 9.05 | Concrete paving | m2 | 171 | 70.00 | 11,970.00 | |
| 9.06 | Kerb | m | 676 | 40.00 | 27,040.00 | |
| 9.07 | Road marking | Item | 1 | 3,000.00 | 3,000.00 | |
| 9.08 | Signage | Item | 1 | 3,000.00 | 3,000.00 | |
| 9.09 | Street lighting - modifications to existing | Item | 1 | 10,000.00 | 10,000.00 | 237,055.00 |
| 10 STORMWATER | | | | | | |
| 10.01 | RCP pipe in trench | m | 1,720 | 750.00 | 1,290,000.00 | |
| 10.02 | Stormwater pit | No | 35 | 4,500.00 | 157,500.00 | |
| 10.03 | Headwalls | No | 10 | 2,250.00 | 22,500.00 | |
| 10.04 | Culverts | Item | 1 | 30,000.00 | 30,000.00 | |
| 10.05 | Stone pitching | m2 | 30 | 225.00 | 6,750.00 | |
| 10.06 | Gabions | Item | 1 | 15,000.00 | 15,000.00 | |
| 10.07 | Forming swales | Item | 1 | 7,500.00 | 7,500.00 | 1,529,250.00 |
| Sub-Total | | | | | | 8,445,538.00 |
| Preliminaries | | | | | | 6% 504,462.00 |
| Net Construction Cost | | | | | | 8,950,000.00 |
| Design Contingency | | | | | | 7% 630,000.00 |
| Construction Contingency | | | | | | 3% 290,000.00 |
| Professional fees & Disbursements | | | | | | 9% 800,000.00 |
| Client Costs | | | | | | excluded |
| Land Costs | | | | | | excluded |
| Headworks | | | | | | excluded |
| Public Art | | | | | | excluded |
| Gross Project Cost (at current costs) | | | | | | 10,670,000.00 |
| Escalation to Tender | | | | | | excluded |
| Total | | | | | | 10,670,000.00 |
| GST | | | | | | 1,067,000.00 |
| Total | | | | | | 11,737,000.00 |

Notes

- All figures exclude GST unless noted otherwise
- These estimates are based on preliminary information and should be considered indicative only
- These estimate are based on the following documentation. Only those works shown on those documents have been included herein:
 - Sketch drawing 1:1000 Option Shire
 - Sketch drawing 1:1000 Option Hass
 - Sketch drawing marked up to show work scopes
- Refer to estimate breakdowns for scope of work included
- This estimate is for the Town Centre only and does not include for Foreshore Works
The estimate assumes asphalt seal to roads and bitumen seal to car parks

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