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September 2008

Yanchep Sun City Pty Ltd

Predicted Future Demand for Coastal Facilities
Yanchep - Two Rocks Project

M P ROGERS & ASSOCIATES

Coastal and Port Engineers

Job J558, Report R187 Rev 1

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Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft Foreshore Usage Section for MRA & Client review	C Doak	M Rogers	M Rogers	25/5/06
B	Draft Report including Boat Demand (figures to be updated when DSP finalised)	C Doak	M Rogers	D Bobridge	2/8/06
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1. Introduction

Yanchep Sun City Pty Ltd (YSC) is planning for the development of a large area of coastal land in the Yanchep - Two Rocks region in the northern corridor of Perth. The location of this development, named the Yanchep - Two Rocks Project, is shown in Figure 1.1.

The majority of the coastline within the development area is largely undeveloped, although some facilities are present at the Two Rocks Marina and Yanchep Lagoon. As the Yanchep - Two Rocks project progresses however; there will be increased demand for boating and marine recreational facilities. The provision of such facilities requires significant forward planning to ensure that the provision of space along the coastline is sufficient to allow development of facilities in the future to at least match the demand.

As part of the planning for Yanchep - Two Rocks, specialist coastal engineers M P Rogers & Associates (MRA) were commissioned by YSC to investigate the likely future demand for beach and marine facilities. This report also addresses comments made by the City of Wanneroo and the Department for Planning and Infrastructure (DPI) on the initial Yanchep - Two Rocks concept plan. These comments are contained in the *"Composite Response to Matters Raised by City of Wanneroo and Department for Planning and Infrastructure"* which was prepared by the consultants team on behalf of Tokyu Corporation. Specifically, this report addresses City of Wanneroo comments 3g, and DPI comments 26, 27 and 29.

1.1 Population Projections

Estimates of the future population of Yanchep - Two Rocks are essential to be able to determine the likely demand for both beach and marine facilities in the future. Population projections have been made by Roberts Day, the project planners, in association with Syme Marmion and Co. These predictions were based on the staging plan shown in Figure 1.2. The population projections for the development are summarized in Table 1.1.

Table 1.1 – Population Projections for Yanchep - Two Rocks Project

Year	Yanchep - Two Rocks Population
2015	10,901
2021	21,560
2033	56,296
2046	110,628
2058	154,091

2. Foreshore Usage

Coastal engineers from MRA have previously inspected this stretch of coastline and found that the majority of the shoreline is characterised by moderate energy sandy beaches of varying widths. Although some of the beaches do have low elevation rock present on the shoreline or in the swash zone, particularly those beaches to the north of Two Rocks Marina, there is very little high elevation reef offshore that has any significant sheltering effect on the shoreline. The only areas where relatively low energy beaches exist are Yanchep Lagoon and on the southern side of Two Rocks Marina, although this beach is often littered with seagrass which can reduce its attractiveness as a swimming location. These observations are consistent with the statements of Short (2006) in his classification of this section of the Western Australian coastline.

Nodal development is planned for the foreshore of the Yanchep - Two Rocks project. Based on the initial concept plan, DPI had the following comment (comment number 26 in the Composite Response Document) on the positioning of these nodes.

"It is unclear whether the location of coastal nodes has been determined based on the desirability and suitability of beaches for recreational issues. A coastal physical processes study prepared by a qualified coastal engineer must be undertaken to determine the coastal physical processes setback in compliance with Schedule 1 of Statement of Planning Policy No 2.6 State Coastal Planning Policy (SCPP) to ensure that subdivision of land and proposed development will not be effected by coastal processes. DPI is currently completing a recreational survey into beach use along the Perth coast – the DCP could utilise this material to justify the suitability of certain nodes for specific activities and placement of infrastructure. Justification and detail of the coastal node selection process is required within the DCP. SPP 2.6 encourages integration of coastal development (ie. Co-location of surf lifesaving facilities, cafes, public amenities etc.)."

2.1 Coastal Setback

In partial response to DPI comment 26 and with reference to DPI comment 29, which identifies the need for the determination of a physical processes setback study, MRA have previously conducted a preliminary assessment of the coastal setbacks that would be required along the Perth Metropolitan Coastline. This work was completed in early 2005 for DPI and is outlined in MRA (2005a & 2005b). One of the purposes of this work was to determine a conservative physical processes setback for the coastline.

The physical processes setbacks that were calculated for this stretch of shoreline range from 48 to 186 m. These setbacks have been shown on the current structure plan in Figure 2.1. This shows that the physical processes setback line is generally forward of the proposed development. As a result of this, the physical processes setback line that was previously calculated will be used for this study.

2.2 Beach Use

The survey into recreational beach use along the metropolitan coast for DPI was undertaken by Eliot et al in 2005. The survey outlines the beach usage observed during a peak use day and a weekday. The results showed that there were low levels of usage of the beaches along the proposed Yanchep - Two Rocks coastline on both days. By far the most popular beach was the Yanchep Lagoon, with around 90 people present on the beach on the morning of Sunday 6 March 2005. No other beach in the area received significant patronage. In part, this indicates that Yanchep Lagoon is the most popular beach along the coastline. However, it should be noted that Yanchep is an area that is already developed, and therefore a resident population is present in close proximity to the Yanchep Beach. Surrounding beaches would not be expected to have such high patronage due to the lack of population in their catchment areas.

A number of other studies have been conducted on the beach usage along the Perth Metropolitan Coastline. These are summarized in Table 2.1. This table shows that the proportion of the total metropolitan population using the beach during a peak use day is typically between 0.8 to 1.7%. However, this proportion is an average over the entire metropolitan area. It would therefore be reasonable to expect that the proportion of beach users would be higher in coastal areas, and lower in inland areas.

Table 2.1 - Summary of Beach Use Surveys

	Houghton (1989)	Coastwise (1999)	Surf Life Saving Western Australia (1994-1998)	Houghton et al (2003)	Coastwise (2004)	Blackweir and Beckley (2004)
Number of Surveys	1	1	2849[1]	1	1	106
Survey Date/s	Sunday 7/02/1988	Sunday 7/02/1999	1994 to 1998	Sunday 5/03/2000	Sunday 8/02/2004	1/11/2003 to 1/02/2004
Beaches Surveyed	Ocean Reef to Fremantle	Two Rocks to Singleton	Quinns to Fremantle[2]	Ocean Reef to Fremantle	Two Rocks to Melros Beach	Two Rocks to Avalon
Maximum Number of People (Metropolitan Coast)	14,080	19,466	23,050[5]	6918[3]	15,058	11,625[4]
Proportion of total population using beach (Metropolitan Coast)	1.46%	1.45%	1.72%[5]	0.52%[3]	1.06%	0.80%[4]

Notes: 1 Refers to the cumulative number of counts for each individual beach.
2 Only Quinns, Mullaloo, Sorrento, Trigg, Scarborough, City Beach, Floreat, Swanbourne, North Cottesloe, Cottesloe and Fremantle (Port and Leighton) Beaches included.
3 Influenced by the fact that Monday 6/03/2000 was a public holiday, which may have resulted in an underestimation of beach use.
4 Based on a combination of peak beach usages, not necessarily recorded at the same times.
5 Peak beach use occurred on 24/1/1998.

Quinns is a coastal suburb to the south of the Yanchep - Two Rocks project that stretches 3 km along the coast and up to 2 km inland. Peak beach usage along the Quinns shoreline, which consists of a series of local beaches, between 1994 and 1998 was estimated to be 500 people (Houghton et al 2003). Using a population of 6,350 people, as given by the City of Wanneroo for 2001, this equates to a proportion of 8% of the local population on the beach during peak use.

Within the Yanchep - Two Rocks precinct, Two Rocks and Yanchep had a combined maximum beach use of 410 people (Houghton et al 2003). This corresponds to a proportion of around 10% of the total population of 3,800 people using the beach during peak periods (City of Wanneroo 2001).

To give an example of the beach usage at a regional beach, the peak beach usage at Cottesloe was around 2,000 people (Houghton et al 2003). The population of Cottesloe has consistently remained around 7,500 for the past decade (ABS 2001). Therefore the proportion of beach users represents around 26% of the local population. However, due to the regional nature of Cottesloe Beach it is likely that many of the beach users would reside outside the local area, particularly given the close proximity of rail and other public transport to the area.

It is possible that the Yanchep - Two Rocks project may create beach use characteristics similar to those seen at Quinns as well as those observed currently within the region at Two Rocks and Yanchep. This is based on the coastal focus of the development and the draft structure plan which shows the majority of the development within 4 km of the coast. It is therefore possible that the demand for beach access and resources along the Yanchep - Two Rocks coast may reach about 10%. Consequentially, it can be assumed that the proportion of beach use for Yanchep - Two Rocks should lie between the peak metropolitan level of 1.7% and the level seen currently at Quinns, Two Rocks and Yanchep, which is around 10%.

To determine an approximate level of beach use from within the above range for the development of an initial beach hierarchy plan, the beach usage on the coast between Ocean Reef and Fremantle was prorated by the length of coastline to give an estimate of the requirement at Yanchep - Two Rocks. Peak use of around 14,000 people has been recorded for the Ocean Reef to Fremantle coast (Houghton et al 2003), with the length of coast around 32 km. The length of coast at Yanchep - Two Rocks is around 14 km, therefore it is expected that peak use for Yanchep - Two Rocks will see around 6,400 people using the beaches. This corresponds to a level of beach usage of around 4% of the local population, which is within the band from 1.7% to 10% and seems reasonable. Nevertheless, strategies should be in place to account for the possibility of increased use by residents of the area, and possible influxes of beach goers using regional beach facilities. By "beaches" it is meant the water and adjacent land, and does not include the nearby commercial properties.

Based on the results of the beach use studies it is possible to make a prediction of the patronage that would be expected at regional, district and local beaches. This prediction is shown in Table 2.2.

Table 2.2 - Beach Usage by Classification

Beach Classification	Predicted No. People per metre of Beach
Regional	2
District	1.2
Local	0.7

Considering the possible level of beach usage along the Yanchep - Two Rocks coast, it is apparent that the demand for coastal access will be significant in the future. The predicted urbanisation must therefore be reflected in the provision of facilities along the foreshore. Associated with this increase in facilities, the beach capacity must be strategically maximised so that the supply of beach access at least meets demand.

2.3 Beach Hierarchy

MRA have produced a beach hierarchy plan for this region. This plan is shown in Figure 2.2. The reasons behind the configuration of this beach hierarchy are outlined below. The suggested facilities for the regional, district and local beaches have been adopted from Ecoscape (2004).

2.3.1 Regional Beaches

Regional beaches essentially provide a node for beach use that attracts people from within the district as well as from adjacent districts. The facility requirements for a regional beach are generally considered to be 500 car parking bays, toilets, grassed areas, shade/shelter, picnic facilities, kiosk/deli, beach front commercial facilities, playgrounds and lighting. The combination of these facilities and a coastal setting help to make these areas popular, and therefore ensures high levels of patronage.

The southern section of the Yanchep - Two Rocks development has a coastal activity centre located in close proximity to a regional activity centre that is planned for around 1.5 to 2 km inland from the coast. This regional activity centre will also be serviced by a rail link and so provides suitable public transport access to the area.

Due to the proximity of the regional centre to the coast, it is likely that there will be an increased desire for beach facilities near this location. It is therefore recommended that a regional beach be developed adjacent to one of the southern coastal activity centres if and when the demand dictates.

Prior to this both coastal activity centres should be developed to district level.

Development of one of these beaches to a regional level would provide facilities on the foreshore in an area that would be easily accessible to people from surrounding regions due to the near by rail link. Further, integration of the coastal activity centre with the regional beach will encourage patronage of this area, while satisfying the DPI's requirement for integration of foreshore uses.

Short (2006) provides guidance on the safety of beaches around the Western Australian coastline, using a beach hazard rating. The beach hazard rating scales a beach according to the physical hazards associated with its beach type and local beach and surf environment (Short, 2006). Current Western Australian examples of regional beaches include Trigg, Scarborough and Cottesloe beaches. These beaches have beach hazard ratings between 3 and 5 our of 10, with 10 out of 10 being the most hazardous beach (Short, 2006). The two proposed locations of the Yanchep - Two Rocks regional beach were given a beach hazard rating of 5 by Short, which is comparable to Trigg.

As the beaches adjacent to the coastal activity centres are generally wide sand beaches and are comparable in terms of wave conditions to Trigg and Scarborough (Short 2006) it is estimated that, if developed to a regional level, the length of developed beach would be in the order of around 1,200 to 1,500 m. This could result in around 2,700 people using this beach during peak periods, however due to the regional classification of this beach it is likely that a proportion of the visitors would be from outside the Yanchep - Two Rocks area. Should the level of demand for these facilities justify an expansion of the regional beach, expansion could occur along the coast.

2.3.2 District Beaches

District beaches are beaches that are used by people that reside within the district of the beach. The facilities generally associated with a district beach are 150 car parking bays, and provision of toilets, grassed areas, shade/shelter, picnic facilities, kiosk/deli, playground and lighting.

Due to the proximity of the regional centre to the coast in the southern section of the Yanchep - Two Rocks project, it is likely that there will be an increased desire for beach facilities near this location. Beaches adjacent to the coastal activity centres should therefore be developed to district level, with the possibility of one of these beaches being upgraded to a regional level if and when the demand dictates. The choice of which beach to

upgrade would be made based on the planning of development at that time. Development of these district beaches in conjunction with the coastal activity centres would also satisfy the DPI's requirement of integrated coastal development.

Located just to the south of the southern coastal activity centre is a surfing area known as "The Spot". Access to this area should be provided, but the focus should be on ensuring that a conflict is not created between those using the beach for swimming and those who are surfing in the area. Similarly at another popular surfing break - "Derrs", which is situated around 500m south of the northern coastal activity centre, a separation of swimming and surfing activities is recommended via the use of signs and lifeguards. This method is currently used at the Trigg regional beach, using signs and lifeguard flags to warn swimmers of the dangers of surfers.

To the south of the southern coastal activity centres is the Yanchep Lagoon. The Yanchep Lagoon is currently classified as a district beach and should remain with that classification due to the very safe swimming area that it provides, which is unique for this area.

The draft structure plan shows a third coastal activity centre north of the Two Rocks Marina. The beach directly in front of this coastal activity centre contains several low elevation rock outcrops on the beach and in the swash zone. Just to the south of this location is a sandier beach that would be better suited to district level development. This would again allow for integrated coastal development with the activity centre and potential marina location.

The draft Two Rocks Yanchep Foreshore Management Plan (City of Wanneroo 2005) identifies that facilities akin to the development of the district beach are to be developed to the south of the Two Rocks Marina at an area known as Leeman's Boat Landing. This area is on the southern side of Two Rocks and is therefore unlikely to be effected by the build up of seagrass that occurs between the southern breakwater of the Two Rocks Marina and the southern rock.

There are currently also two dog exercise areas in the Yanchep - Two Rocks district. These are located to the south of the Yanchep Beach lagoon and to the south of the Two Rocks Marina, as shown in Figure 2.2. These exercise areas are located in close proximity to proposed district beaches, allowing both dog owners and swimmers to utilise the district beach facilities without too much interference. It is anticipated that there will be a need for another dog exercise beach as the development expands. This additional dog beach will likely be a local beach and will be discussed in Section 2.3.3.

The proposed locations of the five district beaches have beach hazard ratings between 4 and 5 (Short, 2006). Yanchep Lagoon is rated the safest for swimming due to the presence of the protected waters behind the reef.

It is estimated that once developed, the length of beach that receives regular use for each district beach would be around 800 m. The combined patronage that would therefore be expected for these five district beaches would be around 4,800 people. This may change if and when one of the southern district beaches is developed to a regional level.

2.3.3 Local Beaches

Local beaches are typically classified as those beaches that are used by residents within the immediate area. Generally, the standard for development of a local beach is the provision of 20 car parking bays with a small toilet block.

Local beaches have been positioned along the coast adjacent to district and neighbourhood activity centres. This provides some integration of coastal development. Ultimately these local beaches will provide coastal access to nearby residents, eliminating the need for them to travel to the district beaches in the area. This will help to spread the beach usage over a wider area, and eliminate the congestion of district and regional beaches.

Local beaches have also been positioned in areas that are believed to be currently used by residents, and are on sections of coast that are generally free from rock. The five proposed local beaches have hazard ratings between 4 and 5 (Short, 2006). This is in the moderately dangerous range, which is comparable to the majority of popular beaches along the northern metropolitan coastline.

It is likely that an additional dog exercise will be required as the Yanchep - Two Rocks district expands. The two existing dog beaches are located near district beaches in the south and in the centre of the development, as shown in Figure 2.2. Subsequently, it is proposed that the local beach at the very north of the development be designated as a dog exercise beach. This will provide a dog exercise area for the northern section of the development, while minimising the disturbance to swimmers. It may also encourage dog owners to utilise this local beach instead of the busier district beaches in the south.

It is assumed that the length of coast used at a local beach would be in the order of around 200 m per beach. This would mean that around 140 people could use each local beach on peak days. The five local beaches would accommodate about 700 people on peak days.

2.3.4 Total Beach Capacity

Assuming that the beach hierarchy plan shown in Figure 2.2 is adopted, it is likely that the facilities provided will meet the requirements of the ultimate population of Yanchep - Two Rocks. It was previously estimated that the peak beach use would be in the order of 6,400. Based on the above mentioned beach hierarchy plan the beach capacity of the area would be between 5,500 and 7,200 people, depending on when a regional beach is developed. Therefore the capacity of the hierarchy plan should be sufficient in the longer term.

If it was found that the capacity of the beaches was not meeting the demand, even once the first regional beach was established, the regional beach could be extended to include established beaches nearby. The capacity of this regional beach could be around 3,000 to 4,000 people, given a length of around 1.5 to 2.0 km and the predicted patronage of 2 people per metre of beach. This would significantly increase the beach capacity for the region. Additional capacity could also be gained by expanding the district and local beaches.

2.4 Beach Development Staging

The progressive development of the beaches should be timed to match the overall demand and population. Consequently, the initial development of the regional beach and district beaches may be modest parking and support facilities that are expanded in line with the increase in population and demand over the years. A recommended staging plan for the beach hierarchy is shown in Figure 2.3.

Adoption of a staged development plan such as that shown in Figure 2.3 should ensure that adequate beach facilities are available to meet the peak beach use during the progression of the development. This would also prevent the over capitalisation of certain areas such as if facilities akin to a regional beach were developed in the first stage and subsequently underutilized and not commercially viable.

3. Marine Facilities

Following a review of the initial concept plan for Yanchep - Two Rocks, the City of Wanneroo and DPI had the following comments with regard to the provision of marine facilities.

City of Wanneroo comment 3g
"*The applicant investigating the proposed marina sites further with the relevant Government agencies and the City providing further advice on the appropriateness of these sites for the Council to consider prior to the final adoption of the District Concept Plan."*

DPI comment 27:
"The rationale for the location of the two potential marinas…and justification in terms of the expected demand for such facilities, the sustainability of the sites in terms of coastal processes, the potential impact on adjacent coastal areas, and the need to ensure that safe swimming beaches are not impacted by the marina locations."

An assessment of demand for marine facilities, along with a brief outline of the opportunities for the development of marine facilities, in terms of both viability and appropriateness, is outlined in this section.

3.1 Assessment of Demand for Marine Infrastructure

The Department for Planning and Infrastructure (DPI; formerly the Department of Transport) keeps statistics of boat ownership in Western Australia. Registration statistics for the entire metropolitan area in 1991, 1996 and 2001 are given in Table 3.1. Registration statistics for the whole of Western Australia are given in Table 3.2 at approximately ten yearly intervals between 1970 and 1999.

Table 3.1 – Boat Ownership Statistics for the Perth Metropolitan Area

Year	Population[1]	Boat Registrations	Boats per 1000 people
1991	1,143,249	36,859	32.2
1996	1,244,320	43,189	34.7
2001	1,339,993	50,992	38.1

Notes: 1. Source Census (ABS 2006)

Table 3.2 – Boat Ownership Statistics for Western Australia

Year	Boats per 1000 people[1]
1970	17
1980	29
1990	31
1999	36

Notes: 1. Source Department of Transport (1999)

Table 3.1 illustrates that the level of boat ownership in metropolitan Perth increased by around 6 boats per 1,000 people, or around 18%, in the decade between 1991 and 2001. On average for the period between 1970 and 1999, the increase in boat ownership across Western Australia shows similar levels of growth.

Locally within established suburbs in the Northern Corridor of Perth, boat ownership levels showed a significant amount of variability. Coastal suburbs such as those between North Beach and Mullaloo had levels of boat ownership ranging from around 42 to 62 boats per 1,000 people in 2001. Other suburbs slightly further inland such as Carine, Duncraig and Joondalup had boat ownership of around 30 to 34 boats per 1,000 people in 2001.

Based on the above assessment of boat ownership in the Perth northern corridor, it is estimated that the level of boat ownership within the entire Yanchep - Two Rocks development will be similar to the Metropolitan average. In 2001 this level was around 38 boats per 1,000 people; however significant increases in boat ownership numbers were seen prior to this time.

The reasons for this increase in the proportion of boat ownership are likely to be wide ranging, however periods of favourable economic conditions, increases in leisure time and increases in the affordability of boats may have made boat ownership more available to a wider demographic. Allowance for increases in boat ownership as a continuation of the current trend should therefore be included in this assessment. Forecast growth of the proportion of boat ownership was determined by extrapolating the recorded trend in boat ownership since 1970. This is shown in Figure 3.1.

Based on the forecasting of the boat ownership trends it is apparent that a linear fit provided a better correlation coefficient with the recorded data compared to a power series approximation. The linear extrapolation of the

trend shown in Figure 3.1 was therefore used for this assessment. The values predicted by this method were seen as the upper end of the range of boat ownership within Yanchep - Two Rocks. The lower end of the range was calculated using the most current boat owner level of around 38 boats per 1,000 people.

The figures in Department of Transport (1999) and P A Australia (1981) suggest that about 85% of the total number of boats will be kept on trailers and launched when necessary. The remaining 15% would be kept in a mooring pen in sheltered waters such as a marina or boat harbour. Based on these figures, estimates of boat ownership in Yanchep - Two Rocks have been made, and are shown in Table 3.3.

Table 3.3 – Projected Boat Ownership in Yanchep - Two Rocks

Year	Number of Boats per 1,000 people	Number of Boats	Boats on Trailers	Boats in Pens
2015	38 - 46	414 – 501	352 – 426	62 – 75
2021	38 - 50	819 – 1,078	696 – 916	123 – 162
2033	38 - 57	2,139 – 3,209	1,818 – 2,728	321 – 481
2046	38 - 65	4,204 – 7,191	3,573 – 6,112	631 – 1,079
2058	38 - 73	5,855 – 11,249	4,977 – 9,561	878 – 1,687

The levels of boat ownership that are estimated for 2058 are almost twice the levels that were observed in the metropolitan area in 2001. However this level is not much greater than the peak level that is currently observed in suburbs within the northern corridor of Perth. These established coastal suburbs have up to around 65 boats per 1,000 people.

It is expected that higher incidences of boat ownership, such as those at the upper end of the estimated forecast range, are likely to occur in the fullness of time at Yanchep - Two Rocks, however in the development phase it is likely that boat ownership will be at the lower end of the range. The reason for this progressive increase is based on the demographic of people that are likely to reside in Yanchep - Two Rocks. It is expected that a significant proportion of residents will initially be first home buyers. Purchase of desirables such as boats would therefore be expected to occur once the development is established and the initial financial burden of home ownership and children at school is overcome.

For the assessment of need for boat launching facilities the figures in Table 3.4 will be assumed. These figures have been based on the results of P A Australia (1981), Department of Transport (1999) and MRA engineering judgement.

Table 3.4 – Factors for Assessment of Demand for Launching Facilities

Item	Assessment
Vessels in regular use	75%
Vessels that are in regular use that are used on weekends	70%
Vessels used on peak day of weekend	50%
Boats launched on each lane of ramp with finger jetty	60 boats / day / lane of ramp
Trailer and car parking required	60 usages / day / lane of ramp

Notes: 1. 60 boat usages / day is likely to need 50 trailer bays

Using the above statistics and the projected boat ownership for Yanchep - Two Rocks, the following tables, Tables 3.5 and 3.6, show the likely demand for marine facilities for recreational boat owners.

Table 3.5 – Projected Demand for Boat Ramps in Yanchep - Two Rocks

Year	Number of Boats Launched on Peak Day	Number of Lanes of Ramp Required	Number of Trailer Parking Bays Required
2015	92 – 132	2 – 2	100 – 100
2021	183 – 283	3 – 5	150 – 250
2033	477 – 842	8 – 14	400 – 700
2046	938 – 1,888	16 – 31	800 – 1,550
2058	1,306 – 2,953	22 – 49	1100 – 2,450

Notes: 1. Trailer parking is on the basis of 50 bays per lane of ramp

Table 3.6 – Projected Demand for Boat Pens in Yanchep - Two Rocks

Year	Number of Boat Pens	Parking Bays
2015	62 - 75	31 - 38
2021	123 - 162	62 - 81
2033	321 - 481	161 - 241
2046	631 – 1,079	316 - 540
2058	878 – 1,687	439 - 844

The numbers calculated in the above tables provide the best estimate of the boat ownership that is likely to be observed in the Yanchep - Two Rocks development. It is obvious from these tables that the requirement for marine facilities within this area is likely to be significant in the future.

During this investigation MRA has been made aware of the existence of an internal DPI report that makes predictions of the future requirements for boating facilities on the metropolitan coastline to the north of Hillary's Marina. It is understood that this report, titled *"Boat Harbour Development Options along the Northern Metropolitan Coastline: A Preliminary Assessment"* makes recommendations of the facilities that will be required along the coast in the future. This report could not be obtained from DPI for use during this study. The above assessment was therefore conducted independently of the DPI report.

3.2 Opportunities for Marine Facilities

Currently along the northern metropolitan shoreline there are a number of existing marine facilities. Table 3.7 lists these facilities moving south to north.

Table 3.7 – Recreational Boat Facilities between the Swan River and Two Rocks Marina

Facility	Distance from Facility to South	Number of Pens for Recreational Use	Number of Lanes of Boat Ramp
Fremantle Sailing Club	9 km	660 pens	6 lanes
Challenger Boat Harbour	1 km	220 pens (ultimately)	0 lanes
Trigg Island Boat Ramp	20 km	0 pens	1 lane
MAAC at Marmion	4 km	0 pens	1 lane
Hillarys Boat Harbour	2 km	720 pens (ultimately)	6 lanes
Ocean Reef Boat Harbour	7 km	0 pens	8 lanes
Mindarie Keys	8.5 km	370 pens (ultimately)	4 lanes
Eglinton Marina (not yet built)	12 km		
Two Rocks Marina	12 km	200 pens (ultimately)	1 lane

Two Rocks Marina currently exists within the Yanchep - Two Rocks precinct. As shown in Table 3.7, this marina has current capacity to allow for 200 pens and has a single launching ramp. The projected demand for boat facilities in this region suggests that this marina will only be able to provide facilities to meet a small proportion of the ultimate demand.

To the south of the project area, the Eglinton Marina is proposed and has both planning and environmental approval. Exact details of this marina are unknown, but it is possible that this marina may be large enough to accommodate patrons from within Yanchep - Two Rocks, as well as from within Alkimos-Eglinton, at least during the first few stages of development.

The opportunity for the expansion of the Two Rocks marina could also arise within the first few stages of development. This expansion of the Two Rocks Marina, if properly designed, could also have the added benefit of

preventing the accumulation of seagrass on the shoreline to the south of the marina, which has been acknowledged as an ongoing problem. Such an expansion may provide an additional 150 to 200 pens and 2 to 3 lanes of boat ramp.

Based on the predicted ultimate demand it is unlikely that the development of the Eglinton Marina and the possible expansion of the Two Rocks Marina would provide adequate marine facilities for the ultimate population of Yanchep - Two Rocks. For this reason two additional potential marina locations have been included on the concept plan. The southern potential marina location provides the opportunity for integration of the marina with the district, or possibly even regional, beach to the south. Furthermore, the marina would be located adjacent to a coastal activity centre and within reasonable proximity to the southern regional activity centre, which should encourage patronage of the associated facilities.

Locating a marina adjacent to nearby activity centres has the distinct advantage that the marina itself can become a regional attractor, whilst also fulfilling its functional requirement of providing marine facilities. One such example of this is Hillary's Marina. This proposed marina would also be positioned behind Rhodes Reef and would receive some protection from offshore wave conditions as a result. Additionally, the entrance to the marina would be located in around 6 m of water, which should significantly reduce the risk of large waves breaking near the entrance to the marina. Further, the location of this proposed marina is in an area that has previously been assessed as having a relatively low physical processes setback allowance, indicating that the region is relatively stable. Nonetheless, it is acknowledged that some form of coastal management would be required to prevent erosion updrift from the marina as a result of the interruption of the longshore sediment transport.

The second potential marina site is located to the north of the Two Rocks Marina. This marina would again be located adjacent to a coastal activity centre to encourage integrated development. Furthermore, the marina would be afforded some protection from the offshore wave climate by the presence of Mallee and Map Reefs just offshore. The entrance to the marina would also be likely to be located in around 5 m of water, which would significantly reduce the risk of large waves breaking near the entrance to the marina and should therefore provide safe boating access for small vessels.

4. Conclusions & Recommendations

Based on the previous investigations, the following conclusions and recommendations are made with regard to the provision of beach and marine facilities.

- Given the ultimate population of the Yanchep - Two Rocks development is around 155,000 people, it is estimated that around 6,400 people would use the beaches along the coastline of Yanchep - Two Rocks on a peak beach use day.

- To accommodate the ultimate peak beach use it is estimated that five local beaches, four district beaches and one regional beach should be developed along the coastline. Development of the facilities associated with these beaches should be staged to ensure that the provision of facilities matches the demand.

- The regional beach should be developed on the southern section of shoreline in close proximity to the regional activity centre and the associated public transport routes. Moreover, the regional beach should be adjacent to a coastal activity centre to ensure integration of foreshore development.

- The current boat ownership rate for Perth is about 38 boats per 1,000 people. An assessment of the increase in the numbers of boats in Western Australia per 1,000 people showed that there is a noticeable trend. This trend, which is best described as a linear increase based on the correlation with the existing data, predicts an increase in boat ownership of around 6 boats per 1,000 people per decade.

- The predicted demand for marine facilities in at least the first two stages of the Yanchep - Two Rocks development could be satisfied by the possible construction of the Eglinton Marina to the south. Additionally, expansion of the Two Rocks Marina could provide further facilities and would help to further satisfy the demand in the first two to three stages of the Yanchep - Two Rocks development.

- Based on the ultimate population of Yanchep - Two Rocks, it is likely that additional marina facilities will be required along the coast. For this reason two proposed marina locations are shown on the concept plans. Both of these marina locations would be integrated with coastal activity centres, and would be afforded some protection from offshore conditions by nearshore reefs. Additionally, the entrances to both marinas would be located in around 6 m of water; therefore the entrance should be relatively safe due to the reduced risk of depth limited wave breaking

near the entrance. It is likely however, that some form of coastal management would be required to account for the interruption of longshore sand transport as a result of the construction of either of the marinas.

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5. Figures

Figure 1.1 Location Diagram

Figure 1.2 Development Staging Plan

Figure 2.1 Concept Plan with Physical Processes Setback

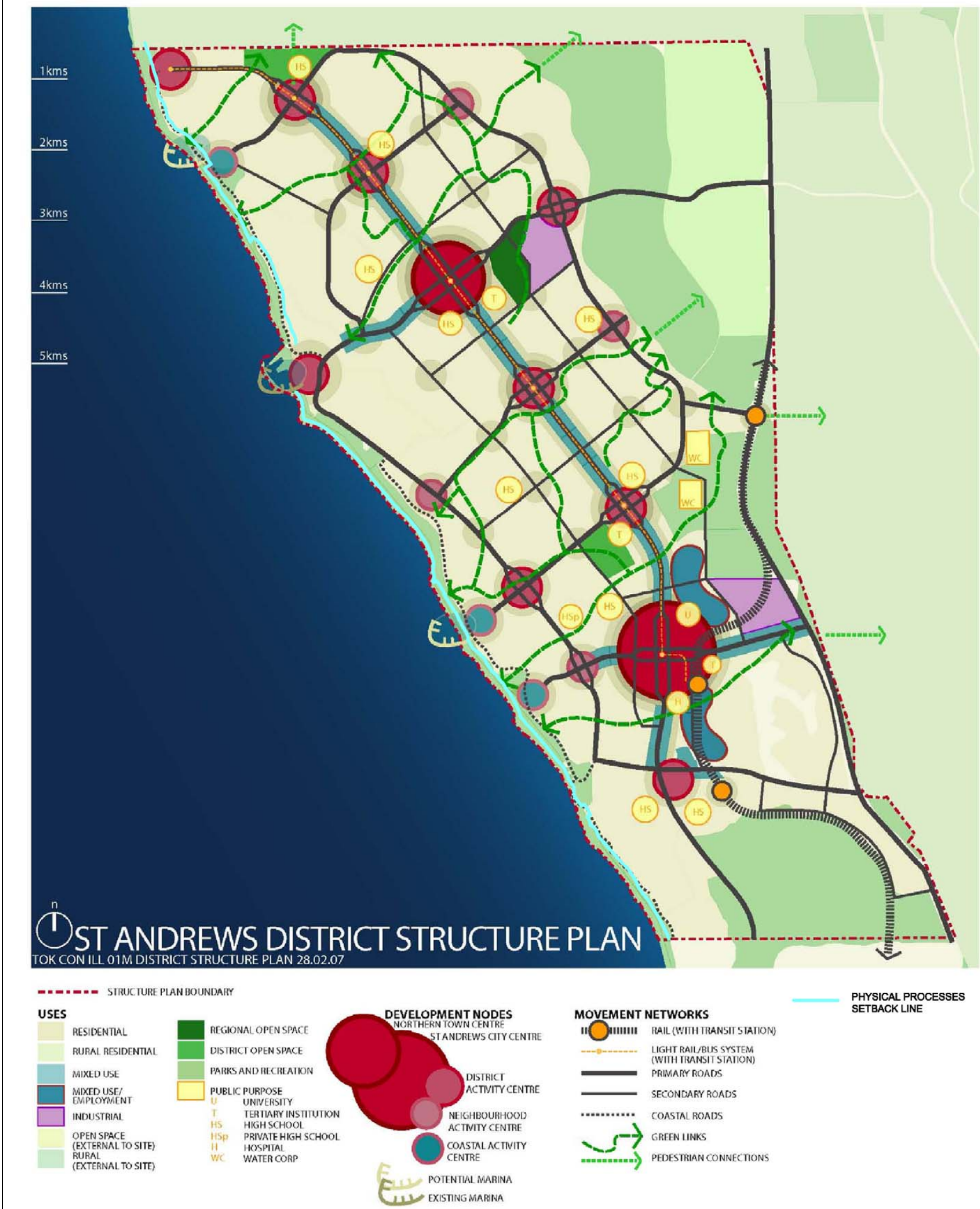

Figure 2.2 Beach Hierarchy Plan

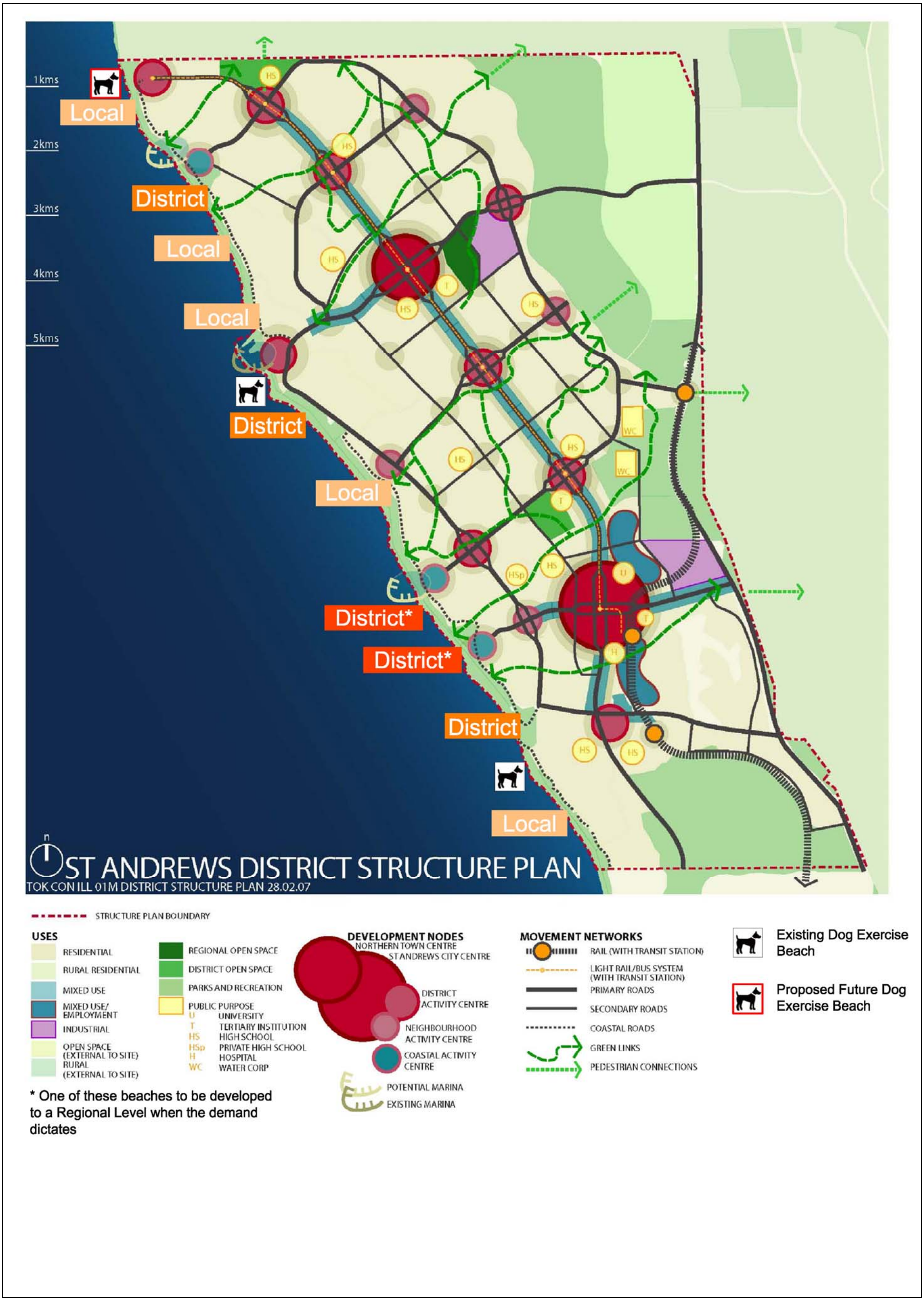

Figure 2.3 Beach Hierarchy Staging Plan

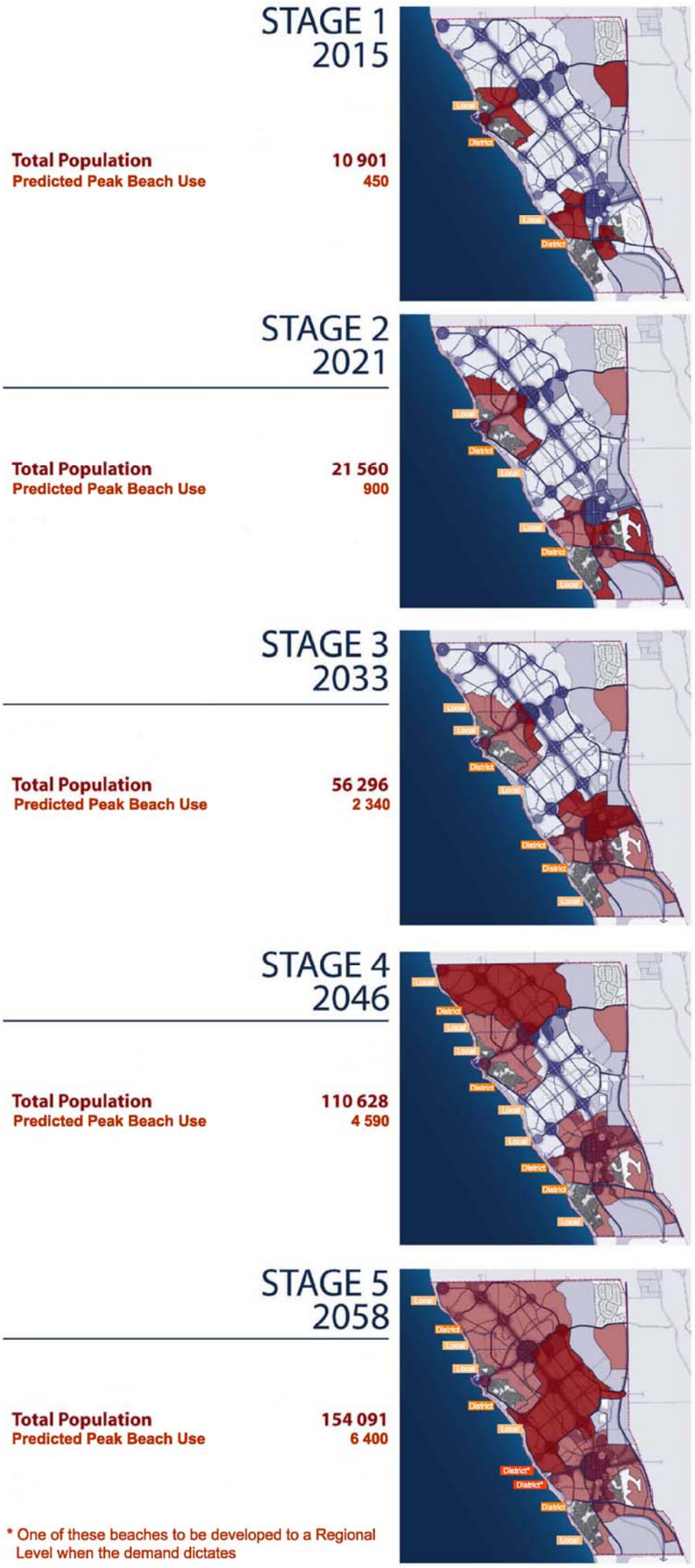

Figure 3.1 Boat Ownership Trends