

TWEED SHIRE COUNCIL

**TWEED RIVER ESTUARY
RECREATIONAL BOATING STUDY**

**Issue No. 2
JULY 2008**

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1 INTRODUCTION

The Tweed River Estuary forms the downstream portion of the most northern catchment on the New South Wales coast and is a vital economic, social and environmental asset for the Tweed Shire. Tweed Shire covers 1303 square kilometres and adjoins the NSW shires of Byron, Lismore and Kyogle, and the NSW/Queensland border which divides the twin towns of Tweed Heads and Coolangatta. Recreational and commercial boating interests continue to play an important part in management of local waterways within the Tweed Shire.

The construction of the Tweed River Entrance Bypassing Project (*TRESBP*) has seen navigational conditions across the previously recognised hazardous estuary entrance substantially improve. As a result, a corresponding increase in recreational boating and greater interest in commercial and tourism boating has been observed. Subsequently, the demand for recreational and commercial boating facilities has intensified and a new prospering marine industry (*including houseboat hire, fishing and tourism charters and boat building*) has developed.

In addition to improved entrance navigational conditions, the impacts of the sea change phenomena, retiring baby boomers and a general trend within the community of increased affluence and leisure time, could see the future demand for recreational and commercial boating activities and associated facility increase dramatically. This demand will most likely increase from both, within the region, and through tourist visitation. This offers great economic opportunities for the Tweed Estuary. However, the expected growth presents complex challenges for the planning and management of the waterway in terms of social and environmental impacts.

Tweed Shire Council (*Council*) and the Tweed River Committee have recognised the need to increase the implementation of infrastructure and services to cater for these growing demands from the boating sector and have already undertaken upgrading of some facilities on the Tweed River in response to the growing demand. To continue this momentum, Council and the Committee wish to formulate a strategy for the continued implementation of facilities and services to address current and future boating sector requirements.

Patterson Britton & Partners (*PBP*) were engaged to undertake a recreational boating study to determine the level of facilities and services required to encourage an appropriate level of boating utilisation of the Tweed River Estuary. This strategic provision of facilities and services needs to recognise the need for the level of boating utilisation to be managed within economic, social and environmental constraints.

The strategy developed involved the analysis of a large amount of spatial data using the software program visionMAKER™. visionMAKER™ facilitates interpretation of large amounts of spatial data through the ready access to, and interrogation of, various information sources through a common, intuitive spatial framework. It allows the power of GIS presentation and interrogation of data to be accessible to non technical users. Users are provided with an interface where all they need to do is click on a GIS entity (*usually a point, line or region*) to reveal information about that entity. This information could be in the form of standard GIS table data, or any number of linked Windows™, or internet, based files.

Appendix A contains a DVD with an auto run function to load the visionMAKER™ environment on a personal computer (PC) with a Windows™ operating system.

The visionMAKER™ environment should be loaded on a PC and viewed in conjunction with the reading of this report. The report text references particular screens within the visionMAKER™ environment in a similar way as a more traditional report format would reference figures. The screens within the visionMAKER™ environment are numbered in a branch structure. An example PC screen grab from the project environment is depicted in **Figure 1.1** below.

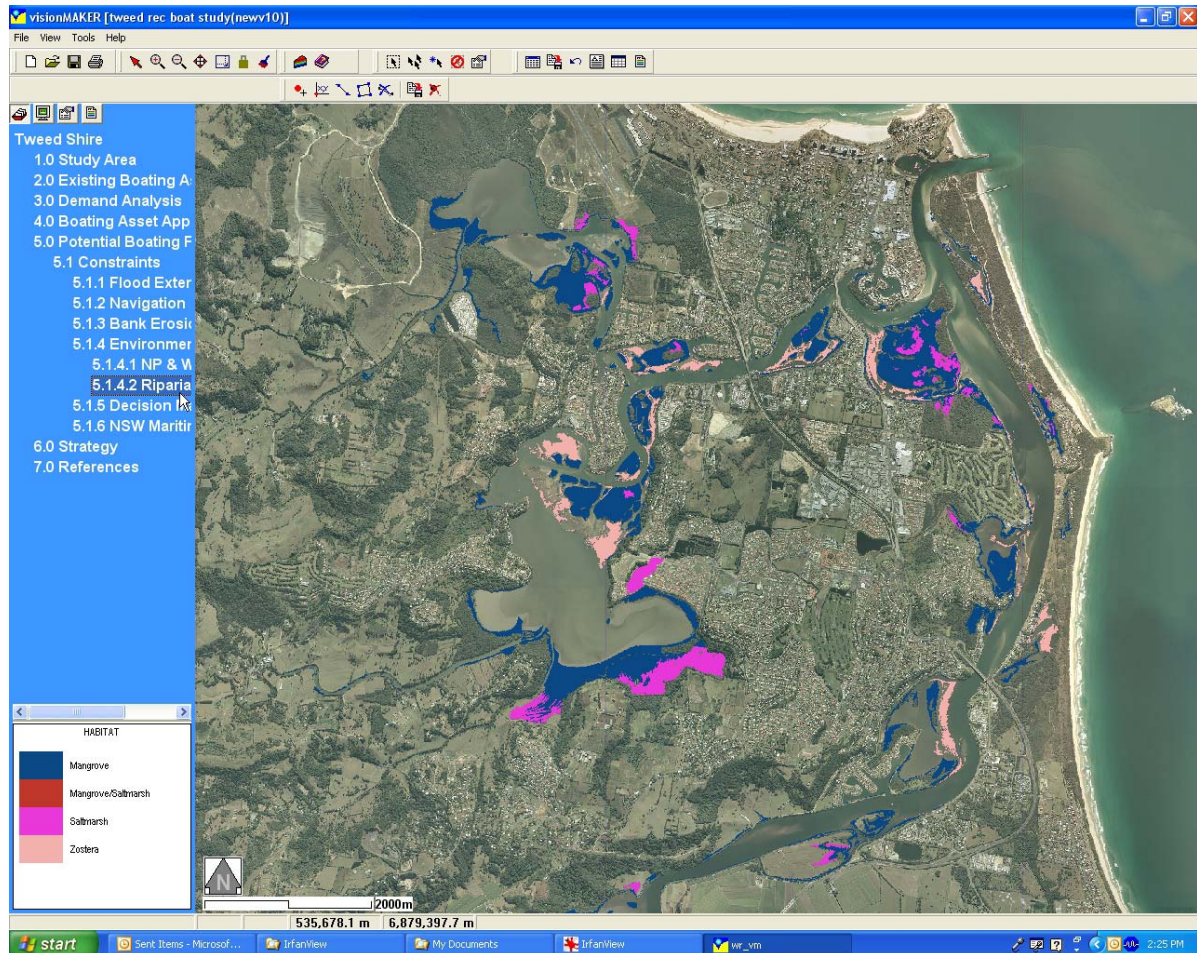


Figure 1.1: PC screen grab from the project visionMAKER™ environment

To view the screen that is referenced by the report, the reader needs to navigate their way down the branch structure by clicking their PC mouse, to expand each branch as necessary, until the numbered branch corresponding to the subject reference is displayed. For example, screen **vM5.1.4.2** is displayed in **Figure 1**.

By clicking on the screen the viewer is able to access interactive files relating to the particular element being represented. This allows readers to explore all the data used in developing the entire strategy beyond a specific reference made in the report text. The visionMAKER™ environment also links to an electronic version of some of the reference material used in collating the study giving instantaneous access to reference material. These links are accessed from Screen 7.0 of the visionMAKER™ environment (**vM7.0**).

2 STUDY SCOPE

Council's Brief stipulated the primary objective of the study to be the formulation of an "integrated short term and long term strategy comprising strategic options that will address the current and future needs and requirements of recreational boating within the Tweed River Estuary (*Study Area*) including a program of works and actions". This included:

- identification of current and future infrastructure requirements for recreational boating generated from within the region;
- identification of potential tourist and recreational boating linkages with other areas such as South East Queensland and Northern New South Wales;
- identification of the levels of marine infrastructure required to promote Tweed Heads as a desirable destination and servicing centre for recreational boating from outside the region;
- consultation with relevant boating groups in making an assessment of boating infrastructure requirements;
- assessment of existing infrastructure adequacy in meeting current and future boating demands;
- assessment of the potential to develop a marine precinct to foster the growth of marine services in accordance with recognised best practice principles;
- formulation of a strategy for Council that will canvas options to meet the principle objectives outlined above;
- identification of the order of costs in implementing individual strategic options; and
- identification of staging for individual options.

The following areas were specified, by Council, as requiring consideration in undertaking the study and providing strategic options:

- mooring areas;
- existing and future public wharves and jetty sites;
- refuelling centres;
- provisioning;
- vessel sewage pumpout facilities and solid waste reception;
- existing and future boat launching ramps and attendant facilities;
- marine service centres and chandleries;
- slipways and hardstands;
- marina sites;
- marine precincts; and
- carrying capacity.

2.1 STUDY AREA

vM1.0 provides an indication of the adopted study area, which includes all navigable waters and adjacent foreshore areas:

- from the mouth of the Tweed River to Bray Park Weir upstream of Murwillumbah;
- Terranora Inlet to the entrances of Terranora and Cobaki Broadwaters; and
- Rous River to Kynnumboon.

The mouth of the Tweed River is contained within entrance training walls at Tweed Heads, immediately south of the NSW/QLD state border. Bray Park Weir, approximately 4 kilometres upstream of Murwillumbah, is the tidal limit of the main arm of the Tweed River and defines the upstream extent of the Tweed River Estuary.

It should be noted that although reference is made to the draft Lower Tweed Boating Study (*PBP, 1997*) throughout this report, the current study encompasses a larger area of river than that covered in the 1997 report. Hence, although some methodologies are similar, direct comparison or correlation of all the numbers presented in the two reports (*unless purely statistical*) would be inappropriate.

2.2 PROPOSED STUDY METHODOLOGY

In response to Councils requirements, PBP defined the proposed scope of work and methodology for the project to achieve the principal objective of formulating an integrated short and long term strategy to address the current and future needs and requirements of recreational boating within the Tweed River Estuary. The scope of work and methodology were subdivided into main tasks consolidating items identified or referred to in Council's briefing document, as follows:

- demand analysis;
- inventory of existing infrastructure;
- assessment of existing infrastructure and potential developments;
- environmental capacity for recreational boating; and
- boating infrastructure strategy;

2.2.1 Study Inputs

Information gathered from the following sources provided additional input to all stages of the study:

- previous boating reports, studies, management plans and strategies;
- an extensive field study; and
- targeted stakeholder consultation.

Previous studies of particular relevance were the Draft Lower Tweed Boating Study (*PBP, 1997*) and the Tweed Estuary Boating Plan 2006 - 2010 (*NSW Maritime, 2006*). Both of these documents provided information that was used in this study to compile ideas, philosophies and strategies in relation to the provision of boating infrastructure in the Tweed Estuary. They also include extensive community and boating user group consultation programs, which were used to gauge community attitudes. In addition to these previous consultative processes, PBP undertook a targeted consultation program of key boating user groups and stakeholders, as a part of this particular study to augment previous information. This was undertaken to assess the infrastructure requirements of the boating community, to confirm key issues surrounding boating on the Tweed River Estuary and to

ensure that attitudes within the community had not altered significantly since previous consultative processes.

2.2.2 Reporting

To assist Council in the ongoing implementation of boating strategies and infrastructure asset management the main reporting for this study is contained in a project file accessed by the GIS software package visionMAKER™. For completeness, and ease of distribution of the main study methodologies, findings and strategic outcomes, this traditional report style document has also been produced. The visionMAKER™ project files, which can be viewed but not modified, are included in a DVD in **Appendix A** of this report. Conversely, this report document is integrated in the visionMAKER™ environment.

visionMAKER™ has been used to store the various information collected and strategies developed as part of this project in a spatial (*GIS*) environment. All types of information used to develop the project (*files, websites, text, reference reports, etc*) have been linked to GIS points or regions, with a background of selected data from Council's GIS set (*aerial photography, cadastre etc*). Linked files and data attached to any point or region can be accessed by simply clicking on the object.

This report document presents an outline of the study objectives, methodologies, key findings, strategic philosophies and recommendations. Graphical presentation of all data sets used in the development of the project is contained in the visionMAKER™ environment.

3 DEMAND ANALYSIS

A market demand assessment for recreational vessels in the Tweed region was undertaken. The task involved investigating the current demand for boating facilities and infrastructure (*in particular boat storage requirements - wet and dry berthing*) within the study area and projecting the anticipated demand over the planning period. PBP were assisted in this task by Ian McAndrew of Australian Marina Management (*AMM*). A full market demand assessment report was completed and is accessible from **vM3.3**. A summary of the key findings of this report is provided in **Section 3.1** below.

Statistical information collected as part of the market demand assessment and augmented with information from additional sources (*such as the Australian Bureau of Statistics (ABS) and the Tourism NSW*), has been used to update estimates (*PBP, 1997*) of the Potential Peak Daily Demand for boating on the Tweed Estuary. **Section 3.2** outlines this process and the updated estimates.

Data presented by NSW Maritime (*2006*) following an extensive survey of boating usage on the Tweed Estuary was used to develop an understanding of the distribution of different types of boating activities and the spatial distribution of these activities on the estuary. This information was used in conjunction with existing infrastructure data to help understand the distribution of the demand for infrastructure and the type of infrastructure required in particular areas. This is discussed further in **Section 3.3**.

3.1 MARKET DEMAND ASSESSMENT REPORT KEY FINDINGS

The current and existing situations were assessed utilising data available on population trends, tourist visitations, vessel registration, boat licences and other berthing and mooring facilities in the region and NSW. Demand projections were then conducted using current demand information and anticipated trends in population, tourism and boat usage.

The market demand assessment covered the following aspects of the boating study:

- market demand assessment for marina berthing and dry-stack storage for recreational vessels;
- boat size distribution assessment for marina berthing and dry-stack storage; and
- general commentary on recreational boating and tourism linkages.

An overview of the current situation is represented by a summary figure on **vM3.3**. The full report is also accessed from **vM3.3**. The key findings were reported as follows:

3.1.1 Existing Situation

- currently on water storage (*including moorings, fixed and floating berths*) in the Tweed River estuary is around 120 or 130;

- wet berthing capacity for approximately 45 recreational vessels (*the remainder are private swing moorings, private residential pontoons or professional/commercial vessels moorings/berths*);
- no formal floating marinas in the Tweed River Estuary to provide modern wet berthing for recreational vessels*;
- despite the extensive demand for trailer boat activity in the Tweed River Estuary there are no modern dry-stack boat storage facilities available;
- the Tweed River Estuary in particular, and the NSW Far North Coast generally, appear to be substantially undersupplied with appropriate modern berthing facilities for recreational vessels requiring on-water storage; and
- comparisons with other populous NSW and Queensland coastal regions would indicate that the Tweed Shire is likely to have a very high level of latent demand for formal berthing facilities which are currently not supplied in the Tweed River estuary.

* subsequent development at the Ivory Hotel Marina since the completion of the demand study has seen the provision of 29 modern floating wet berths for recreational vessels.

3.1.2 Statistical Trends

- vessel registration growth rate in the region is approximately 6% (*last 3 years*) which is twice the NSW growth over the same period and among the highest on the NSW and QLD coasts;
- the Tweed region has one of the highest ratios of boat ownership to population in NSW;
- forecast population growth rate for the Tweed region is one of the highest in NSW (*corresponding growth in demand for boat ownership and storage demand*);
- the region has a much lower ratio of vessels in the range greater than 8m than anticipated through comparison with other populous coastal regions (*well below NSW and QLD average ratios*);
- lack of facilities in the Tweed River Estuary is acting as a general constraint to ownership and use of larger vessels which require on water storage; and
- it is expected that strong latent demand exists for modern marina berthing and boat storage in general.

3.1.3 Anticipated Demand Projections (Wet Berths)

- in comparative regions where modern berthing and dry-stack boat storage facilities have been introduced, an immediate and progressive demand for berths and boat spaces is expressed (*latent demand is fulfilled*);
- regional, national and global examples suggest that access being limited to offshore waters (*as is the case with the Tweed River estuary*) is no deterrent to demand for boating and resultant storage;
- if marina infrastructure existed in the Tweed River Estuary, strong demand would clearly exist in the Tweed River Estuary for the berthing of vessels;
- analysis of comparative regional areas suggest regional demand in the Tweed could reasonably be expected to be somewhere between the 4.0 berths per 1,000 head of population as shown for the adjoining Queensland South Coast Hinterland and the 1.41 vessels per 1,000 head of population as shown for the Hunter Region; and

- conservative demand ratios, taking into consideration the restricted water area to provide berthing facilities, indicate marina berthing within the ranges of 135 - 175 (*immediately*), 150 - 200 (*by 2016*) and 175 - 240 (*by 2026*) would be appropriate for the Tweed River Estuary;
- higher range demand ratios, if space to provide boating infrastructure could be made available, indicate marina berthing of 265 (*immediately*), 310 (*by 2016*) and 350 (*by 2026*) would be appropriate for the Tweed River Estuary; and
- A size distribution model (*based on 150 marina berths*) was developed as well as estimate of the power - sail boat ratios.

3.1.4 Anticipated Demand Projections (Dry Stack Berths)

- demand nationally for dry stack storage is high as evidenced by high occupancy ratios (*average 93%*) in existing facilities;
- demand for dry stack storage is only evident where facilities exist;
- more than half of the facilities nationally are located on QLD's south east coast;
- the Tweed regions strong growth in vessel registrations (*particularly of the size suited to dry stack storage*) indicates that the demand for a dry stack facility could equal ratios on QLD south east coast (*approximately 5% of vessels in the range 5 - 10 m*); and
- an opportunity exists for a dry stack storage facility in the Tweed River Estuary for 100 - 150 vessels.

3.2 POTENTIAL PEAK DAILY DEMAND ESTIMATE

Adopting a similar methodology to that presented in the draft Lower Tweed Boating Study (*PBP, 1997*) and using updated statistics collated during the market demand assessment, the potential peak daily demand estimates and projections for the Tweed River Estuary have been updated. Key parameters that input into the methodology have been summarised below:

3.2.1 Population

An estimate of the population of the Tweed Local Government Area (*LGA*) in 2004 based on ABS 2001 Census data was 80,000 with a growth rate was approximately 2.1% (*TSC, 2004*). **Table 3.1** indicates predicted population projections using these estimates over the planning period relevant to this study.

Table 3.1 Population Predictions for Tweed LGA

Year	Population
2004	80 000
2006	83 400
2026	126 400

3.2.2 Boat Registrations

The number of boat registrations in the region was approximately 40 per thousand head of population in 2006. Based on the average growth in registrations since 1998 of approximately 5% this number could increase to 70 per thousand head of population by

2026. This projection is equivalent to proportions currently experienced in the Hunter Region, which includes the large waterways of Lake Macquarie, Hunter River and Port Stephens. Due to the limited waterway available in the Tweed in comparison, it is anticipated that the continued growth in the proportion of boat registration to population may possibly be consequently limited. 60 boat registrations per thousand of population by 2026 has been estimated for the purposes of providing an upper bound to this factor.

3.2.3 Peak Day Usage

A value of 10% was previously adopted (*PBP, 1997*) as the percentage of registered boats that would use the Tweed Estuary on a peak day. Data collected following a survey of usage on what would be considered a representation of a peak day indicated that this percentage was greater than the actually recorded value of approximately 3.5% (*NSW Maritime, 2006*). The disparity between the estimated and recorded value is considered to arise due to the basis on which the estimated value was determined.

The estimated 10% value defined a “potential” peak demand and assumed that the conditions on the Tweed would be improved for boating through the increased navigability of the river entrance and the provision of adequate facilities to release “latent demand” within the boating community. Latent demand is the demand that exists which will only be fully expressed as “observed” demand when there is an excess in the supply of facilities catering for demand. While noting that there had been improvements to navigation of the entrance and some boating facilities by 2004, the provision of boating facilities has not reached the full recommendations made in the 1997 draft Lower Tweed Boating Strategy. Hence the value of 10% of registered boats was not “observed” using the estuary on a peak day in 2004 as the “potential” had not been realised. This is discussed further in **Section 7**.

For the purpose of updating the estimates of projected Peak Daily Demand, a range of percentages of registered boats that would use the Tweed Estuary on a peak day were selected corresponding to different scenarios of additional infrastructure provision within the estuary over the planning period. These scenarios are as follows:

- minimal additional infrastructure provision (*Lower Limit - 3.5%*);
- medium additional infrastructure provision (*Medium - 6.75%*); and
- full additional infrastructure provision (*Upper Limit - 10%*).

However, it is still the last scenario that is considered to define the “full potential” peak daily demand (*i.e. 10% of registered boats using the estuary on one day*).

Data collected (*NSW Maritime, 2006*) has shown that the estimated peak percentage of Queenslanders using the Tweed of 60% (*PBP, 1997*) to be of the correct order. This factor is again used to include the number of Queensland boats using the Tweed on a peak day.

An estimation of additional boat users as a result of an increased population during holiday periods was derived from NSW Tourism visitation data for the Northern Rivers region. The impact of a holiday population on potential peak daily demand was to increase numbers by approximately 13%. This is consistent with the proportion derived previously (*PBP, 1997*).

The resultant potential peak daily demand for each scenario is presented below in **Table 3.2** and graphically represented in **Figure 3.1**.

Table 3.2 Potential Peak Daily Demand

Year	Potential Peak Daily Demand		
	Lower Limit	Medium	Upper Limit (full potential)
2006	327	629	931
2026	749	1446	2142

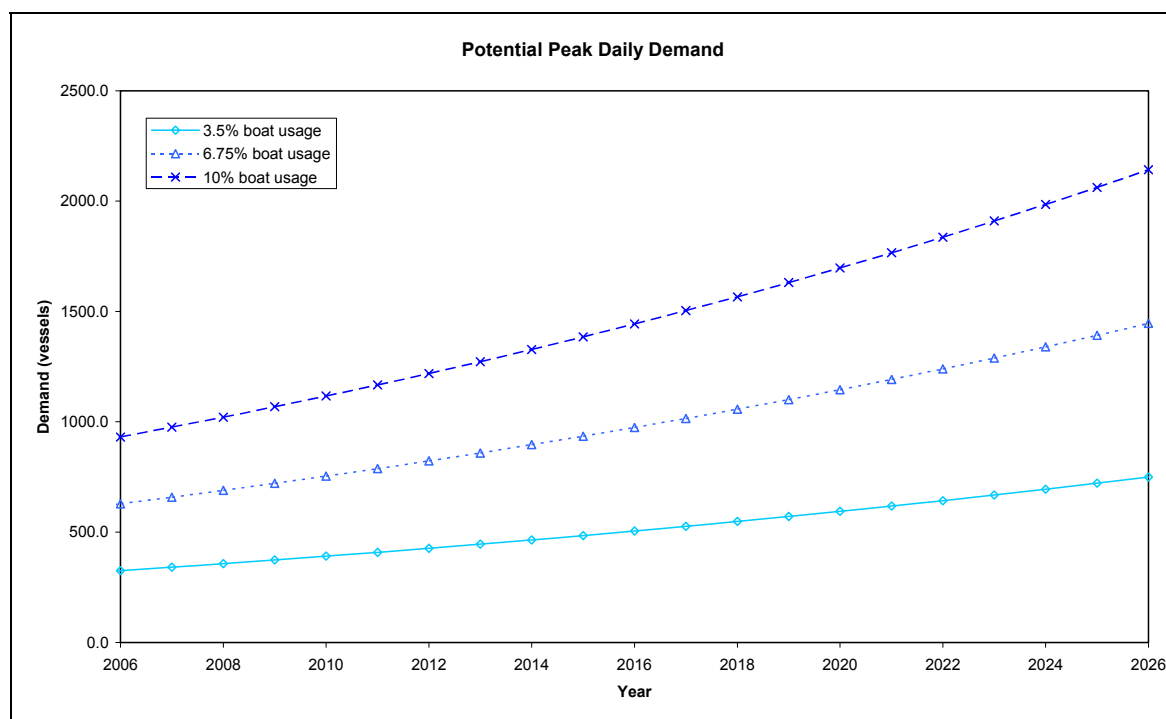


Figure 3.1: Projected Growth in Potential Peak Daily Demand

3.2.4 Current and Latent Demand

The current lack of boating facilities has been shown to limit boating activity on the estuary. NSW Maritime (*NSW Maritime, 2004*) reported that the average peak boating demand in January 2004 fell significantly short of the estimated peak daily demand identified by The Lower Tweed Boating Study (*PBP, 1997*). This statement followed a comprehensive survey of boating activity over the Australia Day long weekend 2004.

The number of boats recorded in the 2004 survey was similar to the number estimated in 1997 as the 1997 peak demand. While noting that there had been improvements to some facilities by 2004, other facilities had been closed entirely. The net result was that boating facilities provided fell short of the recommendations made in the Lower Tweed Boating

Strategy. So in spite of strong growth in boating registrations over the period (1997 - 2004) peak usage of the river remained relatively unchanged.

Given that there has been no significant additional provision of facilities in the Tweed Estuary since the survey was undertaken in 2004 it has been assumed that the current peak demand is approximately equal to that as recorded (*NSW Maritime, 2006*). This value is 280 vessels.

Latent demand represents the additional number of boats that would use the estuary on a peak day given the provision of additional facilities. Adopting the above current peak demand and the potential peak daily demands in **Table 3.2**, the latent peak daily demands for the Tweed Estuary are presented in **Table 3.3**. Current demand values for 2026 have been estimated assuming that facilities have been implemented such that the potential demand in 2006 has been realised.

Table 3.3 Potential Peak Demands

Peak Demand	2006			2026		
	Lower Limit	Medium	Upper Limit	Lower Limit	Medium	Upper Limit
Potential	327	629	931	749	1446	2142
Current	280	280	280	327	629	931
Latent	47	349	651	422	817	1211

3.3 TYPES OF ESTUARY WATERWAY USAGE

The Tweed River Boating Plan (*NSW Maritime, 2006*) divided the estuary into specific management sections and presents data for these sections indicating the amount and type of boating usage currently being undertaken. This data was collected during a survey to measure the level of boating usage during a period of peak demand in 2004.

This data has been used in this study as an indication of the proportioning of boating usage types and volumes spatially along the river. These proportions (*and the site specific demands for particular boating types*) are considered to remain constant over time with overall growth in boating. The presentation of this data in the visionMAKER™ environment has been used to assist in appraisal of existing infrastructure (**Section 4**) and the siting of new facilities (**Section 5**), as well as in the determination of an environmental carrying capacity for the river (**Section 6**).

4 EXISTING INFRASTRUCTURE AND APPRAISAL

A full and detailed inventory of existing facilities for the Tweed Estuary is presented in the visionMAKER™ environment accessed through vM2.0 and sub branches. In overview, the existing facilities are summarised in Table 4.1 below:

Table 4.1 Existing Facilities Overview

Boat Ramps (# lanes)	Wharves/Jetties	Mooring Areas (# of moorings)	Marinas (# berths)	Maintenance Areas
Sthn Boatharbour (informal)	Jack Evans Boatharbour Public Jetty	Tick gates multi hulls (10)	Commercial Operators Marina ^{3,5} (22)	Sthn Boatharbour Slipway
Sthn Boatharbour* (1)	Tweed Heads Finger Wharf ⁵	Tick gates single hulls (25)	Ivory Hotel Marina (29 to be built)	
Kennedy Drive ⁵ (1)	Sthn Boatharbour Finger Jetties ^{1,5}	Sthn Boatharbour (1)		
Blue Water Crescent x 2 (informal)	Keith Curren Park Jetty	The Anchorage* (10)		
Dry Dock ⁵ (1)	Tick Gates Public Wharf ^{3,5}	Temporary Mooring Area adjacent Golf Club (as required)		
Phillip Parade (1)	Ray Pascoe Park Jetty			
Lakes Drive (1)	Crystal Waters Jetty			
Fingal Boatharbour ⁵ (2)	Dry Dock Road Jetty (east)			
Old Fingal Boatharbour (0)	Dry Dock Road Jetty (west)			
Banora Point Caravan Park x 2* ⁵ (1)	Terranora Public Jetty			
Chinderah Bay Drive ⁵ (1)	Pioneer Park Jetty			
Oxley Cove x 2 (informal)	Seagulls RLC Jetty			
Chinderah Road (informal)	Fingal Boatharbour Jetty			
McAuleys Road (informal)	Fingal Commercial Jetty* ^{2,5}			
Bluey Hill Park Old ferry Ramp (1)	Old Barney's Point Bridge			
Tumbulgum (1)	Tumbulgum Boat Ramp Jetty			
Condong North (1)	Tumbulgum Pontoon			
Condong South (1)	Skinner Lowes Wharf			
Tweed River Water Ski Club* (1)	Rudd Park Pontoon			
Commercial Road (1)	Commercial Road Boat Ramp			
	Condong North Pontoon			

Service Provision notes:

¹ - fuel (diesel), ² - fuel (unleaded), ³ - sewage pumpout, ⁴ - bilge pumpout, ⁵ - water
*- private facility

4.1 EXISTING INFRASTRUCTURE APPRAISAL

This section evaluates the current boating infrastructure within the project study area and describes the methodologies used in evaluation. In addition to spatial based data observations, as described in the following sections, consideration of information collated during field work (**vM2.0 and sub branches**); targeted consultation with community, industry and government agency representatives during this study; and community consultation and survey information presented in previous studies, has augmented the appraisal process.

The key recurrent issues raised in the consultation process in relation to the appraisal of boat infrastructure requirements were:

- improved entrance navigability, estuary dredging still needed;
- need for substantial marina complex;
- boating industry area (*marine precinct*) required in Lower Estuary (*boat building, maintenance, slipway, hardstand area*);
- current slipway is already at capacity (*even considering upgrade*);
- no facilities for yachts (*no yacht club, Barney's Point Bridge excludes yachts from marina proposals upstream, no facilities for visitors*);
- Jack Evans Boatharbour (*conflicting opinions on the suitability of current planning objectives*);
- overcrowding issues at Tumbulgum (*ski/wakeboard boats*) - need incentive to distribute more evenly (*sandy beaches*);
- no service provision in upper estuary (*fuel or sewage pumpout*);
- general fuel service limitations on estuary;
- parking limitations at most boat ramps (*excluding Fingal*);
- conflicts at Kennedy Drive due to offshore charter boats using jetty for loading/unloading; and
- current ecological reserves need to be protected.

This information focused the critique of facilities through highlighting specific issues.

4.1.1 Boat Ramps

The appraisal incorporated an assessment of the suitability of the current boat ramp facilities to meet current and future boating needs. **vM2.1.1** provides an assessment of existing facilities in terms of structural condition. Each ramp has been rated based on visual inspection undertaken during the field study. A significant part of the assessment of boat ramp facilities is to quantify the difference between the boat ramp capacity (*supply*) and the current and projected boat ramp requirements (*demand*). This numerical assessment indicates, on a spatial basis, regions where deficits between supply and demand exist, providing information which can be useful when considering future boat ramp works.

The following assumptions were adopted for calculations of the supply and demand of boat ramp facilities;

- 1) Given appropriate infrastructure facilities, boat users will launch vessels within 5 km of their intended destinations;
- 2) Each lane of a boat ramp has a 'launch' capacity of 30 boats per day;

- 3) The projected boat ramp and mooring demand is based on the estimated environmental carrying capacity of the Tweed River. Refer to **Section 6** for details on environmental carrying capacity. For the existing demand scenario the observed vessel usage published in Table 7 of the *Tweed Estuary Boating Plan, 2006 – 2010* is used; and
- 4) For each vessel type a boat ramp launch to mooring ratio was adopted in order to estimate the total boat ramp and mooring demand. These ratios are presented in **Table 4.2** below.

It should be noted that in some regions of the river estuary (*particularly upper reaches*) the environmental carrying capacity, as estimated using the above methodology, is already potentially being exceeded locally during peak demand periods. This is illustrated by **vM3.2.6**. This is primarily the result of the concentration of high demand activities around a particular boating facility in a region favoured for this type of high demand use, despite the degradation of amenity, safety and environmental values from overuse. The provision of facilities to encourage a more even spatial distribution of these high demand users is necessary to maintain demand below the estimated environmental carrying capacity threshold.

This leads to the apparent inconsistency that in some local regions the current demand is greater than the expected future demand. However, the estimation of future demand is based on the assumption that demand will be evenly distributed along river reaches.

Table 4.2 Assumed Boat Ramp Launch to Mooring Ratio for a Range of Vessels

Vessel Type	Percentage of vessels using boat ramps (%)	Percentage of vessels which are moored (%)
Cruising	50	50
Fishing	90	10
Moored	0	100
Sailing	0	100
Skiing	100	0
Wakeboarding	100	0
PWC	100	0

Deficiencies in formal parking at the majority of the boat ramp facilities has been identified as the major constraint to boat ramp availability. Refer to **vM2.1** in the visionMAKERTM environment for existing parking details at each boat ramp. The following vM screens display supply/demand deficits on a spatial basis for the following scenarios:

- **vM4.1.1** – Existing demand & existing boat ramp facilities;
- **vM4.1.2** – Projected demand & existing boat ramp facilities; and
- **vM4.1.3** – Project demand & proposed upgraded facilities.

The same thematic scale has been used for ease of comparison between each of the above mentioned screens in visionMAKERTM.

The supply/demand analysis indicates there is currently a formal parking deficit in the Upper Tweed Estuary as indicated by **vM4.1.1**.

vM4.1.2 indicates that projected growth in boat ramp demand would exacerbate the parking deficit, which would spread to the entire estuary if no upgrades are implemented. **vM4.1.3** estimates the influence of the proposed boat ramp upgrades (*refer to report Section 7 and 8 for proposed boat ramp upgrades*) on meeting the projected demand. It is evident that the recommended upgrades are likely to provide adequate facilities to meet the future boating demand. **Section 6** discusses how the provision of facilities manages the realisation of demand to ensure environmental objectives of the estuary are not compromised.

The supply/demand analysis indicates that boat ramp infrastructure facilities would need significant upgrading in the medium to long term. As the numeric methodologies used to estimate the supply and demand account for spatial variations it is possible to apply infrastructure upgrades at ideal densities (*i.e. sufficiently spaced apart so that they do not service the same region of the river*).

It is noted that the supply/demand analysis does not take informal or illegal parking into account. Currently, informal and illegal parking accounts for the deficit in formal parking. However, as demand continues to grow it is likely that informal and illegal parking will become increasingly problematic.

4.1.2 Marinas and Swing Mooring Areas

The appraisal of wet berthing arrangements in the Tweed Estuary was based on the findings of the Market Demand Assessment (*summarised in Section 3.1*) and the minimal provision of modern marina style floating berth arrangements in the Tweed Estuary. Marina style floating berth arrangements have been identified as the best strategic approach to wet storage in preference to swing moorings, as they provide a much greater efficiency in providing berths per available waterway area. Given the Tweed Estuary provides limited sheltered water areas for mooring arrangements, floating marina style berths are preferred.

Barney's Point Bridge is a constraint to the passage of yachts and this has been raised as a concern with the yachting and boat building fraternity in relation to the provision of future marina facilities. Although not currently constructed, the approved marina proposal at Chinderah (*upstream of the bridge*) would present a facility that possibly excludes these groups within the boating community. That is, unless a similar alternative facility is provided downstream of the bridge to cater for the need of these specific groups.

The demand study identifies an obvious need for marina berthing greater than that proposed to be provided at the Chinderah site and the possibility of siting an alternative marina downstream of the bridge, as described above, would be feasible in terms of meeting demand.

4.1.3 Wharves and Jetties

Information collected through the field study has been assessed for each structure (*vM2.2*) such as:

- on site and photographic evidence of condition;
- mooring depths;
- structural dimensions; and
- auxiliary facilities.

Within the visionMAKER™ environment the spatial distributions of general boat use of the estuary and the provision of wharves and jetties have been compared (*vM4.3*). Additional spatial datasets, such as estuary bathymetry, have been used in the assessment of these facilities.

Generally the provision of jetty structures as auxiliary structures to boat ramp facilities is sufficient. These structures are also generally in fair to good structural condition with some minor concerns (*vM2.2.1*). The main source of concern for these structures is the state of the low level landings and the safety and efficiency of the design of older structures (*fixed low level landing structure*) for boating needs. Structures provided more recently have been designed using best management practice of using a floating pontoon as the low level landing and are considered superior in terms of boating useability, safety and efficiency. Upgrading of fixed low level landings to best management practice will alleviate most concerns.

The spatial distribution of public wharves and jetties is concentrated in the lower estuary, thinning out rapidly to provide minimal facilities in the middle portion, until Murwillumbah in the upper portion, where a handful of facilities exist. This presents problems in the middle portion of the estuary where water skiing/wakeboarding activity is high. The provision of only one location with public wharves/jetties in this section of the estuary, at Tumbulgum, exacerbates the problems surrounding the high concentration of boats and foreshore pressures in this area. Users gravitate to the areas where the wharves/jetties exist because of the nature of the water skiing / wakeboarding which require a high level of regular foreshore access. The provision of shore access facilities suitable for water skiing and wakeboarding needs to be increased and distributed evenly along this middle portion of the estuary.

Fixed berths within the Southern Boatharbour area remains congested despite the recent provision of the commercial operator's marina. The use of wharf structures for mooring is considered a highly inefficient use of the space within this highly constrained environment. The consolidation and reconfiguring of these moorings to the provision of marina style floating berths would provide an opportunity to maximise usage and efficiency of this area.

The lack of a public wharf facility in close proximity to the entrance of the estuary is considered inappropriate for the encouragement of offshore tourism based operations and a limitation to the growth in this high demand industry sector. The current use of upstream facilities by offshore operators to attempt to cater for these demands is highly inefficient and creates conflicts and pressurised environments at non purpose built structures.

4.1.4 Services

Information gathered during the field inspection of existing boating facilities and accessed through vM2.0 sub screens by clicking on the symbols and inspecting the “record” data shows that auxiliary services, such as;

- basic water (*wash down*);
- fish cleaning facilities;
- rubbish receptacles;
- parkland;
- tables and seating; and
- public amenities.

are generally adequately provided on site or in adjacent reserves throughout the estuary. This has been a result of Councils continued upgrading of existing sites. Some recommendations for further works needed at specific locations have been suggested in **Section 8**.

However, concerns have been raised in relation to the inadequate provision of sites within the estuary dedicated to the more major servicing needs of the boating community. These major servicing needs include:

- fuel outlets (*diesel and unleaded*);
- sewage and bilge pumpout;
- slipway availability; and
- boat maintenance areas.

Within the visionMAKER™ environment the spatial distributions of general boat use of the estuary and the provision of major servicing facilities have been compared (**vM4.4.1**). Through this comparison it is obvious that there is a lack of current service provision in the Tweed Estuary with service provision being non existent in the upper reaches.

High current usage and forecast increased usage necessitates the improvement of services throughout the estuary. Without the dedication of controlled facilities to provide services (*especially fuel and sewage and bilge pumpout*), the environmental impacts of people resorting to illegal ad hoc methods of servicing their vessels because of the lack of an alternative, could become significant.

Despite the current upgrade to the slipway facility within the Southern Boatharbour, this facility cannot presently cater for the demand for its services. With increases in boating patronage forecast for the estuary, the lack of an additional similar facility is considered a major shortcoming in strategic planning. Predicted increases in boating industry demands, in general, provide support to the idea of the combination of a slipway (*or shiplift facility*), hardstand area, maintenance and boat building area, industry suppliers, retailers and workshops in a dedicated marine precinct area. Such a facility does not current exist to service the Tweed Estuary.

5 POTENTIAL DEVELOPMENTS AND APPRAISAL

Generally, the demand analysis (*Section 3*) indicated that boating activities are concentrated in the Lower Tweed Estuary. Consequently, the demand for infrastructure and services will similarly be highest in this lower portion of the estuary. The exception to this observation is the concentration of demand from power boat towing activities for the stretch of river in the vicinity of the upper estuary townships of Tumbulgum and Condong during peak demand periods.

Stakeholder consultation, a field study and desktop research indicated that the lower estuary is highly constrained with regard to the provision of new boating facilities. Some of these constraints include:

- limited waterway availability;
- limited foreshore space availability;
- overriding town planning objectives;
- overriding environmental/habitat conservation objectives; and
- dedicated habitat conservation areas.

This early identification of a highly constrained environment lead to the development of a strategy for the provision of new boating infrastructure facilities that revolves around the centralisation of these facilities into multi purpose marine precincts or areas. These areas would aim to provide a range of facilities and services in one location to achieve the objective of providing for the estuary wide demand for such infrastructure. Such centralisation of industry specific facilities is good planning practice in a potentially highly urbanised environment. This practice can lead to efficiencies in operations and minimises pressures on other urban infrastructure and the environment.

5.1 POTENTIAL SITES

Potential green field development sites within the Lower Estuary portion of the study area were identified through the consultation process, site investigations and desktop research. All sites identified were visually assessed by the study team during the fieldwork exercise. Potential sites for the following type of facilities were considered:

- mooring areas;
- public wharves and jetties;
- boat launching ramps;
- marinas; and
- services (*fuel, sewage pumpout, etc.*).

Given the limited sheltered waterway area of the Lower Tweed Estuary, it is considered that providing permanent berths in a marina style arrangement is more efficient in terms of space than providing additional swing moorings. A previous survey (*PBP, 1997*) clearly indicated that this was the form of mooring arrangement, with associated onshore facilities, that was desired by the general boating community. Targeted stakeholder consultation of relevant government agencies,

industry groups, commercial operators and community groups, undertaken as part of this investigation, reiterated that this desire had not changed in the subsequent years and pressure is increasing for such facilities. The provision of this style of wet storage has been considered a fundamental at all multi-purpose sites considered in the lower estuary.

Twelve sites were identified as possibilities for the development of an area to provide facilities and services to the boating community. The sites were first selected on a “wish list” basis and did not include consideration of any existing constraints. It was decided to use the ensuing assessment process to eliminate, or otherwise, sites in relation to such constraints. This allowed a totally transparent process and allows for further discussion surrounding constraints in cases where a compromised situation is a possibility. The thirteen Lower Estuary sites from the Tweed entrance upstream identified were:

- Jack Evans Boatharbour;
- Kerosene Inlet;
- Boyds Bay Tick Gates;
- Southern Boatharbour;
- Letitia Spit;
- Ukebah Nature Reserve;
- Tweeds Heads Golf Course;
- Shallow Bay;
- Fingal;
- Banora Caravan Park;
- Chinderah Bay;
- Chinderah Caravan Parks; and
- Action Sands site at Chinderah.

These locations are illustrated in **vM5.0**.

The township of Condong was identified by the Upper Tweed Estuary Management Plan (*PBP, 1996*) as a potential location for a new boat ramp facility. This location is still considered the ideal choice for such a facility as it is one of the few riverside locations in the upper estuary which provides adequate space. This site was not included in the assessment with the 12 sites listed above, as it was considered to not be in the same urbanised marine precinct/area category. This more rural upstream location, or alternatives, are discussed further in **Section 7.1.2.1**.

5.2 DECISION MATRIX

The twelve potential sites listed in **Section 5.1** were assessed using the following general considerations:

- navigational and operational suitability;
- onshore services capability;
- capacity to meet future boating demands;
- planning considerations; and
- environmental considerations.

To summarise the suitability of all assessed sites for redevelopment or green field development works an array of assessment criteria based on considerations as listed above was developed.

A consistent, relative scoring system was specified for the criterion (*this included an “unacceptable” score which will immediately disqualify an option from further consideration unless compromise is possible*). A decision matrix of the criteria presents the relative scoring system and the ranking of each option for suitability for redevelopment/development in **Table 5.1** on the following page. **vM5.1** and sub branches provide access to some of the information data sets used in determining scores.

The ranking of sites in this way adds a powerful tool to demand analysis work in building the framework for the development of strategic options for the study area.

Preliminary concept proposals for the potential sites considered appropriate to be included in the boating strategy were developed and are discussed further in **Section 8**. The top five ranked sites were included in this category and comprise:

- Jack Evans Boatharbour* ;
- Southern Boatharbour;
- Boyd’s Bay Tick Gates site†;
- Banora Caravan Park site; and
- Action Sands site at Chinderah.

The next two ranked following these five were shown to be of marginal inferiority according to the ranking system. These sites are:

- Tweed Heads Golf Course site; and
- The Chinderah Caravan Parks site.

These were initially considered possibilities to be included in the development of boating strategies. However, the appropriate and high value existing land use of these sites was considered to provide a greater challenge in developing the site for the provision of boating facilities than the five sites chosen. Further consideration of these two sites in future may be necessary if the five sites chosen prove to be unworkable for any reason.

* This site was labelled as “unacceptable” by the decision matrix scoring system despite being the top scoring site. Council and LANDS have advised that the consideration of this site for a predominantly marina precinct is not a possibility as this area has been earmarked for alternative purposes. However, it is considered that there may be room for a compromised arrangement that will allow the coexisting of some form of boating facilities and the existing planning constraints responsible for the “unacceptable” label.

† This site originally ranked equivalent to The Tweed Heads Golf Course site by the decision matrix scoring system. However, subsequent discussions with LANDS have revealed a willingness to consider constructing a suspended deck structure to provide land base that is currently a major deficiency at the site. The provision of such a land base would elevate this site among the top ranking sites.

Table 5.1 Potential Development Sites Decision Matrix

	Jack Evans Boatharbour	Southern Kerescene Inlet Boatharbour	Boyd's Bay Tick Gates ¹	Ukebah Nature Reserve Letetia Spit	Banora Point Caravan Park	Chinderah Chinderah Bay Caravan Parks	Chinderah Action Sands
1 proximity to river entrance	5	5	4	4	4	2	2
2 deep water access	5	1	5	5	5	1	5
3 large vessel mooring capability	3	1	2	4	5	2	5
4 water area available	5	5	3	4	3	5	5
5 adjacent land area available [†]	3	5	3	5	1	5	5
6 safety & security	4	1	5	5	3	4	3
7 proximity to commercial district	5	1	5	2	5	2	2
8 current planning/zoning	0	0	3	3	0	5	5
9 neighbouring land use	5	3	4	1	3	1	4
10 bank condition	5	5	5	5	3	5	3
11 onshore facility potential	4	5	2	2	2	5	5
12 services/infrastructure	5	1	5	4	5	2	5
13 SMS	2	0	4	4	3	5	3
14 dredging requirements	3	1	4	4	1	3	3
15 PASS	3	2	5	5	2	2	5
16 habitat	5	1	5	5	1	5	5
17 threatened species	5	5	5	5	0	5	5
18 navigational issues	3	5	3	4	5	2	2
19 visual amenity	4	2	4	3	3	4	5
20 floodway	5	5	3	2	5	3	5
SCORE	79	54	79	75	61	59	75
RANK	1	13	1	6	9	11	8
ZERO FACTOR	unacceptable	unacceptable	acceptable	acceptable	unacceptable	unacceptable	acceptable

Scoring Notes:

- 5 = <2km, 4 = 2 - 5 km, 3 = 5km - Barney's Point Bridge 2 = upstream of bridge < 10km 1 = >10km
- 5 = immediate, 4 = minor downstream issues, 3 = initial dredged entrance to deep water required, 2 = major downstream issue 1 = natural shoal
- 5 = minimal restriction, 4 = possible restrictions, 3 = moderate restrictions, 2 = major restrictions 1 = no chance
- 5 = large, 4 = adequate, 3 = limited, 2 = minimal, 1 = none
- 5 = large, 4 = adequate, 3 = limited, 2 = minimal, 1 = already developed
- 5 = total built environment, 4 = fringe of totally built environment, 3 = minor built environment, 2 = fringe of minor built area, 1 = isolated area
- 5 = <2km, 4 = 2 - 4km 3 = 4 - 6km, 2 = 6 - 8km, 1 = >8km
- 5 = no change needed/no conflict, 4 = possible changes without issues/no major conflict, 3 = change with issues/conflict, 2 = difficult change/conflict, 1 = no change possible/major conflict, 0 = environmental protection, or, not in line with Tweed Town Centre MP
- 5 = totally incompatible, 4 = some incompatibilities, 3 = major incompatibility, 2 = incompatible or nearby SEPP14 wetland or similar sensitive area, 1 = immediately adjacent to SEPP14 wetland or similar sensitive area
- 5 = engineered protection works, 4 = ..., 3 = currently stable, 2 = ..., 1 = unprotected/eroding
- 5 = large, 4 = adequate, 3 = limited, 2 = minimal, 1 = no potential land area
- 5 = minimal additional requirements, 4 = on site upgrading req., 3 = no services on site/surrounding built environment (no req.), 2 = no services on site/upgrades req. in surrounding area, 1 = no services/isolated area
- 5 = no SMS, 4 = minimal SMS, 3 = moderate SMS (multiple species), 2 = prolific on site, 1 = prolific on site and surrounds, 0 = site within SEPP14 wetland
- 5 = none req., 4 = min. area &/or depth req., 3 = moderate area &/or depth req., 2 = large area &/or depth req., 1 = dry site (all dedged)
- 5 = min. potential, 4 = low potential, 3 = moderate potential, 2 = high potential, 1 = extreme potential
- 5 = totally built environment, 4 = built environment with min. natural enviro., 3 = landscaped enviro. or open space parkland, 2 = possible wildlife corridor/large % of natural enviro., 1 = designated habitat area, 0 = national Park/Nature reserve
- 5 = no threatened species, 0 = threatened species
- 5 = no issues, 4 = minor issues, 3 = major issues, 2 = limits a major portion of boating, 1 = limits all boating
- 5 = enhancement, 4 = no change or similar outcome/level of development, 3 = change keeping within character of surrounding area, 2 = change leading to visual degradation (not keeping within character of surrounding area), 1 = major visual degradation
- 5 = built offshore, 4 = natural offshore environment, 3 = backwater, 2 = within minor tributary, 1 = within main floodway

[†] This site originally ranked equivalent to The Tweed Heads Golf Course site, as shown above. However, subsequent discussions with LANDS have revealed a willingness to consider constructing a suspended deck structure to provide land base that is currently a major deficiency at the site. The provision of such a land base would elevate this site among the top ranking sites with an adjusted score of 78 or 79 (depending on the amount of land base able to be provided).

6 ENVIRONMENTAL CARRYING CAPACITY

The demand study (*Section 3*) indicates that the demand for recreational boating on the Tweed Estuary is likely to increase significantly in the future, and discusses the factors contributing to this in further detail. Provision of additional facilities to cater for future boating demand is likely to contribute to this increase through the release of what is termed “latent demand”. The demand study provides comparison of the Tweed Region’s boating situation to other coastal regions such as the Hunter Region and the Gold Coast, providing analysis of historic boating usage trends in response to the implementation of improved facilities over of the past 15 years. In summary, the case study of the Hunter Region shows that with the increased provision of boating facilities, latent demand is released and there is an equivalent increase in the “observed” demand creating a situation which encourages the implementation of further facilities.

Even without knowing the exact numbers of boats involved, or the timing of the occurrence, it is reasonable to conclude that with the ongoing provision of facilities on the Tweed Estuary the corresponding increase in boat usage on the river will put pressure on the environmental values of the estuary. A level of boat usage of the estuary could potentially reach a point that exceeds the environmental objectives of the region.

The Lower Tweed Boating Study (*PBP, 1997*) discusses the environmental considerations that are coupled with increased boating on the Lower Tweed, which are also applicable to the entire estuary. These included potential impacts on:

- water quality;
- flora;
- fauna;
- bank stability;
- fish stocks;
- human comfort/amenity value; and
- personal safety.

The 1997 study also discusses recreational boat carrying capacity and uses industry accepted values for determining the maximum number of boats able to comfortably use the river for recreational purposes at one time. This method is based on applying a waterway area requirement for each vessel using the river. The area requirement of the waterway area depends on the type of vessel (*for example a vessel towing water skier requires more space than a fishing vessel*).

For the purposes of this study, this methodology for calculating recreational boat carrying capacity was developed further to include consideration of potential environmental impacts in the estimation of an environmental boat carrying capacity. Recognised environmentally sensitive areas and buffer zones surrounding these areas were excluded from the area used to calculate boating numbers. The definition of excluded buffer zones was based on judgement giving consideration to:

- the size of the environmentally sensitive area;

- its significance in terms of habitat and sensitivity;
- the type of boating usage in the area; and
- the proximity to potentially congested mooring and marina areas.

Further consideration of environmentally sensitive areas was also implicitly included through reductions in area and exclusion of boating activity types recommended in the *Tweed Estuary Boating Plan 2006 - 2010 (NSW Maritime, 2006)*. These include navigational restrictions enforcing no wash zones (*4 knot speed limits*), no skiing zones and total boating exclusion zones.

The adopted methodology for calculating the environmental carrying capacity is summarised as follows;

- 1) The river was segregated into the management sections adopted in the *Tweed Estuary Boating Plan 2006 – 2010 (NSW Maritime, 2006)*. The carrying capacity of each section was calculated separately;
- 2) For each section the total useable river area was estimated. These estimations included reductions for environmentally sensitive areas, congested marina/mooring areas, and no skiing areas (*as discussed above*);
- 3) The observed vessel activity trends presented in Table 7 of *Tweed Estuary Boating Plan 2006 – 2010 (NSW Maritime, 2006)* were assessed in order to estimate the vessel type ratios in each section;
- 4) The following minimum boating densities, as used in *Lower Tweed Boating Study (PBP, 1997)*, were applied to the environmental carrying capacity calculations;
 - Towing activities 5ha/vessel
 - All other vessels 1.2ha/vessel
- 5) Considering the minimum boating densities and the observed vessel type ratios the total number of allowable vessels in each management section was estimated by satisfying the following equation; *available area ÷ boating densities = environmental carrying capacity* for each section. Detailed calculations and graphical representation are accessed from **vM3.2**.

This methodology adopts the following assumptions;

- 1) Future boating usage vessel type ratios will be consistent with the observed data presented in the *Tweed River Boating Plan 2006 - 2010 (2006)*; and
- 2) Vessels destined for the ocean will go via the shortest route, using the Tweed River waterways for only a short period of time. Therefore the environmental carrying capacity is not significantly influenced by ocean-going vessel activity.

The total environmental carrying capacity for the Tweed River Estuary (*study area*) was estimated as being approximately **650** vessels. **Figure 6.1** illustrates this capacity relative to projected potential peak daily demand scenarios (discussed in **Section 3.2.3**). The environmental carrying capacity considering offshore vessels (discussed in **Section 6.1**) is also included.

It is considered that, as part of the environmental assessment and approvals process, best practise management measures would be identified to minimise the effects of the implemented infrastructure on the environment and the corresponding environmental carrying capacity of the estuary.

It should be noted that in some regions of the river estuary (*particularly upper reaches*) the environmental carrying capacity, as estimated using the above methodology, is already potentially being exceeded locally during peak demand periods. This is illustrated by **vM3.2.6**. This is primarily the result of the concentration of high demand activities around a particular boating facility in a region favoured for this type of high demand use. The provision of facilities to encourage a more even spatial distribution of these high demand users is necessary to maintain demand below the estimated environmental carrying capacity threshold.

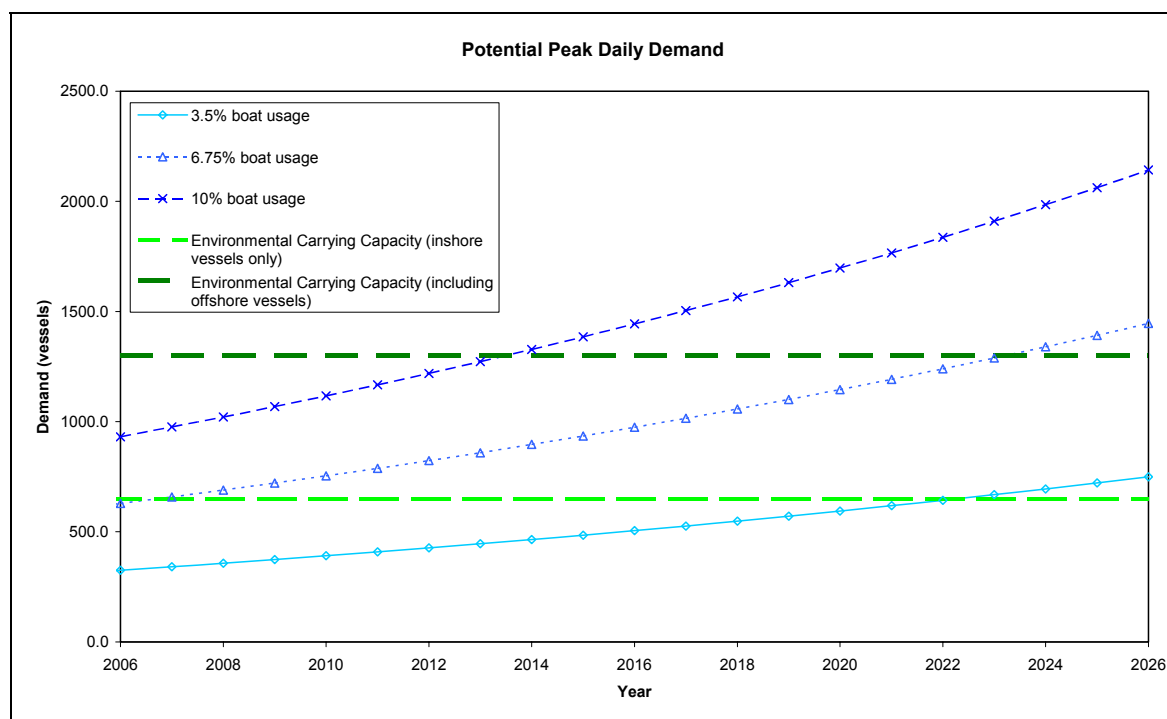


Figure 6.1: Potential Peak Daily Demand Relative to Environmental Carrying Capacity

6.1 OFFSHORE BOATING USE

The environmental carrying capacity estimate of approximately 650 vessels considers only the capacity of the inshore waterway. PBP, 1997, following a survey of boat owners in the region, estimated that at least 50% of boating use involves offshore activities. This proportion of offshore activities is expected to have risen since the navigational improvements to the estuary entrance that now allows consistent safer passage to the open ocean. However, to maintain a conservative indication of the additional environmental carrying capacity (i.e. a lower estimate of the number of vessels) of the Tweed River Estuary including the passage of vessels to offshore destinations, this 50% ratio has been assumed to still be representative of boat usage.

This indicates that general boating peak demand, inshore and offshore, for the use of the Tweed River Estuary could be accommodated up to a total of approximately **1300** vessels. This assumes that facilities will be provided to encourage the optimum distribution of boating activities in the inshore area and that the ratio of high demand activities (*e.g. water skiing and other towing activities*) to low demand activities (*e.g. house boats*) remains consistent with that currently observed.

6.2 FUTURE OBJECTIVES AND MONITORING

The estimation of environmental carrying capacity above is based on generic industry accepted methods for recreational boating capacity. These methods have been combined with an increased high level of interpretation of available data to modify the estimate to be of a site specific nature including consideration of the local environment values.

The estimate is also based on the estuary in its current condition. Future changes in conditions in the catchment or a single event ultimately effecting the estuary such as, increasing catchment urbanisation, an environmental emergency (*acid sulphate leachate*) or climate change impacts (*sea level rise or increased flooding*), may provide a shift in the overall health of the estuary.

The estimate of environmental carrying capacity should be reviewed consistently over the planning period to ensure that environmental objectives of Council and the community continue to be met. These objectives may change in response to changing estuary conditions.

Baseline environmental monitoring of the estuary may provide data that is helpful in assessing the health of the estuary, and any impacts from boating increases. Correlation of this data to the staged provision of increased facilities for boating should provide indication of whether the environmental carrying capacity is being approached due to increased boat usage.

Future revision of strategies to provide boating facilities may be needed to ensure the environmental objectives are not compromised due to either a general reduction in estuary health or boating usage increases, or a combination of the two factors.

7 BOATING INFRASTRUCTURE STRATEGY

The demand study undertaken for this investigation (*Section 3*) has identified strong growth rates in recreational vessel registrations which are amongst the highest on the NSW and Queensland coasts. These rates, along with one of the highest forecast general population growth rates in NSW, demonstrate the very strong demand for boating and associated facilities, existing now and in the future in the region.

Previous studies have attempted to quantify the actual numbers of boats that will make up a “peak demand” for the Tweed Estuary and subsequently match the provision of facilities to this estimated number. There has been some conjecture raised about the accuracy of these numbers due to the confusion surrounding the use of the term demand, the concept of realisation of what is termed “latent” demand and “observed” demand (*or usage*). Latent demand is the demand that exists which will only be fully expressed as “observed” demand when there is an excess in the supply of facilities catering for demand. Estimation of latent demand is inherently difficult in a situation where demand is far greater than the supply of facilities.

The demand study also made reference to recreational boating studies undertaken over time of a comparative regional area on the NSW coast. These studies have been shown that with the increased provision of boating facilities, latent demand is released and there is an equivalent increase in the “observed” demand creating a situation which encourages the implementation of further facilities. With rapidly increasing populations amongst coastal regions and a general increase in affluence amongst the community leading to a greater proportion of the population owning recreational vessels and with the leisure time to use them, it could be considered that the increased provision of facilities will lead to increased observed demand at infinitum. This is commonly known in layman’s terms as the “if you build it, they will come” philosophy.

In the extreme, this phenomenon has shown to be true for recreational facilities in affluent societies in the cases of the development of:

- surf culture surrounding the development of wave pool infrastructure in the mid western states of the USA; and
- snow skiing culture surrounding the development of an indoor ski slope in Dubai.

The strategy developed for the implementation of recreational boating infrastructure on the Tweed Estuary recognises that the converse to this philosophy holds true. That is, the management of the implementation of boating infrastructure can be used to control levels of boating within the estuary to a desired level corresponding with community objectives, including those based on environmental considerations. The development of an estimated environmental carrying capacity for the estuary has been undertaken to define an appropriate upper limit on boating activity as being approximately 650 vessels (approximately 1300 including offshore vessels). This number has been used to guide and limit the suggested implementation program for all boating facilities, whilst recognising that there exists within the community a very strong latent demand for recreational boating activity that would be released if sufficient facilities were provided.

The development of a methodology to correlate future increase in boat usage to monitored environmental indicators that provide an indication of environmental health of the estuary should be undertaken. An extensive database of baseline monitoring of environmental data is currently being compiled by Council. Such a methodology will provide a scientific basis for future decision making in relation to the impact of increased boating facilities (*through increased boat use*) on the estuary and any likely exceedance of the environmental carrying capacity. Strategic management of the provision of facilities can be modified to counter any future identified issues, on a site specific, or estuary wide basis.

The identification of a highly constrained environment providing limited opportunity for provision of facilities within the lower estuary gives rise to a strategy of locating sites that can provide for a range of boating related land and water based activities. The concept of centralised Marine Precinct areas with multipurpose functions and associated services in the one location is good planning practice in an urban environment which is highly constrained for space. Centralisation eliminates access and traffic conflicts associated with the movement of heavy equipment and possibly vessels to and from remote locations. The provision of land based services and accommodation facilities give such a development a wider base from which to derive income and increase its financial feasibility.

The Marine Precinct concept also provides opportunity for more efficient and effective management of mooring arrangements (*contracts and fee collection, temporary berthing booking and rate collection*). This will be controlled by marina management in the case of a privately owned operated facility. In the case of a facility based on public land (*as would be the case within the Southern Boatharbour/Boyds Bay Tick Gates site*) the appointment of an on site management entity by public agencies to control operations and business matters could provide this role. The reinvestment of any profits (*or lease fees*) made as a result of operations from the use of public land could be directed back into improving facilities, maintenance or other navigational or estuary works. Other alternative models of forming public private-partnerships for business operations on public land could be explored in progressing concepts to implementation stages.

The subsequent sections break the overall strategy down into type specific philosophies and general implementation recommendations. An indicative program of works suggested for each site (*existing and proposed*) is outlined further in **Section 8**.

7.1 BOAT RAMPS

Boat ramps and associated facilities are an important component of boating infrastructure on the Tweed River as they allow boat users to conveniently launch trailerable boats. The demand study (**Section 3**) undertaken as part of this investigation reports that boat sizes in the region are predominantly of trailerable size. As discussed above, it also reports that the regions population and the proportion of that population owning boats is increasing at a significant rate and that analysis of a comparative regional area has shown that the supply of boating infrastructure will continue to encourage growth in demand. Given an uninhibited supply of facilities, peak usage of the waterway, in the future, is likely to reach a point which exceeds the expectations of an acceptable level with regard to the community's environmental objectives.

The key aim of the boat ramp strategy is to provide adequate formal boat ramps and parking spaces to facilitate the current and projected demands within the constraints of the environmental objectives of the region.

The provision of formal ramps and associated car parking spaces can be shown to be an effective means of limiting boating activity on the estuary. NSW Maritime (*NSW Maritime, 2004*) reported that the average peak boating demand in January 2004 fell significantly short of the estimated peak daily demand identified by The Lower Tweed Boating Study (*PBP, 1997*). This statement followed a comprehensive survey of boating activity over the Australia Day long weekend 2004.

The number of boats recorded in the 2004 survey was similar to the number estimated in 1997 as the 1997 peak demand. While noting that there had been improvements to some ramp facilities by 2004, other facilities had been closed entirely. The net result was that boating facilities did not fulfil the recommendations made in the Lower Tweed Boating Study. So in spite of strong growth in boating registrations over the period (1997 - 2004) usage of the river remained relatively unchanged.

NSW Maritime (2004) also states that during their survey period the total average number of car and trailers parked was 187 indicating demand only slightly outweighing supply, (*supply was noted as between 150 and 177 with 83 formal and somewhere between 67 and 94 informal spaces*) and that there is little correlation between parking capacity and demand because of the high level of parking outside of dedicated parking areas. However, the opposite in fact is true.

Until there is excess capacity in existence, a measure of the true demand cannot be observed. Historically, trailerable boat owners have used informal boat ramps and informal parking spaces if there are insufficient facilities in the local area. The numbers indicated by the survey are a measure of supply only, which exceeds capacity through the use of informal parking. Realisation of the actual demand is inhibited by the insufficient supply and hence there remains a latent demand which cannot be directly measured. This also translates to the numbers of boats observed using the waterway. Hence the observed average peak boating “demand” in 2004, as observed by NSW Maritime, is significantly less than the projected estimate calculated in the Lower Tweed Boating Study (*PBP, 1997*), which had assumed the provision of adequate facilities to realise demand.

With growth rates in population and boating registrations increasing in the region it is recognized that boating demand may exceed what is considered appropriate by the community in terms of environmental objectives for the estuary. Through recognizing that the provision of adequate facilities is the control for the realization of boating demand it has been considered appropriate to not only focus on the provision of facilities to meet the peak boating demand but also to maintain a level of boating within the upper bound of an estimated environmental carrying capacity calculated for the estuary.

It is envisioned to control boating numbers in the Tweed River through limiting the capacity of boat ramps in any region. Theoretically, this could be an effective means of ensuring the environmental carrying capacity of the river is not exceeded. However, as previously mentioned, historically boat users have used informal or unauthorized boat ramps to launch their vessels in the absence of appropriate infrastructure. In response to this, the boat ramp strategy will recommend the decommissioning (*i.e. block and rehabilitation*) of many of the informal boat ramps along the

river. Fortunately, in most locations, the banks of Tweed River are sufficiently steep to prevent anyone from launching their boat directly over the bank. However, an ongoing low level of policing will be required to prevent any further unauthorized boat ramps from developing in those locations that allow informal access.

The strategy focuses on the continued upgrading of parking facilities at existing sites and the provision of two new regional boat ramp and parking facilities, one in the upper estuary and one in the lower estuary. The control of launching and parking facilities will enable Council to manage the realisation of boating demand within the community's environmental expectations for the estuary over the short and long term.

7.1.1 Short Term (0 - 5 years)

As discussed above, and in previous studies (*PBP, 1997*), the inadequacy of car and trailer parking at boat ramp facilities has been a constraint to boating on the Tweed for a number of years. The supply of trailer parking at ramps is still well below the recommended 30/launching lane (*PWD, 1987*) for the number of boat ramp lanes supplied on the Tweed River. It is recommended in the short term, where possible, the number of trailer parking spaces formalised at a site should be maximised in an attempt to achieve this recommended figure.

Opportunities to formalise and improve efficiency in trailer parking and traffic management possibly exist at the following locations:

- Lakes Drive;
- Dry Dock Road;
- Chinderah;
- Oxley Cove (*also includes formalisation of ramp*);
- Tumbulgum; and
- Commercial Road, Murwillumbah.

Also included in short term actions are some aspects of more substantial works (*long term strategic options discussed in Section 7.1.2*). These aspects include planning, zoning and land negotiations, which it is recommended should commence at the earliest opportunity.

7.1.2 Long Term (0 - 20 years)

Achieving the full 30 trailer parking spaces per launching lane is recognized as impractical at all of the existing boat ramp facilities as many of these facilities are highly constrained with no expansion of the site possible. For this reason it is recommended that the provision of two new regional boat ramp facilities with at least the recommended 30 trailer parking spaces per launching lane be provided; one in the upper estuary to provide capacity which is currently non-existent for the high demand stretch of river between Condong and Tumbulgum, and one in the Lower estuary to cater for predicted increasing demands for offshore and lower estuary activities.

The provision of these regional facilities will provide the capacity that is lacking on the Tweed River to cater for a strong demand for boating (*current and predicted growth*) which is currently unable to be realised. Consideration of environmental carrying capacity

of the river indicates that providing these facilities will allow the number of boats using the estuary during peak demand periods to remain below the estimated carrying threshold.

Planning, zoning and land negotiations for this purpose should be commenced at the earliest opportunity (*i.e. essentially a short term task*) as the sites identified in this study are not without constraints and may take some time to secure. However, the implementation of the completed facilities is recognised as a long term proposition.

7.1.2.1 Upper Estuary Regional Boat Ramp[‡]

Condong was identified by the Upper Tweed Estuary Management Plan (*PBP, 1996*) as a potential location for a new boat ramp facility at the site of the existing northern Condong public boat ramp (*vM2.1*). This location is still considered an ideal choice for such a facility as it is one of the few riverside locations in the upper estuary which provides adequate space. Investigations of river usage have identified the stretch of river between Condong and Tumbulgum as having very high peak usage. This usage consists mainly of towing activities such as water skiing and wake boarding.

Currently the Tumbulgum boat ramp, surrounding foreshore and the town experiences intense pressure during peak usage times. Facilities at Tumbulgum are insufficient to deal with the current pressures and conflicts exist between river users and the local community. There is no further capacity to provide adequate onshore facilities due to space and roadway constraints. Providing a regional boat ramp facility at Condong is a possible solution to relieving the pressure on the Tumbulgum township and foreshore while still allowing the boating fraternity access to a favoured stretch of river.

However, discussions with river user groups have indicated that the attraction to the township of Tumbulgum is not limited to the stretch of river but also includes amenity factors such as the proximity to shops, cafés and hotel along the foreshore. These businesses provide onsite services and supplies to river users that enable minimal preparation and baggage for a day trip to the river. This convenience along with a township “ambience”, are factors that will provide a challenge to the success of a new regional boat ramp at Condong.

For the above reasons, it is suggested that in addition to providing a regional boat ramp facility at Condong, a concept of which was presented in the Upper Tweed Estuary Management Plan (*PBP, 1996*), a “clubhouse” style facility should be incorporated (*vM6.2.1*). This clubhouse facility could provide the convenience and a sense of community amongst the river users that may be a key factor to the success of relocating boat launching focus from Tumbulgum to the new purpose built facility at Condong.

Depending on the appropriate scale of development for the site, the “clubhouse” facility could range in form anywhere from a kiosk style building providing basic services and supplies (*manned only on weekends and public holidays*), to a permanent open clubhouse

[‡] The provision of the upper estuary regional boat ramp and auxiliary facilities are considered a high priority long term strategic option. If the opportunity to expedite the implementation of such an option arises then it should be taken and fast tracked for implementation in the short term. This may take the form of a staged implementation of facilities.

facility to compliment the Northern Rivers architectural style incorporating a wider range of services for the whole community, such as:

- large verandas overlooking the stretch of river;
- food and beverage outlet;
- café style al fresco dining and drinking areas;
- bbq area;
- lounge area and restaurant;
- child minding or play area and
- service shop (*boating supplies, fuel, ice, minor mechanical advice*).

A license to manage the kiosk style facility could be provided to interested community groups on behalf of the Council such as the Tweed River Water Ski Club. If a larger scale development was considered an appropriate and worthwhile proposal, private investment would most likely be necessary. Other development issues such as flooding would need to be taken into consideration. Regardless of the scale of the facility, it is the concept of providing convenience and a sense of community for the river users that would be the common theme required to ensure success of the Condong Regional Boat Ramp facility.

To avoid simply relocating the overcrowding and all the issues that currently exist at Tumbulgum to the new facility at Condong, the creation of landing locations distributed along the stretch of river to compliment the facility is essential. This idea was also conceptualised in the Upper Tweed Estuary Management Plan. A number of sandy beaches along the stretch of river from the Condong to Tumbulgum, and immediately either side of these townships, should be purpose built for ski boats to distribute the crowd evenly along the popular stretch of river away from the main launching area (**vM6.2.1**).

The sandy beach concept may only be appropriate in bank locations that are not of an erosive nature. In bank locations that are potentially erosive, a floating pontoon and jetty arrangement for access and temporary berthing should replace the beach landing area in the concept.

A site to the north of Tumbulgum (**vM5.0**) was suggested as a possible location for the provision of new boat launching facilities. This particular site is highly constrained and at best presents an opportunity to provide remote boat and trailer parking for the existing Tumbulgum boat ramp, and a landing location to augment the Condong Regional Boat Ramp Facility. A simple concept for this area is accessed through **vM6.1.1**. To provide remote parking for a boat ramp is not ideal. However, given the very limited opportunities to provide parking at the Tumbulgum ramp and the opportunity to combine with a landing location, it may provide a workable (*if not ideal*) solution. The concept for this location is indicative of a generic floating pontoon landing area to distribute crowds along the popular stretch of river, as discussed above for locations where a sandy beach is not suitable.

7.1.2.2 Lower Estuary Regional Boat Ramp

Limited opportunities exist in the Lower Tweed to expand existing facilities to provide the required trailer parking capacity despite adequate launching lane provision. It is proposed that a new regional boat ramp facility with, at least, the recommended trailer parking spaces be implemented to release the latent demand that is being constrained by inadequate trailer parking provision at boat ramps.

Due to the limited availability of foreshore sites for development of boating infrastructure in the Lower Tweed, the sites which have been identified for the provision of marina style berthing facilities have been considered as multipurpose locations. These locations should aim to provide as wide a range of boating facilities as possible in marine precincts. The provision of a regional boat ramp facility within such a precinct eliminates the need to identify and procure further sites in a highly constrained environment.

A suitable marine precinct site has been identified at the existing Banora Point Caravan Park site during the assessment the Lower Estuary for the provision of marina style berthing arrangements. Within this marine precinct allowance has been made for a 2 lane boat ramp facility with 60 car and trailer parking spaces. This site is not without a number of its own constraints and should be considered a possibility only. However, it remains the best location, whilst planning constraints remain on the use of Jack Evans Boatharbour for the implementation of a similar marine precinct, incorporating a regional boat ramp facility.

Other identified sites included the future possibility of a marine precinct on the existing Action Sands site at Chinderah, and possible modification to the existing Fingal Boatharbour's (*Old and New*) to expand future capacity.

7.2 WHARVES, JETTIES AND SERVICING

Jetty structures in the Tweed Estuary are primarily provided as auxiliary structures at boat ramp sites. Generally the provision of jetties at existing boat ramp sites is adequate. Upgrading of these jetties to provide increased functionality with improved low level landings (*preferably in the form of a floating pontoon*) should continue (*vM6.1.2*).

The implementation and operation of the new commercial operators marina, providing approximately 20 modern floating berths within the Southern Boatharbour, has provided some relief to a highly congested area. However, this area is still considered to be an inefficient use of valuable "off stream" waterway area. Further consolidation of berthing arrangements is recommended to improve the use of the limited waterway area. This site has been considered as a possible location for the provision of modern marina style floating berths in an attempt to fully utilise the site (*Section 5.1*).

The new commercial operators' berths in the Southern Boatharbour are mainly occupied by commercial operators servicing the inshore, estuary, area and there remains a lack of a dedicated facility in the Tweed estuary servicing offshore commercial ventures. The draft Tweed Heads Town Centre Masterplan presents a concept of Jack Evans Boatharbour which includes the provision of a small outer harbour. Within this harbour exists the opportunity to provide a fully

serviced public wharf in close proximity to the River Entrance that would facilitate the loading/unloading of offshore vessels. Adequate wharfage could be provided to also provide temporary berthing for visiting cruise vessels. The development of a boat mooring area for tourism based operations would compliment the adjacent cultural centre proposed in the Masterplan.

In addition to this wharfage, a concept of the Jack Evans outer boatharbour has been presented with the provision of a floating marina mooring arrangement. This marina could in future provide mooring of vessels (*possibly up to 25 berths*) involved in offshore tourist based operations in a similar fashion to the mooring of estuarine commercial vessels at the Southern Boatharbour.

All the new major boating facilities proposed should include the provision of either pontoon style low level landing at regional boat ramp facilities, or floating berths at marinas. Both these styles provide modern functional access points for passenger pickup or set down. It is also considered that the major facilities proposed should include (*amongst others*) the provision of the following services:

- water;
- fuel (*diesel and unleaded*); and
- sewage and bilge pumpout.

These services, along with others such as water, power and telecommunications, would be expected to be included with the development of larger style marina developments such as the conceptual plans presented for the following sites in the Lower estuary:

- Banora Marine Precinct;
- Action Sands site Marine Precinct;
- Southern Boatharbour Marina;
- Boyds Bay Tick Gates Marina; and
- The approved marina development at Chinderah.

However, a purpose built jetty/wharf with floating pontoon arrangement such as the existing facility at the Boyd's Bay Tick gates should be considered to provide the basic services (*fuel and sewage/bilge pumpout*) in the upper reaches of the estuary. This facility would be most appropriately incorporated in the suggested Condong Regional Boat Ramp concept (**vM6.1.4**). This facility would then provide a multipurpose facility to be used as an access location for ski boats in the highly utilized section of the river, and a servicing location for the ski boats and the increasing number of house boats and cruising vessels in the upper estuary. The lack of such a facility in the upper estuary was raised as a major infrastructure inadequacy in discussions held with boating industry representatives.

7.2.1 Short Term (0 - 5 years)

Short term recommendations for wharves and jetties are accessed through **vM6.1.2** and servicing through **vM6.1.4** and include:

1. Upgrading of existing boat ramp auxiliary facilities to best management practice with floating pontoon arrangements to be continued. Opportunities exist at the following locations:
 - Dry Dock Road;
 - Tumbulgum; and
 - Commercial Road, Murwillumbah
2. Requirement for all new major facilities (*jetties and marinas*) that basic services be included (*water, fuel, sewage and bilge pumpout*).
3. Planning, zoning and land negotiations for more substantial works discussed below as long term strategic options should commence at the earliest opportunity as a short term task.
4. First stage of Southern Boatharbour consolidation to be commenced in line with concept presented for mooring rearrangement to marina style floating berths.

7.2.2 Long Term (0 - 20 years)

Long term recommendations for wharves and jetties are accessed through **vM6.2.2** and servicing through **vM6.2.4** and include:

1. Upstream servicing jetty (*Condong Regional Boat Ramp facility location*).[§]
2. Provision of fully serviced wharf within Jack Evans outer harbour (**vM6.2.2**) for offshore charter operations and visiting vessels (*possibly including floating marina style berths for offshore charter operators and visiting vessels*).
3. Expansion of Southern Boatharbour consolidation concept to full capacity (**vM6.2.2**) staged in response to demand.

7.3 MOORINGS AND MARINAS

The demand for the provision of mooring facilities is concentrated in the lower region of the Tweed Estuary. Given the limited sheltered waterway area of the Lower Tweed Estuary, it is considered that providing permanent berths in a marina style arrangement is more efficient in terms of space than providing additional swing moorings. A previous survey (*PBP, 1997*) clearly indicated that this was the form of mooring arrangement, with associated onshore facilities, that was desired by the general boating community. Targeted stakeholder consultation of relevant government agencies, industry groups, commercial operators and community groups, undertaken as part of this investigation, reiterated that this desire had not changed in the subsequent years and pressure is increasing for such a facility.

[§] The provision of the upper estuary regional boat ramp and auxiliary facilities are considered a high priority long term strategic option. If the opportunity to expedite the implementation of such an option arises then it should be taken and fast tracked for implementation in the short term. This may take the form of a staged implementation of facilities.

The immediate initiation of implementation programs to provide a minimum of 200 modern marina style berths is recommended for the Tweed Estuary in line with the conservative estimate indicated by the demand study (*AMM, 2006*) undertaken as part of this investigation. This number is consistent with predictions for demand in 2006 by previous studies (*PBP, 1997*).

The number of suitable sites for a single large marina development is limited to the lower estuary, where various constraints further limit available locations. To provide the available berths it is suggested that a number of moderately sized marinas be developed to make up the wet berthing capacity. These moderately sized marinas may be designed to cater for specific user vessel types and provide onshore services to suit.

It is considered that provision for 200 modern marina style berths in the Tweed Estuary is a conservative estimate of demand for this style of mooring in the future. The provision of modern facilities and associated services will possibly release a latent demand in the region for larger boats and associated mooring arrangements driving the projected demand figure well over 200 berths. To plan for this eventuality, and considering the shortage of suitable sites, the marina complexes should have the flexibility to be built in stages and expand in response to future demand driven influences. Also, a site for a large marina facility is suggested for further investigation.

The current swing mooring arrangement adjacent to the Tick Gates at Boyds Bay should be retained in a reduced format to provide lower cost moorings and maintain socially equitable boating opportunities. Formalised dinghy storage is required at this site to improve amenity of the facility. Use of the existing multi hulled mooring area for all vessel types could perform this function if the proposed Boyds Bay Tick Gates Marine Precinct is to be implemented in the long term. The provision of swing moorings offshore to the southeast of the proposed marina concept could be integrated into the marine precinct.

Due to the limited availability of foreshore sites for development for boating infrastructure, the sites identified for the provision of marina style berthing facilities have been considered as multipurpose locations. These locations should aim to provide as wide a range of boating facilities as possible in marine precincts. Facilities include the following:

- refuelling;
- vessel sewage pumpout and solid waste reception;
- marine service centres and chandleries;
- shiplift and hardstand areas for maintenance; and
- accommodation areas.

The centralisation of the provision of moorings and associated services is good planning practice in an urban environment which is highly constrained for space. Centralisation eliminates access and traffic conflicts associated with the movement of heavy equipment and possibly vessels to and from remote locations. The provision of land based services and accommodation facilities give such a development a wider base from which to derive income and increase its financial feasibility. This may be essential for the Tweed Estuary if a number of smaller marina berthing arrangements are necessary to meet berthing demands rather than one large complex.

The provision of short stay accommodation at marina sites recognizes the potential to attract tourist visitors to the Tweed from regional areas, in particular, an immediate demand from the recreational boating stronghold of South East Queensland.

Potential marina developments to the south at Ballina and an expansion at Yamba further south, identified in the demand study undertaken, are typical of many proposed developments at coastal towns in regional NSW. It is evident that the creation of future cruising yachts/power boats linkages along the eastern seaboard of South East Australia is a reality. With the provision of quality boating services and associated accommodation facilities the Tweed Region will be prepared to provide services for, and to benefit from, this potential tourist industry.

7.3.1 Short Term Strategy (0 - 5 years)

Provision of commercial moorings and marinas are not the responsibility of Council. The following short term recommendations that need to be considered when Development Applications for moorings and marinas are being considered by Council are accessed through **vM6.1.3** and include:

1. First stage of Southern Boatharbour consolidation to be commenced in line with concept presented for mooring rearrangement to marina style floating berths.
2. Planning, zoning and land negotiations for more substantial works discussed below as long term strategic options should commence at the earliest opportunity as a short term task.

7.3.2 Long Term Strategy (0 - 20 years)

Provision of commercial moorings and marinas are not the responsibility of Council. The following long term recommendations that need to be considered when Development Applications for moorings and marinas are being considered by Council are accessed through **vM6.1.3** and include:

1. Full consolidation of all moorings in the Lower Tweed River Estuary through the staged provision of modern marina style floating berths within the Southern Boatharbour.
2. Constraints on the supply of one large marina facility may necessitate the consideration of a number of more moderate, specialized marina complexes to cater for the total estimated marina berth demand (**Section 3.1.3**).
 - tourism/commercial charter vessel marina and public wharf at Jack Evans outer harbour; and
 - moderately sized marina complexes incorporating marine industry facilities, dry stack storage and accommodation areas (*possibly different power boat and yacht orientated facilities to cater for specific requirements of either*).
3. Further investigations into a large marina complex suitable to cater for the immediate realisation of a large latent demand for marina berthing or future demands beyond

the planning horizon of this particular study are recommended in the long term. Consideration of a demand of up to twice that conservatively estimated (**Section 3.1.3**) is recommended. A preliminary concept is presented for the site currently occupied for Action Sands at Chinderah, accessed through **vM6.1.3**.

8 STRATEGY WORKS IMPLEMENTATION PROGRAM

The following section outlines an itemised works implementation program including:

- a brief description of works (*or conceptual idea*);
- strategic timeframe;
- prioritisation;
- an order of cost estimate; and
- any further comments.

Table 8.1 presents a summarised implementation program by location with each item detailed further in subsequent sections of the report. Some locations appear in both the short and long term strategic timeframes as a result of possible staging of development, or, an indication of planning priorities.

Table 8.1 Strategic Works Summary

Strategic Timeframe	Location	Priority	Estimated Order of Cost (\$'000)	
<i>Short (0-5 years)</i>	Boat Ramps			
	Southern Boatharbour Boat Ramps	Low	5	
	Kennedy Drive Boat Ramp	Low	5	
	Dry Dock Road Boat Ramp	High	60	
	Informal ramps at Blue Water Crescent	-	-	
	Phillip Parade Boat Ramp	Low	10	
	Lakes Drive Boat Ramp	High	2.5	
	Chinderah Bay Boat Ramp	High	2.5	
	Oxley Cove Informal Boat Ramps	Medium	35	
	Chinderah Informal Ramps	Medium	10	
	Informal ramp opposite Stotts Island	Low	10	
	Bluey Hill Park	Low		
	Tumbulgum	High	200	
	Commercial Road Boat Ramp	Medium	95	
		Jetties/Wharves/Services		
	Jack Evans Public Jetty	-	(maintenance as necessary only)	
Keith Curren Park	Low	30		
Tick Gates Public Wharf	-	(maintenance as necessary only)		
Ebenezer Park Jetty	Low	3		
Ray Pascoe Park Jetty	Low	30		
Crystal Water Jetty	Low	30		
Dry Dock Road Jetty (east)	Medium	30		
Terranora Public Jetty	Low	30		

Strategic Timeframe	Location	Priority	Estimated Order of Cost (\$'000)
	Pioneer Park Public Jetty	Low	30
	Fingal Boatharbour jetty	-	(maintenance as necessary only)
	Tumbulgum Boat Ramp Jetty	High	30
	Tumbulgum Floating wharf	-	(maintenance as necessary only)
	Rudd park Floating Wharf	-	(maintenance as necessary only)
	Skinner Lowes Wharf	-	(maintenance as necessary only)
	Commercial Road Boat Ramp Jetty	High	30
	Multi Purpose Facilities		
	Condong Regional Boating Facility	High (planning/staged)	1,100 - 1,600
	Barney's Point Marine Precinct	High (planning)	20,000
	Southern Boatharbour Consolidation	High (planning/staged)	15,000 (Stage 1 - 5,000)
	Jack Evans Outer Harbour	High (planning/staged)	3,500
	Boyd's Bay Tick Gates Marine Precinct	High (planning)	30,000
Long (0-20 years)	Boat Ramps		
	(included in multi purpose facilities at Condong and Barney's Point as listed below)		
	New Fingal Boatharbour (option)	Low	150
	Old Fingal Boatharbour (option)	Low	260
	Jetties/Wharves/Services		
	Dry Dock Road (west)	Low	30
	(included in all multi purpose facilities as listed below)		
	Multi Purpose Facilities		
	Condong Regional Boating Facility	High	1,100 – 1,600
	Barney's Point Marine Precinct	High	20,000
	Southern Boatharbour Consolidation	High (staged)	15,000 (Stage 2 and 3 - 10,000)
	Jack Evans Outer Harbour	High (staged)	3,500
	Boyd's Bay Tick Gates Marine Precinct	High	30,000
	Action Sands Site Marine Precinct	High (planning/staged)	33,000 16,500 (Stage 1)

It should be noted that the cost estimates for each item discussed indicates the order of magnitude of the estimated cost and do not attempt to provide accurate, detailed costing. The estimates have been developed using preliminary conceptual ideas only (for example; areas of development type,

number of marina berths, number of car spaces, estimates of unit measurement for maintenance, etc.). They have been based on previous experience with similar developments or projects, PBP internal cost estimate databases, and industry standard estimates (*Rawlinsons, 2006*). On this basis, the resulting costs developed for each item are indicative and only intended for the use in strategic planning decisions, not budgeting.

It has been assumed that the relatively minor work items will be undertaken wholly by Council and do not include any allowance for external design and construction. It is recognised that the more major projects will have to involve the investment of funding from outside of Council and will require specialist environmental assessment, design and construction advice. The larger projects (*i.e. those estimated at greater than \$100,000*) include a contingency to allow for these specialist undertakings. Costs do not include the price of land acquisition if required for a particular site.

The cost estimates have also been presented in terms of 2006 dollars and do not allow for any time based change of rates.

8.1 BOAT RAMPS

8.1.1 Short Term (0 – 5years)

Spatial information and concept plans mentioned for specific sites below can be accessed through **vM6.1.1**.

Southern Boatharbour Ramps

Proposed Works	<ul style="list-style-type: none"> Restrict access to the informal ramp (<i>sandy beach</i>) at northern extremity of southern boatharbour using bollards or natural barriers. Rehabilitate bank area.
Timing	Short Term (0 to 5 years)
Estimated Costs	\$5,000
Priority	Low
General Notes	The other boat ramp in the Southern Boatharbour adjacent to the restaurant lease is a private facility.

Kennedy Drive

Proposed Works	<ul style="list-style-type: none"> Provide traffic management mechanism to separate car and car and trailer conflicts during launching procedures, if possible;
Timing	Short Term (0 to 5 years)
Estimated Costs	\$5,000
Priority	Low
General Notes	Site is highly space constrained which may limit traffic improvement possibilities. Previous strategic position to encourage the use of the Fingal boat ramp (<i>main arm of river</i>) in preference to this facility should be maintained and strengthened by the provision of new facilities away from Terranora Creek.

Dry Dock Road

Proposed Works	<ul style="list-style-type: none"> Complete formalisation of car and trailer parking spots (<i>suitable areas previously identified below bridge and beside road. 10 spaces already provided, 30 ideal but probably not feasible</i>).
Timing	Short Term (0 to 5 years)
Estimated Costs	\$60,000
Priority	High
General Notes	

Informal ramps at Blue Water Crescent

Proposed Works	No proposed works
Timing	-
Estimated Costs	-
Priority	-
General Notes	-

Philip Parade Boat Ramp

Proposed Works	Extend boat ramp and fix structural damage at the toe. Excavate ramp toe area, provide gravel base, new concrete works (<i>slab/planks</i>) and toe treatment (<i>scour protection</i>).
Timing	Short Term (0 to 5 years)
Estimated Costs	\$10,000
Priority	Low
General Notes	Maintain as small low usage ramp

Lakes Drive Boat Ramp

Proposed Works	Provide 10 (<i>or more if possible</i>) formal car and trailer parking areas. Layout design and formal road markings/signage.
Timing	Short Term (0 to 5 years)
Estimated Costs	\$5,000
Priority	High
General Notes	

Chinderah Bay Boat Ramp

Proposed Works	Provide formal car and trailer parking spaces (<i>20 if possible</i>). Layout design and formal road markings/signage.
Timing	Short Term (0 to 5 years)
Estimated Costs	\$5,000
Priority	High
General Notes	

Oxley Cove Boat Ramps

Proposed Works	No proposed works
Timing	-
Estimated Costs	-
Priority	-
General Notes	Maintain as low key, informal ramp

Chinderah Informal Ramps

Proposed Works	<ul style="list-style-type: none"> • Restrict access to the informal ramps using bollards or natural barriers. • Rehabilitate bank area. • Encourage use of the formal Chinderah boat ramp (i.e. provide signs etc)
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000
Priority	Medium
General Notes	

Informal Ramp McAuleys Road

Proposed Works	No proposed works
Timing	
Estimated Costs	
Priority	
General Notes	Maintain as low key, informal ramp

Bluey Hill Park

Proposed Works	<ul style="list-style-type: none"> Remove ramp
Timing	Short Term (0 to 5 years)
Estimated Costs	
Priority	Low
General Notes	Land behind ramp is private land, not possible for purchase at this stage. Not to be used as public ramp.

Tumbulgum Public Boat Ramp

Proposed Works	<ul style="list-style-type: none"> provide any nearby formal car and trailer spaces, if possible; Implement traffic control devices to restrict the launching of boats to occur from vehicles approaching from the south only; construct an off road turning and backing bay to eliminate conflict with through road traffic; provide off road car and trailer waiting bays adjacent to launching ramp to also eliminate conflict with through road traffic; and possible augmentation of boat ramp facility through remote North Tumbulgum car and trailer parking, floating pontoon access and foreshore park areas.
Timing	Short Term (0 to 5 years)
Estimated Costs	\$250,000
Priority	High
General Notes	Traffic management and North Tumbulgum area concept plans provided. Note: remote car and trailer parking for boat ramp not an ideal solution. However, given the limited alternatives and high level of existing conflicts in the immediate launching area this compromised situation may be a workable solution. Consideration should be given to the closure of this ramp following the implementation and success of a regional boating facility at Condong.

Private Boat Ramp (Tweed River Water Ski Club)

Proposed Works	<ul style="list-style-type: none"> facility would no longer be required by the Ski Club if access to facilities were provided at a regional boat ramp facility at Condong;
Timing	-
Estimated Costs	-
Priority	-
General Notes	Private facility. Freehold land was currently for sale at time of site visit.

Commercial Road Boat Ramp

Proposed Works	<p>Reconfiguration of boat ramp and adjacent parking and park area to provide:</p> <ul style="list-style-type: none"> 10 – 20 car and trailer parking spaces (<i>dependant on space constraints</i>); toilet, picnic (<i>bbq</i>) and rubbish receptacles; a floating pontoon to replace fixed structure adjacent to ramp; turning and backing area for boat launching; and traffic management measures and signage to direct traffic through boating facility.
Timing	Short Term (<i>0 to 5 years</i>)
Estimated Costs	\$125,000 (<i>includes cost for floating pontoon jetty</i>)
Priority	Medium
General Notes	Concept plan provided. Bank erosion and navigation (gravel extraction) issues may constrain future increased use. If so, maintain as low key facility.

8.1.2 Long Term (5 - 20 years)

Spatial information and concept plans mentioned for specific sites below can be accessed through vM6.2.1.

Condong Regional Boating Facility (proposed)

Site Opportunities	<p>Regional boat ramp facility possibly incorporating the following features:</p> <ul style="list-style-type: none"> • construct a 2 lane boat ramp (<i>this could possibly be staged by initially providing a 2 lane ramp designed to accommodate a later additional lane in line with increased demand</i>); • provide 60 formal car and trailer parking spaces (<i>possibly staged similarly to launching ramp</i>); • provide other facilities such as toilets, lighting etc • construct a clubhouse facility, which could provide for a café, takeaway shop and basic provisions (<i>or larger plans depending on the appropriate level of investment</i>); • bank works to implement sandy pocket beaches or floating pontoons distributed only the stretch of river including Condong and Tumbulgum; and • floating wharf structure to provide multi-purpose function. Provision of fuel, water and sewage/bilge pump out facilities for the upper estuary and access for water skiers into boats. (alternatively could be provided at Tumbulgum) • Protect opposite riverbank to mitigate impacts from increased boat usage of this site (see Tweed Estuary Bank Management Plan)
Site Constraints	<ul style="list-style-type: none"> • lack of existing services and nearby commercial outlets; • flooding; • remote site requiring the importing of a sense of community; and • challenge to change the status quo of the use of Tumbulgum as the location of choice for boats undertaking towing activities accessing the favoured stretch of river.
Timing	Long Term (<i>5 to 20 years</i>)
Estimated Costs	\$1.1Million - \$1.6Million (<i>depending on level of “clubhouse” development</i>)
Priority	High
General Notes	The suggested clubhouse facility (<i>at the minimal end of the development scale</i>) and associated services could possibly be managed by the Tweed River Water Ski Club on behalf of

	<p>Council in an attempt to encourage ownership of the regional facility by the water skiing community. If a larger scale development was considered feasible local business entrepreneurs would most likely be involved.</p> <p>The provision of the upper estuary regional boat ramp and auxiliary facilities are considered a high priority long term strategic option. If the opportunity to expedite the implementation of such an option arises then it should be taken and fast tracked for implementation in the short term. This may take the form of a staged implementation of facilities.</p> <p>Basic concept for regional facility and pocket beach or floating pontoon concept, to avoid concentration of water skiers in one area, are provided.</p>
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Marine Precinct at Banora (proposed)

Site Opportunities	<p>Marine Industry Precinct Site possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement for approximately 80 -100 vessels (<i>priority given to yachts as power boats can use "sister" facility upstream of Barney Point bridge</i>); • regional boat ramp facility (2 lane ramp and floating pontoon with appropriate car and car + trailer parking); • industry area (<i>boat building, repairs, dry stack storage for 100 - 150 vessels, ship travel lift</i>); • marina facilities - fully integrated facility with all services (<i>fuel, water, power, telecoms, sewage/bilge pumpout, showers, toilets, laundrette, rubbish etc..</i>) provided incorporating yacht club; and • provision of short stay accommodation area (<i>"eco resort" amongst wetland environment</i>);
Site Constraints	<ul style="list-style-type: none"> • private freehold land; • marina berths in main floodway (<i>alternate idea of dredging land for canal arrangement would remove this constraint but add others e.g. increased cost and environmental considerations, reduced land base area</i>); • marina berths in navigation channel - need to minimize the extent to which these impact on the channel by providing a number of short berth arrangements (<i>may also help in minimising the extend to which berths protrude into the main flood flow</i>).
Timing	Long Term (5 - 20 years)
Estimated Costs	\$20Million

Priority	High
General Notes	<ul style="list-style-type: none"> • Council may need to be involved in progressing the approval process (<i>i.e. Council to undertake Environmental Assessment process/ or feasibility study</i>) for the site to encourage a potential proponent to purchase, or current owner to further invest, and undertake redevelopment of site. Substantial private investment interest is needed to facilitate this development (<i>requiring confidence in outcomes</i>); • land based development could be graded from the south to north. Boat ramp and marine industries in the south grading through marina facilities, yacht club, resort style accommodation to “eco cabins” in the northern extremity of the site to compliment adjacent wetland environment; • site is currently underutilised and would benefit (<i>visually and financially</i>) from an upgrade to a modern complex. • basic concept of marine precinct is provided.

Fingal Boatharbours

Proposed Works (<i>option if the provision of facilities at other site proves unachievable</i>)	<ul style="list-style-type: none"> • Provide a new lane to upgrade to a 3 lane boat ramp • Extend parking provision to 90 formal car and trailer parking spaces (<i>possibly use portion of old boatharbour reserve area if new harbour area to constrained. Boats can pick up car driver from old boatharbour</i>)
Timing	Long Term (5 to 20 years)
Estimated Costs	New - \$150,000 Old - \$260, 000
Priority	Low
General Notes	The reopening of the old Fingal Boatharbour ramp may be seen as a back ward step given it was only recently closed to provide swimming and passive recreation area. Future community focus may change and the use of the old boatharbour may again be considered more appropriate for boat launching and retrieval given the lack of other suitable sites in the Lower Estuary and increasing pressure for boating facilities (<i>option should be reserved for longer term review</i>). The Fingal Boatharbour options may need to be considered if other proposed facilities are unable to proceed.

8.2 WHARVES, JETTIES AND SERVICING

8.2.1 Short Term (0 – 5 years)

Spatial information and concept plans mentioned for specific sites below can be accessed through vM6.1.2.

Southern Boatharbour Consolidation

Site Opportunities	<p>Consolidated development possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement (<i>commercial fishing vessels to be consolidated into one area within marina</i>); • ground level road, parking, services (<i>fuel, water, power, telecoms, sewage/bilge pumpout etc.</i>) and access to floating marina style berths; • upper level marina office and facilities (<i>showers, toilets, laundrette, rubbish etc.</i>); • upper level government agency and commercial offices; • upper level decks overlooking marina with food and beverage outlets (<i>cafés, etc.</i>), and retail outlets; • Mediterranean style moorings on boardwalk around northern and eastern perimeter; • possible shuttle link to “The Anchorage” fore and aft mooring arrangements; • staged development in response to demand; and • existing slipway facility to provide maintenance and servicing opportunities.
Site Constraints	<ul style="list-style-type: none"> • limited land based area space (<i>necessity for multi level land based development with associated costs and high density feel</i>); • possible issues with building over roadway; • limited waterway area and environmental constraints (buffer zones to mangrove species, navigation channel); and • multiple current land owners/managers.
Timing	<p>Short to Long Term (up to 20 years). Staging of development could be achieved by commencing development (<i>buildings and marina berths</i>) at the northern end and building in planned stages towards the south west (<i>in line with demand for facilities</i>)</p>
Estimated Cost	Total \$15Million (<i>possibly three equal stages at \$5Million each</i>)
Priority	High
General Notes	<ul style="list-style-type: none"> • possible private public sector partnership development opportunities;

	<ul style="list-style-type: none"> • various government agencies cooperation needed. Department of Lands minor ports program may consider forming partnership with Council to facilitate new development; • provision of berths necessary to commercial fishing fleet currently located on finger jetties in this location; and • basic concept provided.
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Jack Evans Boatharbour (Public Jetty)

Proposed Works	No works required. Facility to be retained as per the Tweed Heads Town Centre Masterplan.
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Minor facility. Very shallow berthing depth - only suitable for small craft.

Keith Curren Park Jetty

Proposed Works	Low level landing reinstatement <i>(floating pontoon may be best practice)</i>
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000
Priority	Low
General Notes	

Tick Gates Public Wharf

Proposed Works	No proposed works.
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Currently operates a sewage pump out facility.

Ebenezer Park Jetty

Proposed Works	Demolish a further metre or so of the jetty approach and place stone armour units at end of remaining pathway
Timing	Short Term (0 to 5 years)
Estimated Costs	\$5,000
Priority	Low
General Notes	Jetty has previously been demolished

Ray Pascoe Park Jetty

Proposed Works	No proposed works.
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	

Crystal Waters Jetty

Proposed Works	Low level landing reinstatement <i>(floating pontoon may be best practice)</i>
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000
Priority	Low
General Notes	

Dry Dock Road Jetty (east)

Proposed Works	Extend current jetty with low level landing with best practice floating pontoon arrangement.
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000
Priority	Medium
General Notes	Extension will increase berthing depths enabling larger vessels to access jetty and facilitate operation of Sailability group in the vicinity.

Terranora Public Jetty

Proposed Works	Original fixed low level landing has recently been removed. <i>(future replacement with floating pontoon may be a possibility)</i>
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Boat set down / pick up possibly not the major use of this facility. Possibly fishing location bias. Identified as potential tourist wharf linked with tourism operations.

Pioneer Park (Maritime Museum) Public Jetty

Proposed Works	Replacement of fixed low level landing with best practice floating pontoon arrangement has recently been undertaken. No further proposed works
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Facility arguably not included in the scope of this study.

Seagulls RLC Public Jetty

Proposed Works	No proposed works
Timing	-
Estimated Costs	-
Priority	-
General Notes	Facility arguably not included in the area for this study.

Fingal Boatharbour Jetty

Proposed Works	No proposed works
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Facility is part of well designed and maintained regional boat ramp facility at Fingal Boatharbour.

Fingal Boatharbour Commercial Jetty

Proposed Works	No proposed works
Timing	-
Estimated Costs	-
Priority	-
General Notes	Facility is not a public facility.

Barney's Point Bridge Wharf

Proposed Works	No proposed works.
Timing	-
Estimated Costs	-
Priority	-
General Notes	Facility is not suitable for boating without major modification (<i>construction of a low level deck and a floating pontoon access.</i>) Generally not considered a boating facility.

Tumbulgum Public Boat Ramp Jetty

Proposed Works	Replace existing jetty with low level floating pontoon (<i>similar to Lakes Drive</i>)
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000 (<i>this cost has also been included in the pricing for the Tumbulgum boat ramp works</i>)
Priority	Low
General Notes	

Tumbulgum Floating Wharf

Proposed Works	No proposed works
Timing	(<i>ongoing maintenance</i>)
Estimated Costs	(<i>ongoing maintenance costs as needed only</i>)
Priority	-
General Notes	Facility is a recent best practice construction and is in very good condition without need for modification.

Budd Park Floating Wharf

Proposed Works	No proposed works
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Facility is a recent best practice construction and is in very good condition without need for modification.

Skinner Lowes Wharf

Proposed Works	No proposed works
Timing	<i>(ongoing maintenance)</i>
Estimated Costs	<i>(ongoing maintenance costs as needed only)</i>
Priority	-
General Notes	Facility is a recent best practice construction and is in very good condition without need for modification.

Commercial Road Public Jetty

Proposed Works	Replace existing jetty with low level floating pontoon <i>(similar to Lakes Drive)</i>
Timing	Short Term (0 to 5 years)
Estimated Costs	\$30,000 <i>(this cost has also been included in the pricing for the Commercial Road boat ramp works)</i>
Priority	High
General Notes	Concept plan for Commercial Road facility in general provided.

8.2.2 Long Term (5 – 20 years)

Spatial information and concept plans mentioned for specific sites below can be accessed through vM6.2.2.

Dry Dock Road Jetty (west)

Proposed Works	Extend current jetty with low level landing with best practice floating pontoon arrangement. Original fixed low level landing has recently been removed.
Timing	Long Term (5 to 20 years)
Estimated Costs	\$30,000
Priority	Low
General Notes	Extension will increase berthing depths enabling larger vessels to access jetty.

Southern Boatharbour Consolidation

Site Opportunities	<p>Consolidated development possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement (<i>commercial fishing vessels to be consolidated into one area within marina</i>); • ground level road, parking, services (<i>fuel, water, power, telecoms, sewage/bilge pumpout etc.</i>) and access to floating marina style berths; • upper level marina office and facilities (<i>showers, toilets, laundrette, rubbish etc.</i>) • upper level government agency (<i>NSW Maritime, Police, Fisheries, Air Sea Rescue</i>) and commercial offices; • upper level decks overlooking marina with food and beverage outlets (<i>cafés, etc</i>), and retail outlets; • Mediterranean style moorings on boardwalk around northern and eastern perimeter; • possible shuttle link to “The Anchorage” fore and aft mooring arrangements; • staged development in response to demand; and • existing slipway facility to provide maintenance and servicing opportunities.
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Site Constraints	<ul style="list-style-type: none"> • limited land based area space (<i>necessity for multi level land based development with associated costs and high density feel</i>); • possible issues with building over roadway; • limited waterway area and environmental constraints (<i>buffer zones to mangrove species, navigation channel</i>); and • multiple current land owners/managers.
Timing	Short to Long Term (up to 20 years). Staging of development could be achieved by commencing development (<i>buildings and marina berths</i>) at the northern end and building in planned stages towards the south west (<i>in line with demand for facilities</i>)
Estimated Cost	Total \$15Million (<i>possibly three equal stages at \$5Million each</i>)
Priority	High
General Notes	<ul style="list-style-type: none"> • possible private public sector partnership development opportunities; • various government agencies cooperation needed. Department of Lands minor ports program may consider forming partnership with Council to facilitate new development; • provision of berths necessary to commercial fishing fleet currently located on finger jetties in this location; and • basic concept provided.

Condong Regional Boating Facility (proposed)

Site Opportunities	<p>Regional boat ramp facility possibly incorporating the following features:</p> <ul style="list-style-type: none"> • construct a 2 lane boat ramp (<i>this could possibly be staged by initially providing a 2 lane ramp designed to accommodate a later additional lane in line with increased demand</i>); • provide 60 formal car and trailer parking spaces (<i>possibly staged similarly to launching ramp</i>); • provide other facilities such as toilets, lighting etc • construct a clubhouse facility, which could provide for a café, takeaway shop and basic provisions (<i>or larger plans depending on the appropriate level of investment</i>); • bank works to implement sandy pocket beaches or floating pontoons distributed only the stretch of river including
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	<p>Condong and Tumbulgum; and</p> <ul style="list-style-type: none"> • Floating wharf structure to provide multi-purpose function. Provision of fuel, water and sewage/bilge pump out facilities for the upper estuary and access for water skiers into boats (alternatively could be provided at Tumbulgum). • Protect opposite riverbank to mitigate impacts from increased boat usage of this site (see Tweed Estuary Bank Management Plan)
Site Constraints	<ul style="list-style-type: none"> • lack of existing services and nearby commercial outlets; • flooding; • remote site requiring the importing of a sense of community; and • challenge to change the status quo of the use of Tumbulgum as the location of choice for boats undertaking towing activities accessing the favoured stretch of river.
Timing	Long Term (<i>5 to 20 years</i>)
Estimated Costs	\$1.1Million - \$1.6Million (<i>depending on level of “clubhouse” development</i>)
Priority	High
General Notes	<p>The suggested clubhouse facility (<i>at the minimal end of the development scale</i>) and associated services could possibly be managed by the Tweed River Water Ski Club on behalf of Council in an attempt to encourage ownership of the regional facility by the water skiing community. If a larger scale development was considered feasible local business entrepreneurs would most likely be involved.</p> <p>The provision of the upper estuary regional boat ramp and auxiliary facilities are considered a high priority long term strategic option. If the opportunity to expedite the implementation of such an option arises then it should be taken and fast tracked for implementation in the short term. This may take the form of a staged implementation of facilities.</p> <p>Basic concept for regional facility and pocket beach or floating pontoon concept, to avoid concentration of water skiers in one area, are provided.</p>

Jack Evans Boatharbour (Outer Harbour)

Site Opportunities	<p>Offshore Tourism/Charter vessel marina possibly incorporating the following features:</p> <ul style="list-style-type: none"> floating marina style berth arrangement for charter/tourism vessels located within small outer harbour area as depicted by the Tweed Town Centre Masterplan (<i>LFA, 2004</i>); marina related commercial offices and services integrated with proposed adjoining cultural centre; and a fully serviced public wharf.
Site Constraints	<ul style="list-style-type: none"> limited waterway area outlined in Masterplan concept; small size of marina may limit its commercial viability; and competition for land based space with proposed cultural centre development.
Timing	Long Term (<i>5 to 20 years</i>)
Estimated Costs	\$3.5 Million (<i>includes minor breakwater structures to modify existing harbour</i>)
Priority	High
General Notes	<p>Jack Evans Boatharbour was rated by the multi criteria matrix developed for this study as the most ideal location within the Tweed Estuary for the location of a large marina and marine precinct. However, it has been ruled out by the planning constraint of an existing Masterplan for the Tweed Heads Town Centre which does not incorporate such a development.</p> <p>The tourism/charter vessel marina was considered to be the optimum use of this premier location for a boating facility while fitting within the planning constraints placed on the location by the Tweed Heads Town Centre Masterplan.</p> <p>Basic concept plan provided.</p>

8.3 MOORINGS AND MARINAS

8.3.1 Short Term (0 – 5 years)

Spatial information and concept plans mentioned for specific sites below can be accessed through vM6.3.1.

Southern Boatharbour Consolidation

Site Opportunities	<p>Consolidated development possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement (<i>commercial fishing vessels to be consolidated into one area within marina</i>); • ground level road, parking, services (<i>fuel, water, power, telecoms, sewage/bilge pumpout etc.</i>) and access to floating marina style berths; • upper level marina office and facilities (<i>showers, toilets, laundrette, rubbish etc.</i>) • upper level government agency and commercial offices; • upper level decks overlooking marina with food and beverage outlets (<i>cafés, etc</i>), and retail outlets; • Mediterranean style moorings on boardwalk around northern and eastern perimeter; • possible shuttle link to “The Anchorage” fore and aft mooring arrangements; • staged development in response to demand; and • existing slipway facility to provide maintenance and servicing opportunities.
Site Constraints	<ul style="list-style-type: none"> • limited land based area space (<i>necessity for multi level land based development with associated costs and high density feel</i>); • possible issues with building over roadway; • limited waterway area and environmental constraints (<i>buffer zones to mangrove species, navigation channel</i>); and • multiple current land owners/managers.
Timing	<p>Short to Long Term (up to 20 years). Staging of development could be achieved by commencing development (<i>buildings and marina berths</i>) at the northern end and building in planned stages towards the south west (<i>in line with demand for facilities</i>)</p>

Estimated Cost	Total \$15Million (<i>possibly three equal stages at \$5Million each</i>)
Priority	High
General Notes	<ul style="list-style-type: none"> • possible private public sector partnership development opportunities; • various government agencies cooperation needed. Department of Lands Minor Ports Program may consider forming partnership with Council to facilitate new development; • provision of berths necessary to commercial fishing fleet currently located on finger jetties in this location; and • basic concept provided.

Boys Bay Tick Gates Moorings

Proposed Works	<ul style="list-style-type: none"> • Staged reduction in moorings corresponding to the increase provision of wet berthing involved with the consolidation and reconfiguration of Southern Boatharbour and in response to demand. Final objective to retain reduced number of moorings to maintain socially equitable boat mooring opportunities.; and • Provision of a dinghy storage facility to improve the amenity of the foreshore adjacent to mooring area.
Timing	Short Term (0 to 5 years)
Estimated Cost	\$10,000
Priority	High
General Notes	Integration with proposed Boys Bay Tick Gates Marine Precinct in future. Swing mooring to be provided offshore to the southeast of the marina concept.

8.3.2 Long Term (5 – 20 years)

Spatial information and concept plans mentioned for specific sites below can be accessed through vM6.3.2.

Southern Boatharbour Consolidation

Site Opportunities	<p>Consolidated development possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement (<i>commercial fishing vessels to be consolidated into one area within marina</i>); • ground level road, parking, services (<i>fuel, water, power, telecoms, sewage/bilge pumpout etc.</i>) and access to floating marina style berths; • upper level marina office and facilities (<i>showers, toilets, laundrette, rubbish etc.</i>) • upper level government agency and commercial offices; • upper level decks overlooking marina with food and beverage outlets (<i>cafés, etc</i>), and retail outlets; • Mediterranean style moorings on boardwalk around northern and eastern perimeter; • possible shuttle link to “The Anchorage” fore and aft mooring arrangements; • staged development in response to demand; and • existing slipway facility to provide maintenance and servicing opportunities.
Site Constraints	<ul style="list-style-type: none"> • limited land based area space (<i>necessity for multi level land based development with associated costs and high density feel</i>); • possible issues with building over roadway; • limited waterway area and environmental constraints (<i>buffer zones to mangrove species, navigation channel</i>); and • multiple current land owners/managers.
Timing	<p>Short to Long Term (up to 20 years). Staging of development could be achieved by commencing development (<i>buildings and marina berths</i>) at the northern end and building in planned stages towards the south west (<i>in line with demand for facilities</i>)</p>

Estimated Cost	Total \$15Million (<i>possibly three equal stages at \$5Million each</i>)
Priority	High
General Notes	<ul style="list-style-type: none"> • possible private public sector partnership development opportunities; • various government agencies cooperation needed. Department of Lands Minor Ports Program may consider forming partnership with Council to facilitate new development; • provision of berths necessary to commercial fishing fleet currently located on finger jetties in this location; and • basic concept provided.

Boys Bay Tick Gates Marine Precinct

Site Opportunities	<p>Land base and marina development possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement for approx. 130 vessels; • parking, services (<i>fuel, water, power, telecoms, sewage/bilge pumpout etc.</i>); • Boat repair facilities including travel lift and hardstand; • marina office and facilities (<i>showers, toilets, laundrette, rubbish etc.</i>) • food and beverage outlets (<i>cafés, restuarants etc</i>), and retail outlets (<i>ship chandlery, boat brokerage, health spa etc</i>); • dry stack storage facilities for 200 vessels could be developed on the western side of the road/bridge in conjunction with the marina and associated facilities to the east, with a pedestrian link under the bridge.
Site Constraints	<ul style="list-style-type: none"> • limited land based area space (<i>necessity for suspended slab structure over water or reclamation to provide land area</i>); • limited waterway area and environmental constraints (<i>buffer zones to mangrove species, navigation channel</i>).
Timing	Short to Long Term (up to 20 years). Staging of development could be achieved by commencing development (<i>buildings and marina berths</i>) on the eastern side of the bridge with dry stack

	storage development on western side of bridge occurring as Stage 2 of development.
Estimated Cost	Total \$35 million for suspended slab option or \$27 million for reclamation option.
Priority	High
General Notes	<ul style="list-style-type: none"> • possible private public sector partnership development opportunities; • various government agencies cooperation needed. Department of Lands Minor Ports Program may consider forming partnership with Council to facilitate new development; • possible integration with proposed Southern Boatharbour Consolidation. Common management and sharing of some services to provide more efficient use of limited resource (<i>space</i>). Links (<i>pedestrian and nautical</i>) between the two developments are feasible. • basic concept provided.

Marine Precinct at Banora (proposed)

Site Opportunities	<p>Marine Industry Precinct Site possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement for approximately 80 -100 vessels (<i>priority given to yachts as power boats can use “sister” facility upstream of Barney Point bridge</i>); • regional boat ramp facility (<i>2 lane ramp and floating pontoon with appropriate car and car + trailer parking</i>); • industry area (<i>boat building, repairs, dry stack storage for 100 - 150 vessels, ship travel lift</i>); • marina facilities - fully integrated facility with all services (<i>fuel, water, power, telecoms, sewage/bilge pumpout, showers, toilets, laundrette, rubbish etc..</i>) provided incorporating yacht club; and • provision of short stay accommodation area (<i>“eco resort” amongst wetland environment</i>).
Site Constraints	<ul style="list-style-type: none"> • private freehold land (<i>is there a chance to purchase land?</i>); • marina berths in main floodway (<i>alternate idea of dredging</i>

	<p><i>land for canal arrangement would remove this constraint but add others e.g. increased cost and environmental considerations, reduced land base area);</i></p> <ul style="list-style-type: none"> • marina berths in navigation channel - need to minimize the extent to which these impact on the channel by providing a number of short berth arrangements (<i>may also help in minimising the extend to which berths protrude into the main flood flow</i>).
Timing	Long Term (5 - 20 years)
Estimated Costs	\$20Million
Priority	High
General Notes	<ul style="list-style-type: none"> • Substantial private investment interest is needed to facilitate this development (<i>requiring confidence in outcomes</i>); • land based development could be graded from the south to north. Boat ramp and marine industries in the south grading through marina facilities, yacht club, resort style accommodation to “eco cabins” in the northern extremity of the site to compliment adjacent wetland environment; • site is currently underutilised and would benefit (<i>visually and financially</i>) from an upgrade to a modern complex. • basic concept of marine precinct is provided.

Jack Evans Boatharbour (Outer Harbour)

Site Opportunities	<ul style="list-style-type: none"> • Offshore Tourism/Charter vessel marina possibly incorporating the following features: • floating marina style berth arrangement for approximately 25 charter/tourism vessels located within small outer harbour area as depicted by the Tweed Town Centre Masterplan (LFA, 2004); • marina related commercial offices and services integrated with proposed adjoining cultural centre; and • a fully serviced public wharf.
Site Constraints	<ul style="list-style-type: none"> • limited waterway area outlined in Masterplan concept; • small size of marina may limit its commercial viability; and • competition for land based space with proposed cultural centre development.
Timing	Long Term (5 to 20 years)

Estimated Costs	\$3.5 Million <i>(includes minor breakwater structures to modify existing harbour)</i>
Priority	High
General Notes	<p>Jack Evans Boatharbour was rated by the multi-criteria matrix developed for this study as the most ideal location within the Tweed Estuary for the location of a large marina and marine precinct. However, it has been ruled out by the planning constraint of an existing Masterplan for the Tweed Heads Town Centre which does not incorporate such a development.</p> <p>The tourism/charter vessel marina was considered to be the optimum use of this premier location for a boating facility while fitting within the planning constraints placed on the location by the Tweed Heads Town Centre Masterplan.</p> <p>Basic concept plan provided</p>

Action Sands Site Marine Precinct

Site Opportunities	<p>Possible future power boat harbour and marine industry precinct possibly incorporating the following features:</p> <ul style="list-style-type: none"> • floating marina style berth arrangement for approximately 100 (and possibly in future up to 300) vessels located within existing “off stream” dredged pond; • Industry area <i>(boat building, repairs, dry stack storage for 100+ vessels, ship travel lift)</i>; • Marina facilities <i>(fully integrated facility with all services provided)</i>; • short and long stay resort style accommodation area; • possible site for regional boat ramp facility <i>(3 lane with 90 car + trailer parking spaces)</i>; and • adjacent land area for future expansion to the east and west of existing Action Sands site <i>(if able to be purchased - freehold land)</i>;
Site Constraints	<ul style="list-style-type: none"> • existing industry on location <i>(Action Sands and concrete batching plant)</i>; • dredged entrance channel needs to be provided cutting existing road service; and • upstream of Barneys Point Bridge - limits provision of services to yachts;
Timing	Long Term <i>(5 to 20 years)</i> . Action Sands lease to expire in 2012.

Estimated Costs	\$33Million (<i>Total – 300 berths</i>). \$16.5Million (<i>First Stage – 100 berths</i>)
Priority	Low
General Notes	<ul style="list-style-type: none">• further investigation required;• road that would be cut by dredged entrance is a dead end and only provides service to two properties immediately to the west of Action Sands;• may be possible to stage marina such that the existing industry (<i>relocated to adjacent site</i>) and marina can coexist in the short term with future expansion of the marina site possible following industry expiration date;• basic concept provided

8.4 CONCLUDING COMMENTS - SCENARIO DISCUSSION

In all the sites identified to contribute to the strategy as multi purpose facilities there are constraints that produce a level of uncertainty about the implementation of conceptual proposals. Especially those in the **lower estuary** providing marina wet berthing arrangements. The appropriate provision of wet berthing necessary (by 2016) is estimated to be up to an additional **200 wet berths**. Additionally, the provision of **150 dry stack storage** is recommended. These estimates are based on anticipated demand, and the spatial and carrying capacity constraints of the Tweed Estuary. This represents the lower bounds of infrastructure provision to meet anticipated demands and subsequent projected usage of the Tweed Estuary.

Due to the uncertainty in the implementation of conceptual proposals a number of scenarios are provided with different combinations of sites to meet estimated wet berthing demands in the lower estuary. These scenarios are outlined below, in no particular order of preference. Further to this, the provision of a new lower estuary regional boat ramp facility is proposed as a component of the Banora Marine Precinct concept. If this site proves to be unsuitable, alternative scenarios involving the augmentation and expansion of the two existing Fingal Boatharbour facilities (*as discussed briefly in Section 8.1.2*) will need to be given further consideration.

8.4.1 Scenario 1

Short Term

- Consolidation of moorings and future development within the Southern Boatharbour is maximised. Additional marina berths possibly 80 (*dependant on spatial constraints*); and
- Immediate investigation and planning of Marine Precinct at Banora Point and/or Boyds bay Tick Gates site with a marina(s) providing up to at least 120 berths.

Long Term

- Implementation of Marine Precincts at Banora Point and/or Boyds Bay Tick Gates site. Opportunity exists to combine management of Southern Boatharbour and Boyds Bay Tick Gates facilities and share resources/services;
- Tourism/commercial charter vessel marina and public wharf at Jack Evans Boatharbour; and
- Investigation of Future Marina Precinct at Action Sands site.

8.4.2 Scenario 2

Banora Point Marine Precinct is considered NOT feasible

Short Term

- Consolidation of moorings and future development within the Southern Boatharbour is maximised. Additional marina berths possibly 80 (*dependant on spatial constraints*); and

- Immediate investigation and planning of Marine Precinct at Boyds Bay Tick Gates site with a marina providing 120+ berths (*number of berths maximised dependant on spatial constraints*).

Long Term

- Implementation of Marine Precinct at Boyds Bay Tick Gates site. Opportunity exists to combine management of Southern Boatharbour and Boyds Bay Tick Gates facilities and share resources/services;
- Tourism/commercial charter vessel marina and public wharf at Jack Evans Boatharbour; and
- Investigation of future Marina Precinct at Action Sands site to meet projected demands.

8.4.3 Scenario 3

Banora Point Marine Precinct AND Boyds Bay Tick Gates sites are considered NOT feasible

Short Term

- Consolidation of moorings and future development within the Southern Boatharbour is maximised, planning for priority provision of services for yachts given a future power craft bias at Action Sands Marine Precinct. Additional marina berths possibly 80 (*dependant on spatial constraints*); and
- Immediate investigation and planning of Marine Precinct at Action Sands site at Chinderah with a marina providing 120+ berths.

Long Term

- Implementation of Marine Precinct at Action Sands;
- Marina berths at Southern Boatharbour could provide priority to yachts on the basis of a power craft bias at Action Sands Marine Precinct;
- Tourism/commercial charter vessel marina and public wharf at Jack Evans Boatharbour; and
- Investigation of future Marina Precinct expansion at Action Sands site to meet projected demands.

8.4.4 Strategy Flexibility and Land Ownership Issues

The permutations of strategic possibilities are many and can not be specified at this point in time as future external influences will govern the optimum strategic response. However, it highlights the point that strategic options for the provision of centralised multi purpose boating facilities, especially marina style wet berthing arrangements and associated facilities for the Tweed Estuary need to be flexible. The basic conceptual ideas for multi

purpose sites presented represent the most suitable locations for siting marina style developments in the Tweed Estuary but the exact combination or configuration of these sites should remain fluid. They should be able to be implemented to suit changing situations and future demands.

Dialogue with various land owners should be entered into as a matter of priority to develop partnerships that can promote greater certainty in planning and further define strategic options available to the Council. In the case of public owned reserves or currently leased property, and developments that involve water based operations, the Department of Lands (LANDS) should be consulted further as the government agency responsible for the management of minor ports. The proposed concepts for the Southern Boatharbour Consolidation and the Boyds Bay Tick Gates site present an opportunity to work with LANDS to progress these strategic options. The implementation of these two options together as a strategic solution may present possibilities to combine management, resource usage and service provision. With a common land owner the consolidation of planning processes and land negotiations may also provide fewer obstacles in proceeding to the implementation stage.

To facilitate the implementation of programs within the minor ports environment LANDS have been developing a methodology to provide confidence about the likely success of major projects (*a project proposal of benefit to the general community*). The methodology is also aimed at providing confidence to potential private proponents about the level of certainty in the planning process from all perspectives (*government, stakeholder, interest groups and the community*). This is aimed at enabling the continued progression of the project proposal towards implementation and providing a sustainable solution to the problem of increasing pressure from changing demands being placed on minor ports within the NSW coastal zone.

It involves establishing partnerships with local councils and engaging other relevant state government agencies in attempting to achieve a balance between economic, social and environmental outcomes for minor ports improvements.

For areas of private freehold land, especially where further investment is needed to improve facilities, certainty in particular planning outcomes may provide the incentive for private interest in development opportunities. However, communications with private land owners should be initiated early to assess the likelihood of achieving outcomes of mutual benefit.

9 REFERENCES

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** These references are provided in PDF file format accessed from vM8.0 of the visionMAKER™ environment

APPENDIX A
VISIONMAKER™ FILES
