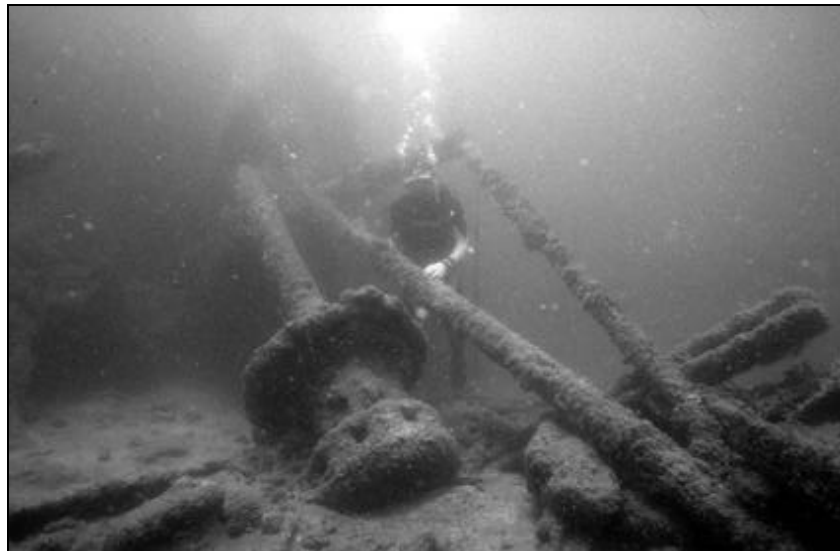


MAGNT RESEARCH REPORT No. 9

March, 2001

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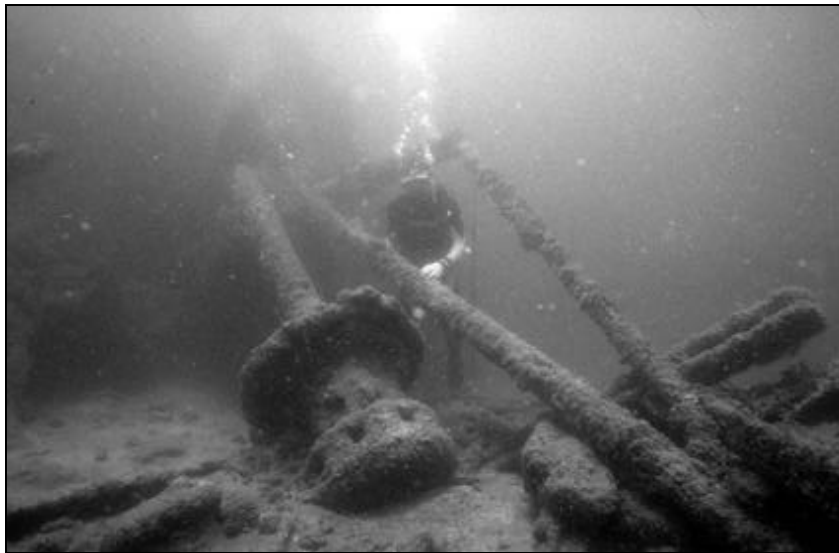


Museums and Art Galleries of the Northern Territory

MAGNT RESEARCH REPORT No. 9, April 2001

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THE HISTORIC SHIPWRECK *AUSTRALIAN*: A PLAN OF MANAGEMENT

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PREFACE

This report is the culmination of an extensive review process in which a series of three draft reports were produced. A first draft of this report was circulated to government agencies and colleagues for review in June 1998. In May and August, 1999, second and third drafts were released for public comment.

Feedback received from government agencies and public groups focused on recommendations relating to site protection and public access. Each successive draft was produced with a consideration of those comments. This was done whilst maintaining an adherence to fundamental heritage management principles.

EXECUTIVE SUMMARY

The history of the shipwreck (including salvage and site visitation)

The *Australian* was a two masted steel steamship built in 1896 by Robert Napier and Sons of Glasgow, Scotland. It was owned and operated by the Eastern and Australian Steamship Company (E&A) as a passenger and cargo vessel. The *Australian* was worked by Australian officers and a Chinese crew.

The *Australian* continuously traversed an extensive circular route which included Adelaide, ports along the east coast of Australia, Palmerston (referred to as Darwin following the Commonwealth takeover in 1911) and finally ports in the Indonesian archipelago and the China Sea. The general route was established, individual ports changing due to shifting management policies and work relating to each individual voyage.

On 17 November 1906, whilst making way to Palmerston from eastern ports, the *Australian* struck Vashon Head reef. An official inquiry concluded that the accident occurred due to a combination of unusual tidal flow and the lack of navigational beacons in the region.

For two years following the accident there was a series of salvage operations and unsuccessful refloating attempts. A public auction of the ship's internal fittings took place in August 1908. In the 1970s, the site was visited by a number of salvors, who, amongst other activities, were responsible for using explosives on the site to remove the condenser of the engine. In 1990 Operation Raleigh, a British-based volunteer organisation, visited the site. In 1996 the MAGNT visited the site as part of a regional maritime archaeology

survey. In this season the museum staff completed a site plan. In 1997, as part of this project, the site was again visited and a more extensive survey conducted.

Design of the *Australian*

The *Australian* had a gross tonnage of 2838 tons; length of 341.7 feet (104.15 m) and a breadth of 42.2 feet (12.86 m).

The steel body of the *Australian* was an advance on iron made hulls, steel being a lighter and stronger material. The triple expansion engine became the dominant steam engine favoured for its fuel efficiency and performance. The coal burning steel boilers allowed higher levels of pressure, which translated into a higher power output. The simple schooner rig of the steamer more likely served as a stabilising feature and emergency propulsion in times of engine failure. The refrigeration engines were 'compressed air' in design, a style that preceded the 'ammonia' and 'carbonic anhydride' types. Though without accurate temperature regulation, the 'compressed air' design was less toxic than later systems.

The *Catterthun* and the *Brisbane* steamship wrecks are useful as a technical comparison with the *Australian*, in order to illustrate various options in design, and indicate evolution in design. For example, the power output of the *Australian* far exceeded that of the *Catterthun* and the *Brisbane* due to the advent of steel boilers.

Site description

The remains of the ship are best understood as consisting of three main sections. These are the bow, the midship-section which rests on the remains of the ship floor and the upright stern counter. Small amounts of debris are located at short distances from this main body of material, however in general these three sections constitute the shipwreck. The wreckage is approximately 110 metres in length and lies in 5-8 metres of water depending on tidal variation.

The superstructure of the vessel has been removed by natural forces. The most noticeable features of the site are the bow, stern section, the boilers and machinery. The machinery includes a windlass, winches, a triple expansion engine, a dynamo and twin refrigeration units. In addition to machinery lower deck construction features are visible, for example remains of the cellular double bottom. Other visible site features include a clipper bow, bowsprit and anchor.

The description of the shipwreck site within this document includes a review of the ship break-up sequence which documents the major changes the ship underwent from its stranding to the present. This includes the refloating in 1907 and the eventual separation of the bow and stern from the midship section.

Site location

The *Australian* is located approximately 220 km NE from Darwin, off the coast of the Cobourg Peninsula. Cobourg Peninsula is a large peninsula of land, approximately 2207 km², and is the most northern region of Arnhem Land. The shipwreck site is located on Vashon Head reef, Vashon Head being a small point of land marking the western entrance to Port Essington.

The Northern Territory experiences two major seasons, a Wet and a Dry season, each following a brief equinoctial episode. The Wet season (November-April) is associated with

high rainfall and cyclonic winds. During this time the winds can change from calm conditions to squalls and cyclonic depressions. Considering these weather conditions the most appropriate time for fieldwork is at the end of the Dry season (May-October), when the conditions are calmest. The sea and swell at Cobourg Peninsula is low to moderate throughout the year, but the area experiences a large tidal range.

Statement of the shipwreck's significance

The *Australian* is historically significant because of its role in facilitating coastal trade between Palmerston and other ports in Australia and in facilitating early international trade between Australia and Asia.

The *Australian* is also historically significant because it was used as a vessel for Chinese immigration and was worked by a Chinese crew. Therefore the history of this steamer contributes to our understanding of the history of Australian immigration and Chinese labour at a time of national debate over non-European immigration and non-European labour.

The *Australian* is the most intact wreck of a steamer located in the Northern Territory and can offer a great deal of archaeological information regarding ship construction and machinery as found on late 19th century steamers. The variety of machinery and ship construction remains, which are in good condition, deem this shipwreck as representative of a class of steamer. Evidence of early salvage and refloating will offer a further level of archaeological data.

The remains of the refrigeration machinery (used in cold cargo storage) demonstrates a technology that markedly changed Australia's export market and most noticeably changed Australia's economic relationship with Britain.

The *Australian* is protected under the Commonwealth's *Historic Shipwrecks Act*.

Management plan – the recommendations

Though the superstructure and a large portion of the hull is absent, what does remain constitutes a shipwreck of technical and archaeological significance. This determined that a management plan with a strong focus on protection and conservation was needed.

Funds to manage the site are limited. Therefore realistic recommendations have been developed with this limitation in mind.

Recommendation 1: that an environmental assessment of the *Australian* be conducted in the near future. This should include an in situ corrosion study. From these results it will then be possible to develop a conservation program that takes a range of variables into account. The CMPPM should stipulate the need for a conservation program and offer partial logistic and/or financial support.

Recommendation 2: that following an environmental assessment a conservation strategy be designed and implemented. The CMPPM should stipulate the need for a conservation program and offer partial logistic and/or financial support.

Recommendation 3: that MAGNT and the NT Parks and Wildlife Commission instigate an ongoing site monitoring program to monitor changes in the site over time. The CMPPM should stipulate the need for this program as part of its commitment towards a conservation program.

Recommendation 4: that select rangers from the NT Parks and Wildlife Commission who work at Gurig National Park, be trained as inspectors under the *Historic Shipwrecks Act*. The CMPPM should indicate approval of this proposal.

Recommendation 5: that the MAGNT and the NT Parks and Wildlife Commission establish a visitor registration system to collect information on site visitation as part of the visitor monitoring program for the CMP. This should be reflected in the CMPPM.

Recommendation 6: that anchoring directly onto the shipwreck be prohibited as a provision of the CMPPM . This restriction should include using the bow or stern as a mooring fixture, when these features are exposed at low tide.

Recommendation 7: that certain items be recovered as they may be stolen. These are the ceramic tiles, the remains of the bone cargo and the brass padlock.

Recommendation 8: that fishing that does not involve anchoring on the site be permitted. Therefore trolling and drifting should continue to be permitted.

Recommendation 9: that an education package be made available at the Black Point ranger station.

Recommendation 10: that information be placed at the boat launch and jetty at Black Point. This will indicate that it is illegal to interfere with, damage or remove an historic shipwreck or related items. This should also include information regarding the prohibition of anchoring on the site. This recommendation should be reflected in the CMPPM.

Recommendation 11: that the brochure on the shipwreck be widely distributed, and in particular made available to visitors at the Black Point Ranger Station. This should be reflected in the CMPPM

Recommendation 12: that there be a consistent inclusion of information about the shipwreck in publicity and publications dealing with the recreational and historic resources of Gurig National Park and the CMP. This should be reflected in the CMPPM.

Recommendation 13: that further non-disturbance survey work be conducted to increase overall knowledge of the site. Particular attention may focus on the midship area.

Recommendation 14: that the machinery and important aspects of ship construction be recorded in greater detail. Aspects of ship construction include the propeller housing, cellular double bottom and the clipper bow.

Recommendation 15: that further survey work include the search for evidence of salvage and refloating repairs.

Recommendation 16: that a small excavation in the stern section be conducted to reveal how the propeller was removed during salvage.

Recommendation 17: that a probe survey east of the exposed material be conducted to indicate the extent of buried material.

Recommendation 18: that a detailed comparison between the technology and archaeology of the *Australian* to similar steamer wrecks be conducted.

Recommendation 19: that records relating to the *Australian*, whilst it was at ports other than Darwin, be collected. This may include customs and port authority documentation from outside of Australia.

Recommendation 20: that the experiences of ethnic or foreign crews on early Australian steamers be investigated, using the *Australian* as one example. The *Australian* had a Chinese crew, visited Asian ports and brought Chinese immigrants to Australia, all during a time of national debate over non-European immigration and non-European labour.

Recommendation 21: that research into the natural significance of this site be encouraged by both the MAGNT and the NT Parks and Wildlife Commission. One example of this kind of work is a marine biological survey of the site. This recommendation should be reflected in the CMPPM.

Administrative strategy

This report contains an administrative strategy. In brief the administrative strategy repeats established policies and suggests objectives. An example of a policy relates to the authority of the delegate of the *Historic Shipwrecks Act* in the management of the site. An example of an objective is the inclusion of key site management recommendations in the CMPPM.

Cobourg Marine Park and Gurig National Park

This report contains a brief explanation of the history and present status of these parks. It highlights some key areas in possible research in maritime archaeology within the geography of the parks. The report also explains the reasoning behind the close involvement of the Parks and Wildlife Commission in site management recommendations.

A guide for those departments participating in the management of the site

This report contains a practical guide for those government departments which may become involved in the management of the *Australian*. It gives a practical review of the *Historic Shipwrecks Act*. This report also includes a discussion on the Historic Shipwrecks Program and a review of other relevant Territory and Commonwealth legislation.

Historic shipwrecks located in marine protected reserves

As the *Australian* is located within a marine park this chapter cites examples of other historic shipwrecks protected under various marine park or marine reserve legislation.

The *Yongala* (1903-1911) is located in Queensland and is protected under both the *Historic Shipwrecks Act* and the *Great Barrier Reef Marine Park Act 1975* (Cwlth). Situated within a Marine Park B zone it is illegal to damage or remove any cultural or natural material from the site under the *Great Barrier Reef Marine Park Act*. The *Clan Ranald* (1900-1909) is located in South Australia within the Troubridge Hill Aquatic Reserve which was established under the *Fisheries Act 1982* (SA.). The reserve was established to protect benthic organisms. The removal of shell, sand or plant life is illegal, resulting in the prohibition of dredging.

1997 fieldwork details

This section explains the aims and methodology of the fieldwork. The aim of the fieldwork was to conduct a non-disturbance survey of the visible remains of the shipwreck. An understanding of site formation and site deterioration was to be developed and key environmental factors that effect material remains identified. Due to restrictions in time and personnel the methodology of survey was simple and aimed for a broad impression of the site with a limited degree of accuracy. The result therefore serves as a good beginning to further more detailed survey work.

This section also lists the dive team and details the boat and diving policies. It also lists fish species observed on the site.

Historical and technical details of the *Australian* steamship

This section lists basic information on the ship's history and design.

ACKNOWLEDGMENTS

I would like to thank those people who have contributed to this report.

Alan Withers, Libby Stirling, Rowan Marshall and Mark Ingram, from the NT Department of Parks and Wildlife, who participated in the 1997 fieldwork. The ongoing support of the rangers based at Black Point ranger station greatly contributed to the success of the fieldwork. I would also like to thank the Department of Parks and Wildlife specifically for their contribution of personnel, equipment and accommodation during the fieldwork.

Thanks also go to John Riley who participated in the fieldwork and contributed significantly to the site survey and the development of a site plan; once again his expertise in steam and iron shipwrecks proved invaluable.

Thanks also to Silvano Jung for his ongoing advice and for his assistance in graphic design. Also thanks to Nova Graphics for its contribution to graphic design, and Barbara Bowden, Lorna Gravener and Dirk Megirian for proof reading and assistance in production.

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CONTENTS

List of abbreviations.....	12
Glossary of terms	12
Chapter 1: The role And scope of this plan	15
The history of the shipwreck; design of the <i>Australian</i> ; site description; site location; statement of the shipwreck's significance; the recommendations; administrative strategy; a guide for those departments participating in the management of the site; historic shipwrecks in marine protected areas; 1997 fieldwork details.	
Chapter 2: The <i>Australian</i> - related histories	16
Napier shipbuilders; the Eastern and Australian Steamship Company; the working life of the <i>Australian</i> ; stranding of the vessel and consequent events; the <i>Australian</i> steamship in relation to the developing maritime economy of Australia; a review of previous site visitations.	
Chapter 3: The design of the <i>Australian</i> steamship.....	37
Introduction; overview; sails and rigging; the steamer's structural design; machinery and systems.	
Chapter 4: The significance of design: a review of design features in relation to technical invention of the period	46
The significance of design; the <i>Australian</i> steamship, a technical comparison with the <i>Brisbane</i> and the <i>Catterthun</i> .	
Chapter 5: Site description and archaeological Information.....	53
Site location and description of the area; site formation sequence; site description; site deterioration; environmental conditions.	
Chapter 6: Assessment of the site's significance.....	69
Preamble; historic significance; technical significance; social significance; archaeological significance; scientific significance; interpretative significance; rarity significance; representative significance; statement of significance.	
Chapter 7: Management policies and relevant issues.....	73
Preamble; management of the <i>Australian</i> through provisions stipulated in the marine park plan of management; the preservation of material remains;	

protective legislation; the impact of development; site identification for passing traffic; visitation to the *Australian*; interpretation material on the *Australian*; artefacts and records; research.

Chapter 8: Management recommendations - implementing policy	82
Preamble; the preservation of material remains from natural forces; the preservation of material remains from human threats; interpretation; research.	
Chapter 9: Administrative Strategy	85
Established policies; Objectives.	
Chapter 10: Cobourg Marine Park and Gurig National Park	86
Establishment of the parks; the archaeological resource of Cobourg Peninsula; the reasoning behind the involvement of the Parks and Wildlife Commission in site management.	
References	88
Appendix 1: A Guide for departments participating in the management of the <i>Australian</i> site	91
Appendix 2: A discussion on the <i>Yongala</i> and the <i>Clan Ranald</i> shipwrecks	97
Appendix 3: 1997 field work details	99
Appendix 4: Historical and technical details of the <i>Australian</i>	101

List of Figures

Fig. 1. Robert Napier	16
Fig. 2. David Napier	16
Fig. 3. The <i>Persia</i> at Napier shipyard, Govan, 1855	17
Fig. 4. The E&A flag	18
Fig. 5. The route of the <i>Australian</i>	23
Fig. 6. Operational Raleigh site sketch	35
Fig. 7. MAGNT site sketch, 1995	36
Fig. 8. The <i>Australian</i>	37
Fig. 9. Sail plan of the <i>Australian</i>	38
Fig. 10. Plan view of the <i>Australian</i>	39
Fig. 11. An example of cellular double bottom design	40

Fig. 12. An example of a compound engine.....	40
Fig. 13. An example of a double ended boiler	42
Fig. 14. The stern section of a similarly designed single screw steamship.....	42
Fig. 15. Diagram of a closed air refrigeration system.....	43
Fig. 16. A steam driven winch.....	44
Fig. 17. A steam driven windlass.....	44
Fig. 18. Bow of a steamship with davit structure to hold anchor.....	45
Fig. 19. The <i>Black Prince</i>	47
Fig. 20. The <i>Great Britain</i>	47
Fig. 23. Location of the site.....	53
Fig. 22. Site formation sequence	55
Fig. 23. Site plan of the <i>Australian.</i> , 1997.	58
Fig. 24. The remains of the bow	59
Fig. 25. The anchor <i>in-situ</i>	59
Fig. 26. The capstan and anchor crane <i>in-situ</i> , located at the bow.....	60
Fig. 27. The forward winch <i>in-situ</i>	61
Fig. 28. The port bilge keel <i>in-situ</i>	62
Fig. 29. Frontal view of similar boilers, a general guide	63
Fig. 30. The low pressure cylinder section of the propulsion engine <i>in-situ</i>	64
Fig. 31. The high and intermediate pressure cylinders section of the propulsion engine <i>in situ</i>	64
Fig. 32. The dynamo <i>in-situ</i>	65
Fig. 33. A refrigeration unit <i>in-situ</i>	65
Fig. 34. Aerial photograph of the <i>Australian</i> ; the bow, boilers and stern are visible.....	78
Fig. 35. Visitors to the site, 1997.....	78
Fig. 36. Seasonal visitation to Gurig National Park	79
Fig. 37. Annual visitation to Gurig National Park.....	79

List of Tables

Table 1. Wrecked E&A ships.....	21
Table 2. Technical comparison: <i>Australian</i> , <i>Catterthun</i> and <i>Brisbane</i> steamships	51

LIST OF ABBREVIATIONS

AIMA	Australian Institute for Maritime Archaeology
A.S.N	Australasian Steam Navigation Company
B.I.	British India Steam Navigation Company. Some authors refer to this company as the British India Company.
CMP	Cobourg Marine Park
CMPPM	Cobourg Marine Park Plan of Management (draft). The CMPPM may eventually be amalgamated with the Gurig National Park Plan of Management (GNPPM). If this occurs recommendations in this report that refer to the CMPPM would refer to the amalgamated version.
E&A	Eastern and Australian Mail Steamship Company. In various references that I used, this company was also referred to as the Eastern and Australian Mail Steam Company. I have referred to the company by the name used during the operational period of the <i>Australian</i> .
GBRMP	Great Barrier Reef Marine Park
GNPPM	Gurig National Park Plan of Management (draft).
HP	High pressure (cylinder)
IHP	Indicated horse power
IP	Intermediate pressure (cylinder)
Knts	Knots
LP	Low pressure (cylinder)
MAGNT	Museums and Art Gallery of the Northern Territory
nhp	Nominal horse power
NTT&G	<i>Northern Territory Times and Gazette</i>
N.T.	Northern Territory of Australia
P&O	Peninsular and Oriental Steam Navigation Company
PWCNT	Parks and Wildlife Commission of the Northern Territory
psi	Pounds per square inch

GLOSSARY OF TERMS

aft peak tank	A water storage tank located at the extreme stern end of the hold of a vessel.
anchor chain locker	A trunk which stores the anchor chain or cable.

anchor crane	A crane positioned on the fore-deck and used to raise and lower the anchor between the deck and the hawse pipe.
bilge keel	Fitted in pairs they sit on the outside of the bilge and lessen the rolling of the ship.
boiler bearers	The supportive rests that a boiler sits on.
bollard	A deck fixture used for securing the boat to jetties etc. It is a supportive frame with vertical spools.
Bowsprit	The spar projecting from the bow of the ship.
bulkhead	A partition between below-deck sections.
capstan	A cylindrical barrel located in the fore-deck area. It is driven mechanically and directs the chain of the anchor.
cellular double bottom	A water ballast reservoir, positioned on top of the ship's floor, whose cannels are cellular in design.
compressed air refrigeration	The air refrigeration system most likely used on the <i>Australian</i> to transport chilled food.
condenser	The section of the steam engine that condenses steam to water.
derrick	A mechanism for hauling cargo, in which a crane- like system is secured on deck, in some cases supported by a mast.
double-ended boiler	A boiler with a separate furnace at each end. The design was to increase power with an attempt to keep size increase to a minimum.
dynamo	A machine that converts energy to electricity.
fairleads	A board with holes in it to allow rigging or line to run through.
feed water filters	The machinery that filters oil and other impurities from the water that leaves the condenser to return to the boilers.
fore-deck	The forward section of the deck.
forepeak tank	A water storage tank located at the extreme fore-end of the hold of the vessel.
gross tonnage	The tonnage measurement which includes both the cargo capacity and the ship's dead weight (own weight).
gunwale	The side of the hull which rises above the upper-deck.
hawse pipe and hawse hole	The hawse hole is located in the bow area near the stem. The anchor chain feeds into the ship through the hole. The hawse pipe leads from the hole and supports the chain from chaffing the internal fittings.

life boat davits	A life boat storage and access system where vertical poles support a pulley system. The lifeboats are stored in a upright position on the deck.
moulding lines-	Distinctive structural lines that run horizontally yet follow the curvature of the hull.
mizzen mast	The rear mast
port	Left side
propeller hub	The hub or nut which holds the propeller blades in place.
sheerstrake plating	Uppermost hull plating
stanchion	A fixed upright support.
starboard	Right side
stringer internal	Supportive frames that are positioned horizontally along the hull.
supportive stays	Bars placed to give support and fix feature in position.
triple expansion engine	A steam engine in which the steam is expanded in three consecutive stages.
warping ends (winch)	The round spools on a winch that feed the chain.
water-line theory	John Riley's theory that an iron ship that sinks upright on sand will become buried in that sand to about the level of its waterline.
winch	Steam driven pulley machine used to haul cargo and deck features
windlass	A large winch used for heaving the anchors.

CHAPTER 1: THE ROLE AND SCOPE OF THIS PLAN

The *Australian* is a shipwreck protected under the Commonwealth's *Historic Shipwrecks Act 1976*. It is located along the northern coastline of Cobourg Peninsula within the Northern Territory.

The aim of this plan of management is to assess the significance of the shipwreck, to investigate what the relevant issues are in relation to the management of the site and to put forward a series of recommendations regarding its future management.

These recommendations have been reached via the following process:

- (i) the collection of data
- (ii) an assessment of the site and the development of a statement of significance which codifies the position of MAGNT
- (iii) a discussion of policies and issues relevant to the management of the site
- (iv) development of the recommendations, based on the previous three stages.

It is important to note that each phase builds on information and reasoning gathered and developed in previous phases.

Archaeological fieldwork and historical research was conducted to produce this management plan. During this process the author became aware of further directions that research could take. It was beyond the role and scope of this project to conduct this further research, however these proposals are briefly discussed.

This plan includes additional chapters which will serve as a resource for government departments that may be involved in the management program. This includes, for example, a discussion of the *Historic Shipwrecks Act*. Therefore a secondary role of this plan is to serve as an ongoing resource in the management of historic shipwrecks.

The implementation of a management program is subject to the resources available. Management recommendations have been developed with these financial restrictions in mind. In response, one strategy has been to support the ongoing participation of the NT Parks and Wildlife Commission in the management of the shipwreck.

This management plan has been funded through a grant from the Commonwealth Department of Communications and the Arts. The Historic Shipwrecks Program was administrated by this Department until November 1998. Following this the program was transferred to the Commonwealth Department for the Environment and Heritage.

The delegated authority of the *Historic Shipwrecks Act* in the Northern Territory is the Director of the MAGNT.

CHAPTER 2: THE *AUSTRALIAN* - RELATED HISTORIES**2.1. Napier Shipbuilders**

The *Australian* was built by Robert Napier and Sons which was based in Glasgow, Scotland. Robert Napier was referred to by many contemporaries as the 'father' of Scottish engineering (Shields 1947: 42). Such praise was justified, as many important figures in the development of marine steam engine technology in Britain had at some point worked and trained under Napier.

Napier Engineers, eventually renamed Robert Napier and Sons, was founded by cousins Robert and David Napier (Figs 1, 2). These men were born into a family legacy of iron engineering. The fathers of both David and Robert were blacksmiths, David's father also being an iron founder. Robert's brother James and his cousin William were engineers and boiler makers. Thus David and Robert were, early in their lives, exposed to skills related to steam and iron technologies.

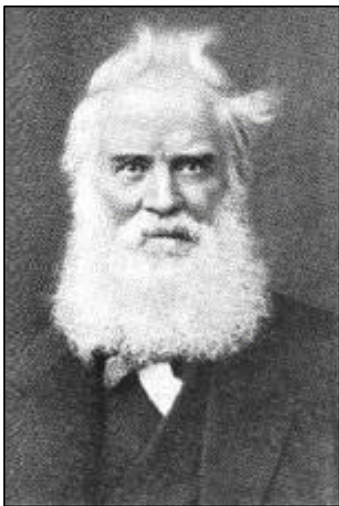


Fig. 1. Robert Napier (Shields 1947: 53)

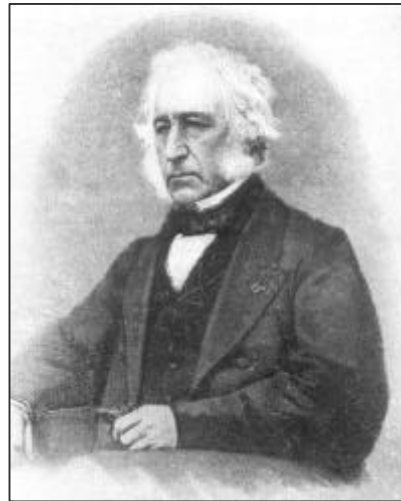


Fig. 2. David Napier (Shields 1947: 53)

David was the founding engineer of the company, whereas Robert was the more business minded man. David built his first steamship, the *Marion* (57 tons), in 1816 (Shields 1947: 35). David left the company in 1836 to work in London (Shields 1947: 40). The notion of Robert Napier being more the businessman than the engineer is supported by Shields, who states that the capabilities of Robert as an engineer depended heavily on those who worked for him (Shield 1947: 43).

Until 1843 Napier built only steam engines, working in conjunction with a ship builder. But in this year, under the guidance of Napier's chief engineer William Denny, Napier built the *Vanguard* with a gross tonnage of 700 tons (Shields 1947: 47). The vessel was praised by the critics, and orders for more vessels came in. Napier Engineers expanded. Napier's expansion included shipyards at Govan and Middleton. Interestingly the company also purchased the Parkhead Forge giving Napier control over iron production. This was the peak for Napier Engineering with orders coming from Russia, Turkey, France, India and elsewhere (Shields 1947: 51). In 1853 Robert Napier's sons joined the company, and the title was changed to Napier and Sons (Shields 1947: 51).

The distinctive clipper bow of the *Persia* was a trademark of Napier shipbuilding, an aesthetic feature also found on the *Australian* (Fig. 3). Ironically the E&A became remembered for operating a number of steamers with this feature. It is interesting to note that, despite a consensus that a clipper bow on these steamer was an aesthetic feature only, a clipper bow did save the *Persia*, allowing it to ride over an ice barrier (Hume 1975: 24-26).

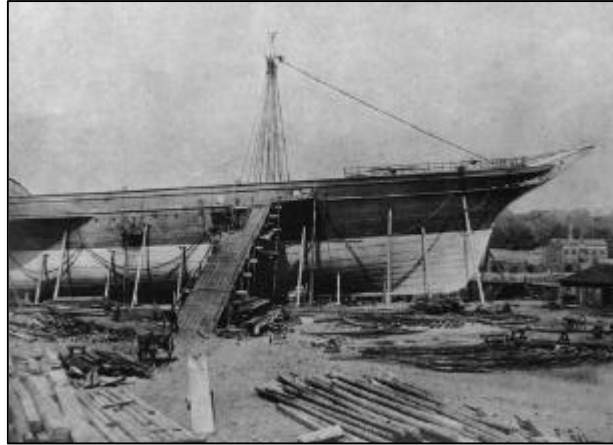


Fig. 3. The *Persia* at Napier shipyard, Govan, 1855 (Hume 1975: 25)

Robert Napier died in June 1876, aged 86 years, and the management of the company was handed to engineer A.C.Kirk. Kirk was the engineer to whom was attributed the design of the first deep sea commercial steamer with a triple expansion engine, the *Propontis*, built by Randolph Elder and Co. (Gardiner 1993: 107). Kirk was also an early pioneer in using steel in ship construction, engineering the *Paristian*, the first steel steamer to cross the Atlantic Ocean (Shields 1947: 51). The ability of steel boilers to produce higher levels of pressure and so, in turn, capable of fully utilising compound steam engine technology was an advantage early appreciated by Kirk and Elder.

However Kirk's greatest success was the *Aberdeen* which was powered by a triple expansion engine and was built in 1881 by Napier and Sons. The *Aberdeen* could produce over 2600 IHP with steam at 125 psi (Gardiner 1993: 107). The true value behind the design was the ability of the engine to utilise the available high pressure steam and available exhausted steam efficiently, translating to 'if the ship travelled at 13 knots in the open ocean it would burn less than 40 tons of coal a day'(Gardiner 1993: 108).

The success of the *Aberdeen* helped convince other ship owners that this kind of engine design was the next step from two stage compound steam engines. In 1883 Napier built two Kirk designed engines for the steamers *Oaxaca* and the *Tamaulipas*, the largest steamers of their time, each with a 60 inch stroke and a working pressure of 135 psi (Gardiner 1993: 109).

The *Australian*, being built in 1896, came after the peak of Napier and Sons. However, the role of Napier in early steam ship innovation should not be undervalued. Napier was an early steam ship engineering company that favoured innovation and creativity and so contributed significantly to a dynamic period of technological development and ship construction.

2.2. The Eastern and Australian Steamship Company

Introduction. E&A was a small British-owned shipping company that contributed to the development of international trade between Australia and Asia and coastal trade between Palmerston (Darwin) and other Australian ports. Based in Sydney, the small fleet of steamers travelled extensively, operating in new territories and working in unestablished trade. The E&A fleet transported passengers and cargo across a route that spanned along the southern, eastern and northern coasts of Australia and through Asia. The fleet also brought Chinese immigrants to Australia.



Fig. 4. The E&A flag. (Olson 1976: 110)

The E&A was created in 1873 to service a contract advertised by the Queensland Government. The contract involved short cutting the standing mail service from Britain to Australia, ensuring that Queenslanders received their mail more regularly. This contract was short lived however the company managed to always subsidise its costs by gaining mail carrier government subsidies throughout its existence. The company went through three liquidated forms, eventually becoming absorbed into the B.I. a subsidiary of P&O, immediately following the first World War (Laxon 1963: 8).

The Queensland mail contract, the Torres Strait route and trade with Asia. The P & O held a long standing contract to work the mail service from Britain and Europe to Australia. From Ceylon (Sri Lanka) the service reached Albany, Port Adelaide, Melbourne and Sydney (Olson 1976: 3). The company first offered this service in 1853, failed a year later but reinstated a service in 1858 (Bach 1967: 110, 147). The earlier route required overland passage at the Suez, linking the Mediterranean Sea and the Indian Ocean. The creation of the Suez Canal in 1869 eliminated the need for an overland route however P&O were only permitted to transport mail through this canal in 1874 (Bach 1976: 148).

These steamers would sail from Britain, through the Suez Canal, and hug the coast of India to Ceylon. From Ceylon the steamers continued down the west coast of Australia, along the southern coast, and then north travelling up the east coast. Queensland would experience delays from up to a month from when the mail steamers reached Albany to when they finally reached Queensland (Olson 1976: 3). The colony of Queensland decided to establish a more regular mail service for itself. Its government had also recognised the trade opportunities inherent with a short route to Asia, this recognition shown in the 1860s when the colony entered into a short-lived funding venture with the Netherlands government to offer subsidies to Dutch shipping companies (Campo 1991: 1). Thus the

Queensland government offered a subsidy for a service to pick up mail at Singapore, from P&O steamers, make way through the Indonesian archipelago and the Torres Strait, reaching the north coast of Queensland. The 'Torres Strait route' to north-east Australia had been a discussion point amongst politicians and businessmen of the colony since the 1840s (Nicholson 1996: 225).

The itinerary for this route was assigned as part of the terms of the mail contract. The designated ports of call were: Singapore, Batavia, Sourabaya, Somerset (a British post in the Torres Strait), then the Queensland regional ports Cardwell, Bowen and Gladstone, reaching Brisbane and finally Sydney. Shortly after the commencement of the contract Hong Kong was added as a port of call (Hardwick 1983: 2). Other conditions of the contract were schedule requirements and the ability to maintain each steamer at an acceptable safety and performance standard. Eventually ports in mainland China and Japan were added to the itinerary. The E&A service offered Queensland a fortnightly mail service with Britain (Olson 1976: 7).

This contract provided Brisbane and regional Queensland ports with their own mail service. The contract subsidised E&A whilst it developed a small but lucrative niche in Australian coastal trade and the Asian trade. This was a remarkable opportunity when one appreciates the variety of ports and opportunity for new markets. The ability for the company's directors to foresee the lucrative Asia trade through the Torres Strait route is best shown in this excerpt from a shareholders meeting in 1874:

the progress of the trade between the East and Australia is realising the expectations formed of it, the steamers having had on more than one occasion to shut out cargo, not only in China but also Singapore (Hardwick 1983: 4).

The foresight to appreciate the trade possibilities in Asia went hand in hand with the ingenuity required to plot a regular route through the poorly charted waters of the Torres Strait. Sail ships and steamers had of course travelled this route before the E&A was established. The area experienced activity from the 1860s with the growth of the pearl industry. In turn the British settlements of Somerset, established in 1864, and then replaced by Thursday Island in 1877, indicated the intention of Queensland to provide assistance to all traffic along the route. However the E&A service was one of the first fleets that regularly made way through these waters as part of an established itinerary. Nicholson reflects that the E&A service was the first with a structured 'reef pilot' program, an official response to the unfamiliar waters (Nicholson 1996: 386). Foley also recognises that a significant majority of pilots who were employed by other companies in these early days were originally from E&A (Foley 1982: 34,29). In turn he reflects that it was the E&A ship the *Sun Foo* which in 1874 completed the earliest known full-length pilotage of the Barrier Reef from Brisbane to Torres Strait (Foley 1982: 27).

The slow development of the Torres Strait as a popular route was due, partially, to the lack of coal and wood to fuel the inefficient early steamers (Nicholson 1996: 234). Thus a regular use of the channel awaited developments in engine efficiency and performance.

In 1880, when the contract came up for renewal, E&A lost it to the larger B.I. This rival offered a direct link between Queensland and Britain (Laxon 1963: 4). In turn this larger company would eventually develop a more popular cargo trade through the Torres route (Lewis 1973: 45). The loss of the contract was steeped in controversy. Olson argues that the loss occurred because of disputes regarding ports of call and the size of the subsidy (Olson 1976: 18). Lewis suggests there was more involved, arguing that B.I. had close

political and commercial ties in Queensland (Lewis 1973: 45). He states that one year before the contract came up for renewal, McIlwraith, the premier of Queensland, was already deliberating details with B.I. (Lewis 1973: 45). The Liberal Opposition challenged this move, fearing a shipping monopoly, the kind a large conglomerate company like BI could create (Lewis 1973: 45). The loss of this contract sent E&A into its first voluntary liquidation (Olson 1976: 18).

The South Australian mail contract. In 1880 the second company was formed. With this came the delivery of two new vessels, the *Catterthun* and the *Tannadice*. The following year saw the E&A awarded a mail contract from the South Australian government, to run a service between Adelaide and Palmerston. In this same year (1881), the *Brisbane* was wrecked, stranding at Fish Reef near Palmerston, inward bound from Hong Kong (Laxon 1963: 5). The E&A had, by this time, extended its service to Melbourne and Adelaide; Palmerston officially becoming a part of the South Australian colony considerably earlier in 1865 (Powell 1982: 77). In 1911, when the Commonwealth took control of the Northern Territory, Palmerston become known as Darwin. This contract continued until World War 1 when the E &A ships were commissioned for active duty (Olson 1976: 23).

By 1884 all of the steamers from the original company had been replaced with faster, more efficient and therefore more financially lucrative ships. In addition to the *Catterthun* and the *Tannadice*, the *Airlie* and the *Guthrie* were purchased and placed into service. The ports of call for this fleet were: Japan, Shanghai, Hong Kong, Manila, Thursday Island, Townsville, Bowen, Brisbane, Sydney, Melbourne and Adelaide. The port of Singapore had been removed from the route to make way for the more lucrative Chinese passenger and trade market (Olson 1976: 22). It was also removed as now the company no longer serviced international mail. The E&A company was developing a strong trade service with Asian ports and did lucrative business servicing Chinese immigration to the colonies. In June 1894 for reasons that are unclear, the second company was liquidated, but by July the third company was formed (Olson 1976: 23).

The third company and the purchase of the Australian. The 1890s saw the development of strong competition in the trade through the Torres Strait to Asia, particularly from the China Navigation Company which offered the east coast of Australia a similar passenger and freight service (Laxon 1963: 6). By this time French and German services were also connecting Asia to the colonies of Australia (Olson 1976: 26). Due to this period of competition, and because of the loss of the *Catterthun* in 1895, the company reviewed its fleet. Over the next few years E&A introduced the *Australian*, the *Eastern* and the *Empire*. These new steamers returned the E&A to a competitive level.

The *Australian*, at 2838 tons, was the first steel steamer of the fleet and also the first with 400 nhp (Laxon 1963: 7). The *Eastern*, built in 1899, was 3,586 tons with 469 nhp (Laxon 1963: 7). The *Empire*, built in 1902, was 4497 tons with 613 nhp (Laxon 1963: 7). These ships demonstrated a return to the clipper bow trademark of the early E&A vessels (previous examples being the *Guthrie* and *Airlie*). The *Australian* and the *Eastern* were both built by Napier and Sons. The *Empire* was built by Beardmores, a company associated with Napier. Following the wreck of the *Australian* the company purchased the *Aldenham* originally built in 1894 for the Aberdeen Line. The *Aldenham* was also built by Napier and Sons (Laxon 1963: 7).

Following the death of a major shareholder named Guthrie in 1900, there was dispute amongst the shareholders as to the company's future (Olson 1976: 28). The shipping

industry was becoming the domain of large conglomerate companies and the era of the small shipping company was over. The E&A resisted an initial buy-out offer from the B.I. (a subsidiary of P&O), but by the end of World War 1 they eventually sold to the P&O group (Olson 1976: 28).

The use of Asian crews in the E&A company. The E&A steamers operated with Australian officers and Asian crews, predominantly Chinese, whilst servicing Asian immigration. This occurred during a period in Australia of restrictive regulations dealing with non-European labour and non-European immigration. One clear example of this is the regulations relating to the Commonwealth's *Immigration Restriction Act 1901*.

Particularly relevant to maritime working conditions, in 1878 European seaman and dock workers who worked for the Australian owned Australasian Steam Navigation Company (A.S.N), staged a strike in Sydney and Brisbane, protesting the use of cheap Asian labour. The strikers gained public support, and the protest ended only after violence was threatened. The experiences of both the Chinese crew and passengers aboard these ships is of social and historical importance.

Conclusion. E & A was a small shipping operator that contributed to the trade and passenger service between coastal ports in Australia, and was a pioneer in the development of trade with Asia. Laxon argues that when the company first worked its route, north Queensland and the Torres Strait were poorly charted and at times treacherous waters (Laxon 1963: 2). He commends the pioneering spirit of the company by arguing its route was 'poorly navigated, dealing in a trade that was mostly untried'. This was certainly true on both counts. The first ocean-going vessel at Port Kennedy, an early British base on Thursday Island, was the mail steamer the *Brisbane* in 1878 (Nicholson 1996: 260). Perhaps reflecting the difficult route travelled over the course of the company's history, six ships had been lost (Table 1).

Table 1. Wrecked E&A ships (Olson 1976: 22-23)

Ship	Year built, location of wreck and year
<i>Queensland</i> -	built 1875, wrecked Wilson's Prom. VIC. in 1876
<i>Singapore</i> -	built 1874, wrecked off Keswick Island, QLD in 1877
<i>Brisbane</i> -	built 1874, wrecked on Fish Reef, NT in 1881
<i>Normanby</i> -	built 1874, wrecked, bound for Manila in 1893
<i>Catterthun</i> -	built 1881, wrecked on Sea Rocks, N.S.W in 1895
<i>Australian</i> -	built 1896, wrecked Vashon Head, N.T in 1906

2.3 The working life of the *Australian*

Introduction. The *Australian* joined the E&A fleet as the first of a new wave of steamers and it was described at the time as the pride of the fleet. It was the company's first steel steamer, and the first with 400 nhp capacity, giving the vessel a tested speed of 15 knots. The steamer was also given a warm welcome from the local Palmerston press, who referred to the vessel as the 'finest ship that has entered this port in many years' (NTT&G 31 July 1896). This report also describes the steamer as being 'beautifully furnished' and with 'electric light throughout'. The *Australian* had accommodation facilities for 70 first class passengers, 35 second class passengers and an unspecified number of places for steerage class passengers (NTT&G 31 July 1896). The E&A fleet was serviced by Australian officers and Asian crews.

The *Australian* and the other steamers of the fleet travelled a long route, which began in Adelaide and ended in Japan. Although the steamers generally ran the same route particular ports may have differed depending on the work and contracts of each voyage. At any one time the fleet would be dispersed across the east coast of Australia and the China Sea.

The ports of call. The E&A fleet worked a common route that changed over time reflecting changes in business interests and contracts. In addition the ports of call for each voyage would differ depending on the available work. Therefore attempts to determine the exact itinerary of the *Australian* are misguided, the problem exacerbated by secondary references that are vague and contradictory. However it is a useful task to produce at least a general view of the fleet's route during the time that the *Australian* was operational.

By the time the *Australian* joined the fleet Singapore and Java had been excluded as ports of call (Hardwick 1983: 5). He explains that the removal of Singapore was to allow the company to focus on the 'more profitable China trade'. Singapore and Java were first introduced as ports during the earlier held Queensland mail contract.

In the early 1880s the E&A fleet called at: Japan (no specific port given in this reference), Shanghai, Hong Kong, Manila, Thursday Island, Townsville, Bowen, Brisbane, Sydney and Melbourne (Olson 1976: 22). The continuing inclusion of small regional Queensland ports like Bowen and Townsville, after the loss of the Queensland mail contract, is an interesting aspect of the itinerary (Olson 1976: 22). This must indicate that following the period of the contract the company continued to make profitable trade through these ports. Bach refers to regional Queensland ports as being profitable and highly competitive (Bach 1976: 251). These ports were kept in business from the rich hinterland industries. For example, the *Australian* transported chilled foods to Asia from producers in Australia, and Bach states that Queensland produced a great deal of meat for this industry (Bach 1976: 195).

Olson lists another itinerary, which seems more likely to have been that used during the operational period of the *Australian* (Olson 1976: 22). This association is based on other references and links Olson makes between the route and the period in question. These ports include: Adelaide, Melbourne, Sydney, Brisbane, Townsville, Cairns, Cooktown, Darwin, Timor, Manila, Hong Kong, Foochow, Shanghai, Moji, Kobe and Yokohama. These ports make up the itinerary mapped in Figure 5.

A difference in this itinerary (Fig. 5.) to what occurred in practice would relate to whether smaller ports were visited during individual voyages and when Foochow (Fuzhou) was introduced as a port of call. In general, any attempt to reveal a set route is misguided, because the *Australian* may have called at different regional ports depending on work specific to that voyage.

The duration of the route. From the newspaper reports of the *Australian's* incoming and outgoings at various ports it is possible to piece together an understanding of the time it took to complete legs of the route. These estimates are extremely broad. They do not account for weather conditions affecting speed or delays at each port. Nevertheless, to complete the journey from Hong Kong to Palmerston, with stops at Manila and Thursday Island, the *Australian* took approximately 10 days (NTT&G 14 December 1900). This voyage can be broken down to finer estimates with references indicating that Palmerston to

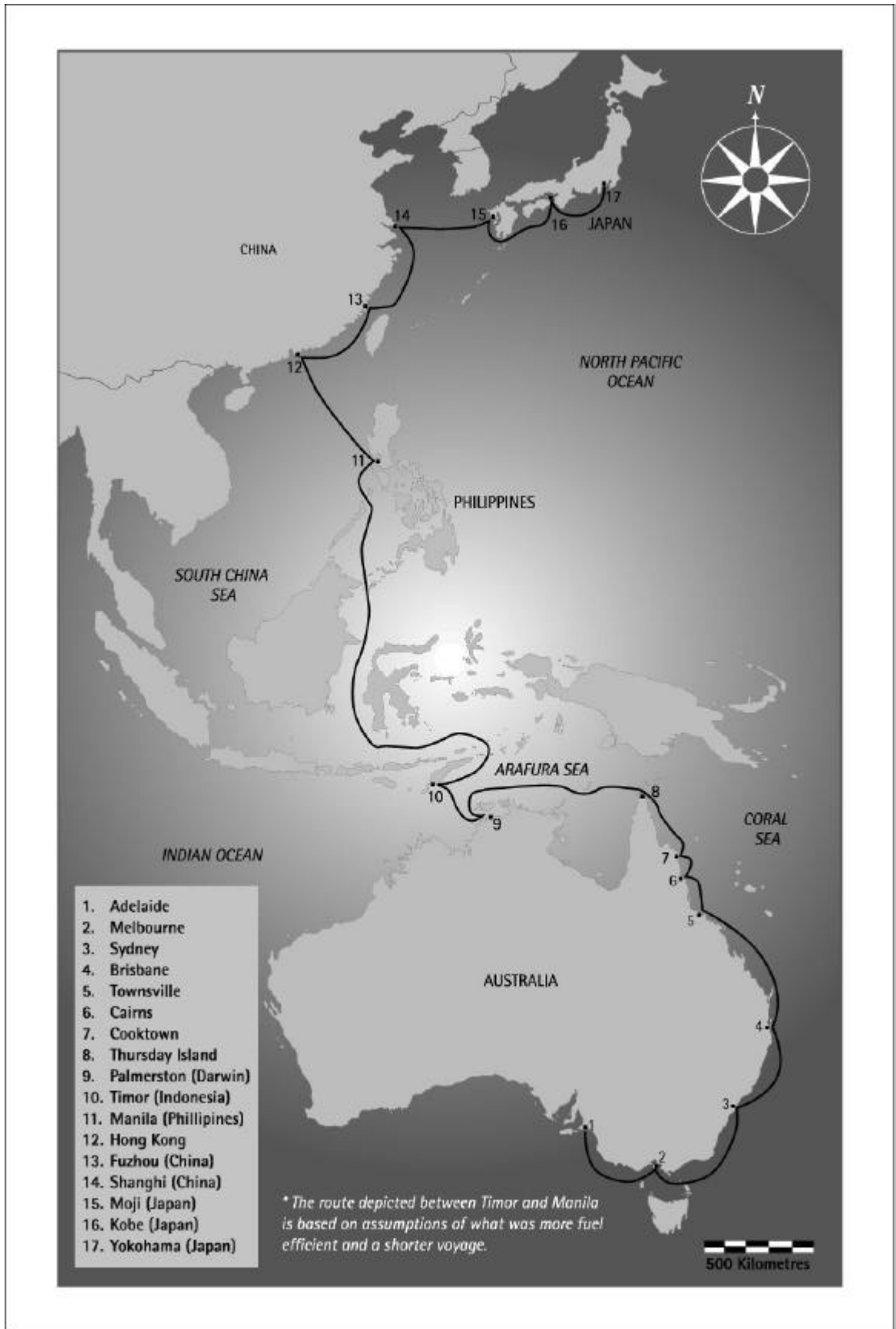


Fig. 5. The route of the *Australian* (Nova Graphics 1997).

Thursday Island took 6 to 8 hours and Palmerston to Timor took 36 hours (NTT&G 31 July 1896). From Adelaide the *Australian* took approximately 5 days to reach Sydney and then transferred passengers and cargo crew before leaving port (NTT&G 19 February

The voyage from Sydney to Palmerston took approximately 10 days (NTT&G 11 December 1896). From these references it can be stated that the *Australian* took approximately 25 days to reach Hong Kong from Adelaide.

Visits to Asian ports. The recorded experiences of crews and passengers aboard these steamships that travelled to Asia at the turn of the 19th century provide fascinating insights. This extract from the local Palmerston newspaper tells the story of Mr Tully, manager of the Palmerston Commercial Bank, who went for a holiday on the E&A vessel *Eastern*, travelling to Japan and stopping at intermediate Asian ports:

Manila would appear to be almost as difficult a place to gain access to as the North Pole or Thibet (sic), the obstructions in this case; however, being of a purely artificial and official nature. The proud Caucasian traveller finds himself placed in somewhat the same situation as the Asianic seeking to gain admission to Australia. If he wishes to stay there he has first to show that he possesses the where withdrawn to pay his way; if he wishes to take a change of linen and go ashore for the night only, much ponderous official machinery has first to be set in motion; and he cannot even land for an hour or two without obtaining a pass from the Customs officials. In fact a visit to Manila would seem calculated to provide food for some serious reflection by the most bigoted of protectionists. Mr Tully saw much interest in Hong Kong and Canton, but the tortuous crowded streets and the overpowering odours of the quaint metropolis of southern China were not provocative of any very strong desire for a too prolonged acquaintance. The foetid (sic) atmosphere is calculated to promote unpleasant reflections respecting plague, cholera and other germs which blunts the keen interest in the novel surroundings. Like myriads of other travellers, Mr Tully found the scenery and the climate of Japan delightful, and was much impressed by the efficiency and cheapness of the railway service. At one point on the route a 300 mile journey can be taken at a cost of 12s, the best meals being provided for about 1s, whilst waiters are detailed for each carriage, who watch over the comfort of the passengers with a tender solicitude, even to fanning away the obtrusive fly which may have settled momentarily upon your nose (NTT&G 9 October 1903).

This excerpt gives us a limited insight into the opinions of one European traveller to the region. Mr Tully's reference to there being differences in tolerance and acceptance for foreign visitors is interesting, as is his mention of the anti-Asian 'protectionist' climate permeating Australia during that time.

The cargo. From newspaper accounts, it is possible to determine the kinds of cargo that the *Australian* had shipped within Australia and the cargo coming in and out of Australia. The cargo is significant in determining the economic role of the steamer. It also reflects examples of trade between Palmerston and coastal ports in Australia, and between Australia and Asia. A limitation to this review is the absence of information regarding shipments between Asian ports.

Regardless of the role of the *Australian* in freighting a variety of goods the mail had always been the most precious of items. The mail service contract aided E&A to subsidise the long route from Adelaide to Palmerston. The significance of the mail cargo was illustrated when the passengers of the stranded *Australian* were rescued by the passing

Waihoi. The *Waihoi* brought aboard 56 bags of mail, in preference to much of the passenger luggage and much of the other goods (NTT&G 23 November 1906).

The *Australian* steamer shipped both exotic and bulk cargo. From Australia to Manila, and other Asian ports, the ship carried export goods such as pearl shell, trepang, tortoise shell, whisky and racehorses (NTT&G 18 May 1900). Thus the *Australian* contributed to servicing small niche markets between Australia and Asia, as well as carrying exotic 'once only' cargo. An extreme example of exotic cargo was the transport of two lions from the Sydney zoo to a zoo in Japan in 1903 (NTT&G 11 December 1903). The export of trepang demonstrates the continuation of a export tradition that had been in progress before European settlement.

The *Australian* also exported exotic and bulk goods from Palmerston markets to southern ports. In August 1903 the *Australian* exported: 153 cattle hides, 225 bags of tin ore, 11 cases of pearl shell, 61 bags of salted fish, 19 bags beef and 40 packages (size unknown) of sundries to southern ports (NTT&G 14 August 1903). This varying and seemingly impressive trade was in fact small and Palmerston struggled at this time to develop a substantial export market (Powell 1982: 85-108). The steamer also provided basic materials to Palmerston from the south, such as coal, flour and building materials (NTT&G 18 May 1900 & NTT&G 30 November 1906) .

The *Australian*, with a net tonnage of 1784 tons, would have been considered a medium sized steamer of its time with regard to the transport of bulk commodities. Nevertheless the ship had a contributory role to play in the development of the minerals export market of northern Australia. Tin, copper and other minerals from mines north of Katherine were shipped from Palmerston to both southern ports and buyers in Asia. In the year 1900 tin ore would go for 70 pounds per ton in the Singapore markets (NTT&G 24 August 1900). The discovery of gold, tin and other mineral deposits in the north restored peoples' hopes that not all of the great mineral deposits of Australia had been discovered and exploited (Harlow 1997: 1).

The hopes for a thriving Northern Territory mineral industry were eventually dashed, problems including poor ore deposits, high costs of labour increased by isolation and fluctuating international prices (Powell 1982: 95). Despite eventual disappointment in the results, the history of mining in the north had a significant impact on development, for example the construction of the Pine Creek to Darwin railway, and on the history of this part of Australia, for example the history of the mining settlement of Southport. Therefore the *Australian* was involved in what was a limited but historically and socially significant industry of northern Australia.

Of all the goods the *Australian* freighted, the industry that was most significant in regard to the developing export economy of the time was the frozen foods market. The *Australian* shipped frozen meats, dairy products and chilled fruit to Asia, eventually reaching markets in Britain. The Torres Strait route was the popular route for this export market, therefore the knowledge and experience of E&A in this passage assisted its expansion into the industry. When the *Australian* was wrecked, the vessel was carrying 2000 tonnes of cargo and an account of the event indicates that a large percentage of this was frozen meat and butter (NTT&G 30 November 1906).

The Australian as a passenger service. The *Australian* serviced passengers travelling between ports along the south, east and north coasts of Australia, those that travelled to

ports in Asia, some international travellers continuing to Europe on connected services. Passengers also included visitors and immigrants to Australia from Asia.

The steamer was advertised as having accommodation for 70 first class passengers and 35 second class passengers. There was also accommodation for steerage class passengers, but the number of places, and the quality of the berths, was less openly advertised. Olson indicates that steerage accommodation was once advertised by E&A as 'extensive coolie accommodation' (Olson 1976: 26). This certainly indicates that management was aware of the lucrative cheap labour passenger trade. To be fair, perhaps this style of marketing lower class berths is more indicative of the time than specifically this company.

Select passengers travelling to Palmerston from southern ports were often mentioned by name in the shipping news section of the *Northern Territory Times and Gazette*. In some cases a short paragraph was written regarding a visitor, the arrival of influential business figures or socialites being important local news. In contrast the steerage passengers were listed based on ethnic affiliation. For example the voyage to Palmerston, cut short by the stranding of the steamer in November 1906, included: 60 Chinese passengers, 2 Japanese, and 2 Hindu, in addition to the 13 European passengers (NTT&G 23 November 1906). The number of passengers aboard this luckless voyage is a broad guide to the number of passengers travelling on earlier voyages of the steamship.

The experiences of passengers aboard the *Australian* would certainly have differed depending on the quality of their berths and their reason for travel. For the more privileged first and second class passengers the voyage was perhaps rough at times but an adventure to be had, particularly for those travelling from southern ports to the exotic and distant north.

There was a social life aboard for the wealthier European passengers, consisting of dances, organised group activities and shared drinks in the saloon (Olson 1976: 47-49). An example of a prevailing sense of adventure for some passengers aboard the *Australian* is that in April 1899 a cricket team made up of passengers from the steamer took on the Palmerston team, a match that would have attracted a number of local spectators (NTT&G 14 April 1899). The same passengers were audience to a cultural performance by local Aborigines (NTT&G 14 April 1899). The organised activities show that for some passengers the voyage was a holiday of sorts, regardless of later intentions when one reached their port of destination.

2.4. Stranding of the vessel and consequent events

The stranding. The *Australian* ran aground on the reef protruding from Vashon Head, a point of land located along the northern coastline of Cobourg Peninsula, a peninsula that marks the most northern point of Arnhem Land. The site is located approximately 220 kilometres from Darwin. Whilst steaming westward to Palmerston, through the Arafura Sea, an unexpectedly strong tide brought the ship over the shallow reef. The officers and crew were attempting to complete a leg of the ship's circular route. This route included Adelaide, intermediate ports along the east coast of Australia, Palmerston and ports in the Indonesian archipelago and the China Sea. This route had been travelled a number of times by the ship and was the standard itinerary of the E&A company.

The *Australian* left Sydney on the 7 November 1906. Whilst in port the ship's compass was realigned, suggesting that it was unlikely that a navigational error due to an inaccurate compass was to blame for the accident. Reflecting on the voyage up to this incident

Captain John George remarked that 'nothing of importance took place on the voyage' (Inquiry 1907).

The ship passed Croker Island at approximately 8:45pm on Saturday the 17th of November, reaching the northern shore of Cobourg Peninsula. The Chief Engineer Douglas Young stated that at the time that the ship ran aground it was travelling at 11.3 knots (Inquiry 1907).

The Captain, who was in charge of the bridge at the time of the incident, describes the accident and his orders following. 'At 8:50 pm the ship took the ground, the engines were immediately stopped and the holds sounded and found 8 feet (2.4 metres) of water in number one hold. At 8:53 the engines were put full speed ahead...' (Inquiry 1907). The water in the hold indicated to the Captain that the bilge of the hull had been breached in the accident. He ordered the engines full speed ahead so that the ship could settle on the shallow reef, avoiding the possibility of it sinking if in deeper water. The impact between the ship and the reef was described by the NTT&G as a 'bump' which startled and alerted the passengers and crew (NTT&G 23 November 1906), a description that suggests the collision itself was not dramatic.

A number of testimonies at the inquiry claimed that the area was experiencing an unusually strong tidal current. A number of expert witnesses also suggested that because there were no navigational markers or signals along this particular coastline the area was inherently dangerous to navigate (Inquiry 1907).

The Captain explained his error in navigation with 'I have been running to and from Port Darwin during the last 20 years. I do not know of any safe anchorage between Croker Island and Cape Don. It is usual to run on when you get your departure from New Year Island. When the vessel struck I was fully impressed that I was at least 8 miles from the land and I was very much deceived...I had no knowledge of a phenomenal tide during this time until I received the letter from Mr A Brown, who is a resident at Port Essington...' (Inquiry 1907)

The Chief Officer Andrew Shaw supports this explanation with '...I thought we were off the land by about 10 miles. I did not notice the ship being set in. The course steered was a correct one and our departure from Cape Croker was made with the usual observations as to the bearings. I have been told since the stranding of the ship that on the evening of the 17 of November she struck, there was an abnormally high tide on the north coast, and this in my opinion would account for the accident' (Inquiry 1907).

The explanation of an abnormally high tide that night was supported by Captain Mugg of the *Waihoi*, the vessel that first reached the stranded *Australian*. Captain Mugg argued that 'I consider that there was an exceptionally strong set of tides to the southward, and from the choppy nature of the sea I consider that the current was unusually strong, this would be the following tide after the stranding of the *Australian*...there is nothing to guide one in the directory as to these exceptionally high tides...On my return to Port McArthur this trip I found an unusually strong set towards the land, and between Cape Wessel and the Goulbourne islands I was 30 miles out...' (Inquiry 1907).

The explanation of an extraordinary strong tide that pulled the ship towards land was accepted by the marine board inquiry and the Captain was not found at fault for the stranding of the steamer (Inquiry 1907).

Following the collision all the passengers rushed to the deck. The newspaper account claims that the Chinese passengers 'seized their life belts and strapped them on, yelling wildly the while' (NTT&G 23 November 1906). The same account states that the boats were lowered in preparation for an escape if necessary. When order was restored and the hull investigated it was determined that the ship was resting 'amidships' on the reef. A breach in the bilge was confirmed with a reading of 16 feet of water in the fore-hold. 'The passengers were all removed to the first saloon and the donkey engine was set to work in a vain attempt to pump out the water from the holds' (NTT&G 23 November 1906). Over the course of the night the lowering tide exposed the hull, and the prospect of floating the steamer, with the pumps working the flooding holds, was discounted.

Over the course of the night the low tide made the ship more unstable, the ship realigned its orientation on the reef and developed a significant list to starboard. The flooding worsened and the boilers and engine room were affected, forcing the crew to shut down auxiliary engines (NTT&G 23 November 1906).

By early Sunday morning Captain George had decided to transport the passengers to the nearby shore of Cobourg Peninsula. Three boatloads of Chinese passengers were deposited on land. Another passenger, Captain Strachan, volunteered to master a boat the 130 miles to Palmerston and return with assistance. Just prior to his departure the *Waihoi*, making its way to Palmerston along the same route, was spotted. She responded to the distress calls and approached the reef cautiously, anchoring 1/2 mile from the stranded *Australian*. The passengers, a few of their personal belongings and the 56 mail bags were transported across and taken to Palmerston (NTT&G 23 November 1906).

The officers and crew remained on board the vessel, staying on the port side which was elevated because of the ship's list to starboard. By this time below-decks was flooded, and at high tide the starboard section of the ship was submerged. Reports indicate that the stanchions and other deck supports appeared twisted and bent indicating the hull itself was being manipulated. On Friday the 30 November, 6 days after the initial accident, the officers and crew abandoned the steamer, and boarded the *SS Pretoria*, transferring stores and personal belongings (NTT&G 23 November 1906).

Further correspondence dealing with a beacon at Cape Don. A beacon at Cape Don was recommended by the inquiry board in conclusion to its investigation of the stranding. This sentiment was echoed in government correspondence to South Australia, with the *Australian* being cited as the example in argument (Government Resident 1907). A committee was formed to discuss the options for making the passage across this stretch safer. Despite the committee's findings that Cape Don was the most appropriate site for a lighthouse or beacon, a beacon was first established at Cape Hotham instead. It is ironic that the *SS Aldenham*, the vessel purchased by E&A to replace the *Australian*, was the vessel contracted to service the construction of this beacon.

Initial salvage operations on the stranded steamer. Following the stranding there were a number of attempts to refloat the vessel. After these failed the vessel was salvaged, and internal fittings sold at auction. The local newspaper, the *Northern Territory Times and Gazette*, recorded these events in detail. The paper also recorded observations on the condition of the wreck as made by the officers of passing ships. These accounts add a further element to the story of this ship. Furthermore this information gives an insight into the strategies taken by a group of early salvors in working the stranded ship. Searching for

signs of these salvage operations has been one way that the archaeology and the history of this vessel have come together.

The first objective following the stranding was to remove the cargo not damaged by the partial flooding of the holds. As stated earlier both the *Waihoi* and the *Pretoria* took cargo aboard when they collected the stranded passengers and crew. The *Pretoria* returned to the site a number of times in the first few days following the accident. The objective of these visits was to take aboard the remaining cargo worth salvaging. In the first two trips she took on board approximately 210 tons of cargo, mostly goods consigned to merchants in Palmerston, and saved from disaster by being originally stored in the no. 2 hold, the drier of the cargo holds. Mr Brown, the representative of E&A in Palmerston, restricted the *Pretoria* from issuing salvaged cargo to these merchants, until conditions with the underwriters had been settled. A further 1800 tons of cargo remained on the vessel at this time, being perished goods, mostly butter and meats (NTT&G 23 November 1906).

Returning for a third salvage venture, 5 days after the stranding event, the *Pretoria* brought a diver, who inspected the damaged hull of the *Australian*. The diver discovered that there were large boulders lying along the reef floor. In particular there were boulders located against the hull walls of hold no. 1 and 2 and the stern section. Also by this time, all the holds were full of water except the aft hold. The engine room was 'swamped' and all engines, including that powered by the 'donkey' boiler, were out (NTT&G 30 November 1906).

Further salvage and attempts to refloat the steamer. Captain Strachan, a passenger aboard the steamer when she struck the reef, took a keen interest in the salvage of the ship. There were few vessels available to be contracted for salvage work. Although the pearling fleets were in harbour, with the season recently finished, the crew had been paid off. All of the 'good' sailors had been secured for the forthcoming season of the Arru Island fleet. Strachan took this opportunity to participate in the investigation of the condition of the steamer and the salvage of its cargo, using his own tug the *Maggie* and his small schooner *Envy*, the latter being towed by the tug (NTT&G, 14 June 1907).

The exact agreement made between the underwriters of the steamer and Strachan over the salvage rights is unclear. It is evident that he worked as the principal salvor for a period of time, and between November 1906 and June 1907 outright ownership of the steamer passed into his hands (NTT&G, 21 and 28 June 1907).

Strachan initially carried out only minimal salvage work, such as the removal of internal fittings, because he was convinced that he would eventually refloat the vessel, tow it to safe anchorage, and fix her breached hull and twisted carriage. He was told after three diving inspections that the hull was not breached by large unmanageable breaks, but rather there was a long 'crack' in the vessel's plates. This was plugged by means of wooden wedges and oakum. The effectiveness of this seal was said to be good, and proven by the fact that the changing tide did not affect the level of water in the holds. Following this success Strachan ordered additional pumps and other equipment, from Sydney, to assist him in the process of refloating the steamer. The plan was to float the vessel and, under assistance from the ship's own steam, move it into deeper water and tow it away (NTT&G 28 June 1907).

The pump that arrived proved insufficient and it was feared that when directed into deeper water the vessel would fill and sink beneath the surface. The project awaited the arrival of

further equipment from Sydney. In the meantime the plugs were removed and the vessel allowed to resettle itself on the reef bed. The vessel was not floated again.

Over the following months, until mid-September 1908, Strachan made further attempts to refloat the steamer (NTT&G 18 September 1908). His team ran into obstacles again and again, however Strachan remained persistent. There is a suggestion that, as late as February 1908, Strachan received financial backing for his endeavour from the Commercial Bank of NSW (NTT&G 28 February 1908). However he did not succeed and over time the vessel deteriorated till mending the hull was no longer an option. Ownership of the vessel was eventually handed to Messrs A.E.Jolly and Company due to an overdue bill of sale given as security to fund the salvage work (NTT&G 18 September 1908). This company held an auction of all salvaged material in August 1908.

Messrs A.E Jolly and Company had the officers of the steamer *Waihoi* complete an assessment of the vessel to finally determine the potential for further salvage and the viability of refloating the vessel. The crew of the *Waihoi* reported that the *Australian* had a fair list to the starboard side, with its bow facing NW. From 'about half flood tide' the sea was breaking across the number 3 and 4 hatchways. Under the saloon the main deck had been forced up into a ridge over a few feet. The funnel was canted at an acute angle and the main mast was also out of position. The engine room was flooded yet the machinery remained in good condition. In turn there were a number of indications that the hull was extensively damaged and breached. Further salvage was conducted on this visit. Material taken included polished satin wood panelling, teak mouldings and other interior fittings. There was also mention that the anchors, winches and chain were worthy of salvage (NTT&G 25 September 1908). The *Australian* was later sold to another salvor named A.H. Albert, in February 1911, who had developed a reputation for working wrecks off the Queensland coast (NTT&G 24 February 1911).

Through the course of the salvage work the remaining rotting cargo, most probably the meat in particular, emitted a foul odour from the cargo holds. There is a reference in a later newspaper account that during the initial salvage work by Strachan, a worker was killed from inhaling toxic fumes emitting from rotting cargo (NTT&G 2 October 1908).

The auction of salvaged material. On Saturday 29 August 1908 Messrs A.E. Jolly and Company held an auction of salvaged items. The auctioneer, W.C.P. Bell, staged the event in the Henrie and Bell's rooms (NTT&G 21 August 1908).

It appears from the newspaper account that the auction attracted a large crowd and was very successful. The advertisement for the auction details that the following items were for sale: Teak safes, Ice chest, Tables, Filters, Settee cushions, Telegraphs and Stands, Compass stand, Binnacles, Binnacle stands, Lamps life belts, Life buoys, Charts etc. There was no mention of the sale of other items for example the bell and salvaged machinery. Material such as this may have changed hands in equally profitable but less public ways (NTT&G 21 August 1908).

2.5. The *Australian* steamship in relation to the developing maritime economy of Australia

Introduction. To appreciate the historical significance of the *Australian* it is necessary to understand its significance in the context of the larger maritime economy of Australia. This chapter contains a brief history of relevant aspects of Australia's maritime history prior to

this steamer's appearance and discusses the working life of the steamer in the context of the maritime economy at that time.

Prior to the 1850s. From the outset both social planning and economic hardship dictated that the Australian colonies remained, at least initially, economically dependant on Britain. There was a serious need for an export commodity that would reduce financial dependency. This search was not aided by ideological positions such as that of Commissioner Brigge who stated that the natural pattern of trade for the colonies will be between itself and the mother country. Resources would be shipped to Britain in return for its own manufactured goods (Bach 1976: 65). Such attitudes would have Australia as a sole resource of Britain, a market for its goods and a source of cheap commodities.

The whale industry failed the NSW colony, because it did not bring in sufficient capital, and the returns primarily went to British investors. It was wool that developed Australia's export market. Wool export grew to considerable proportions in a short period of time. In 1821 the colony exported 175,400 pounds, by 1850 this expanded to 41,426,655 pounds (Bach 1976: 20). However, much of this export industry was controlled by British owned and operated ships, continuing a damaging tradition of the removal of capital returns from the colonies.

In addition to losing capital to a British controlled shipping industry the colony imported much of its manufactured goods from Britain. Bach reflects that between 1821-1850 Australian international trade was 'predominantly a British affair' (Bach 1976: 55). In the era following this domination, Britain remained a significant force in the competitive coastal and international Australian markets. The E&A company, which owned and operated the *Australian*, was owned by British investors. British influence was also felt by the enforcement of British maritime law, and its impending restrictions on free trade.

At this time the Asian/Australia trade, which became the hallmark of the E&A company, was in its infancy. Small but symbolic trade with the Indonesian archipelago and other Asian ports, specifically China, had begun early in colonial history. As early as 1830 an annual average of 1000 tons of shipping trade occurred between Australia and Java. By 1842 Java was exporting 16 million pounds of sugar to NSW (Bach 1976: 63). By 1846 Manila was exporting 10,000 tons of cargo to Australia. This included sugar, coffee and cigars. In return Australia exported flour, cheese, butter and coal (Bach 1976: 63). Additionally McCarthy refers to various pearling companies that were operating between Batavia (Java), other parts of the archipelago and the West Australian coast (McCarthy 1996: 145). The E&A company began shipping operations in the area by 1873. Though this is considerably later, the company was responsible for the development of new markets at a considerably early period.

Restrictive British maritime law and practice. Bach explains that there were two major British obstacles in international trade with the Australian colonies. First was the dominance of the British East India Company that used influence and gained special concessions to create a trade monopoly that restricted the business of other British ship owners and trade companies (Bach 1976: 45-46). The second restrictive force was the regulations of the *British Navigation Act 1651* which banned non-British registered vessels from trading with colonial ports. Blainey argues that this Act had a crippling effect on both foreign ships and ports in need of supplies (Blainey 1966: 174). Bach acknowledges the nature of these obstacles but suggests that in practice these was ignored, particularly by American traders (Bach 1976: 46). Eventually the dominance of the British East India

Company dissipated, and the Act was repealed in 1849. This finally opened the door for foreign companies and non-aligned British traders.

Rapid growth in the 1850s. The discovery of gold along the east of Australia in the 1860s significantly changed the very nature of the colonies' economic and social life. Bach reflects that one of the first increases was that of population as new immigrants attempted to make it rich on the goldfields (Bach 1976: 94). Agriculture also greatly increased with the need to feed this growing population (Bach 1976: 94). Beyond indirect advantages the very nature of coastal and international shipping changed dramatically. Parsons reflects that with the discovery of gold in NSW and Victoria, the coastal and international shipping activity of the Australian colonies greatly increased (Parsons 1981: 4). There was the development of an extensive passenger service to accommodate the massive increase in immigration and the constant movement of workers and families. Foreign imports shipments were increasing, responding to the demands of a growing population. Freight costs for back loading with export goods were low as shipping companies were desperate for return cargo. Exports included wool, gold, coal and whale products, however these never matched the import trade (Bach 1976: 95). Blainey argues that, nevertheless, the high value of wool and gold made this imbalance an acceptable limitation to investors (Blainey 1966: 144). Additionally, perhaps of more interest to the romantic than the economic minded, this demand in efficient and reliable sea services saw the introduction of the American clippers to Australian shores (Bach 1976: 96).

The development of the Suez Canal route. The traditional sea route between Britain and Australia was what has been described as the 'Great Circle Route' (Blainey 1966: 180). This consisted of vessels making their way from Britain south along the west coast of Africa. Utilising the westerlies in low latitudes, ships made their way across the Indian Ocean to southern Australia. The ships returned to Britain via the westerlies again, remaining in low latitudes, passing Cape Horn. When one considers the geometry of the planet, the route, in addition to utilising favourable winds, was shorter than a route along higher latitudes.

The Suez is a narrow strip of land linking Egypt with the Sinai Peninsular. It was first used in 1837 by a British captain, Thomas Waghorn, as a shortcut between the Mediterranean Sea and the Indian Ocean, an alternative to the traditional route which passed the Cape of Good Hope (Blainey 1966: 215). The P&O company was particularly dominant in utilising this route, developing the overland pass and ensuring reliable steamship links on each side of the land passage (Blainey 1966: 215). The canal was built in 1869 and remains a vital sea passage today.

The creation of the canal introduced new services between the west and the east thus increasing competition. The route favoured the steamship trade, being less about wind and able to provide reliable coaling ports (Blainey 1966: 216). In turn this route allowed companies to take advantage of the train services between the English Channel and the Mediterranean, cutting days off the transport time (Blainey 1966: 216). By 1860 the Suez route was the fastest mail service between Britain and Australia, this feat heavily dependent on the contribution of the rail service link (Blainey 1966: 217).

The Suez Canal eventually became the dominant mail route between Britain and Australia however it remained considerably limited until the development of vastly more efficient compounding engines and the ability to create higher pressures of steam. This would alter the extent of dependency on numerous coaling ports along the way. An increase in coastal

trade in Australia during the 1880s consisted of mostly traffic between the larger ports of the colonies, for example Melbourne and Sydney, where the route was short and the coaling ports numerous. International trade was still dominated by sail ships and would not be challenged until the introduction of new steam related technologies (Blainey 1966: 221-217).

The mail routes to Australia; an increase in Asian trade as a consequence. The mail route between Britain and Australia through the Suez Canal had a number of shaky starts and as a consequence alternative routes were suggested. One such route was a trans-Pacific route. By 1880 the mail route between Britain and Australia, through the Suez Canal, took 48 days whereas via the Pacific Ocean it took 45 days (Bach 1976: 148). Companies were formed to service this route however they failed and the permanent domination of the Suez route was established.

The trade between Asia and Australia has been discussed earlier in this chapter and it can be stated that the mail service between Europe and Australia through Asia greatly increased trade opportunities. On a very practical level mail subsidies allowed companies to spread into new areas and maintain trade services.

The Australian steam trade in the 1890s and the Eastern and Australian Steamship Company. By the 1890s, the period in which the *Australian* came into service, steam was controlling much of the inter-state freight and a substantial degree of the international freight. In 1890 the world shipping market controlled by steam was a significant 60.7%. However this was a peak year for steam (Bach 1976: 142). Bach also notes that in the colonies by this time there was a general expansion and diversification of export goods, such as the introduction of metal exports (for example tin, silver and lead), which joined the already established gold export market (Bach 1976: 136).

This period also saw a greater degree of competition between rival steam companies. Parsons describes the 1890s as a period of 'hectic expansion' (Parsons 1981: 6). A passenger freight war had developed between companies over the more popular routes, for example Melbourne to Sydney. There was also the emergence of a number of competitive shipping companies, some formed by the amalgamation of originally independent smaller companies. The major players in Australian coastal shipping at this time were the Adelaide Steamship Company, the Melbourne Steamship Company and the Australian United Steam Navigation (Bach 1976: 189). Competition from foreign companies was also developing, with German and French companies taking portions of the market (Bach 1976: 146).

The sheer number of steamships working the rivers and coastlines indicates that, in some respects, this was a boom period for steamship trade both in Australia and the world. However, there were a number of problems, not the least being conflict with attempts to create overseeing bodies and committees. For example the issue of subsidies for mail services led to a heated debate. Some parties argued that mail subsidies, of the kind awarded to E&A by Queensland and then South Australia, supported inefficient companies, and consequently took work from better performing competitors (Bach 1976: 145).

In addition to regulation concerns, there were economic concerns. There was an overall slump in international trade volumes between 1873-1898 (Bach 1976: 142). In turn there was an imbalance between available tonnage and goods that needed to be transported. In addition despite the diversity of goods being exported from the colonies, there remained a significant imbalance between the export market compared to the larger import market

(Lewis 1973: 390). With regard to this latter problem the colonies needed high value export goods to balance the market and reduce the cost of shipping generally. One such market was frozen meat and dairy products.

The frozen food market included mutton, lamb, fruit and dairy products (Bach 1976: 177). These goods reached Britain from the east coast of Australia, through the Torres Strait to connecting services in Asia (Lewis 1973: 93). By 1896 more than 100 ships, including the *Australian*, were equipped to deal with the frozen food trade (Bach 1976: 177). The E&A had been established in trade with Asia since 1873 and so had the advantage of experience and established connections. By 1910 Australia was earning 11% of its export income from shipping frozen and chilled foods (Blainey 1966: 276). This market increased the importance of these mail steamers as their ability to move cargo quickly and efficiently was paramount.

2.6 A review of previous site visitation

Salvage and other activity (1906-1908). Following the initial stranding event a series of salvage operations were conducted (see Section 2.4). In summary the salvage consisted of the eventual removal of most of the internal fittings and non-perished cargo and the removal of some heavier machinery (unspecified) prior to a failed refloating procedure.

The wreck no longer retains any substantial portion of its superstructure. The engine and much of the other secondary machinery remains on the site, suggesting that the initial salvors either decided against its removal or could not remove it. The winch located in the stern, once used for the rear cargo hatchway, was used during these salvage operations. It was repositioned on the deck and used to haul rescued goods. With the collapse of the aft deck following this salvage, the winch now lies on the seafloor. It is unclear what happened to the white lady Figurehead. It may have been removed with other fittings during this initial salvage work, removed later, or perished over time.

In an attempt to refloat the vessel the breaches in the hull were corked and pumps worked the bilge and cargo holds. The refloating attempts brought about a shift of the ship from its original stranded position to lying with the bow facing in a N-NW direction. The remaining wreck still retains this alignment. Buried sections of the lower hull may contain evidence of the breaches and repairs that followed. In 1911 the wreck changed ownership to a A.H. Albert (NTT&G 24 February 1911). It is unknown what work this new owner conducted nor who were following owners over the years.

Salvage during the 1970s. Salvage operations on the wreck of the *Australian* were conducted on a number of occasions during the 1970s. This was recalled by George Tyres in an interview with the author in April 1998. Whilst George Tyres did not work the site personally, he is familiar with the site and is a prominent figure in marine salvage within the Northern Territory. John Chadderton, now living in Western Australia, was contacted in April 1998, by the author, and shared his experiences on working the site. It should be understood that there is no reason to conclude that this account constitutes the complete history of salvage since the initial 1906-8 work.

Mr Chadderton explained that he and Harry Baxter, now deceased, worked the site a number of times to remove the copper alloy material for scrap metal sale. Mr Chadderton claimed that at the time he was under the presumption that the ship was carrying a cargo of copper and lead. Despite this mistake the wreck was still rich in copper alloy material.

The salvors decided to remove the condenser of the engine, a section of machinery made of copper. A section of the port hull wall had collapsed to starboard over the engine, covering it. The salvors used explosives to destroy the collapsed hull and separate the condenser from the engine. In the process the engine was split, the low pressure cylinder breaking away. The salvors tied the copper piping of the condenser into a bundle with the intention of raising it. However due to poor weather conditions the bundle was not raised, and remains on the site to this day. Mr Chadderton did sell the condenser itself for scrap metal, according to him receiving \$3.83 a kilo (1975). Mr Chadderton also claims that at the time of his visit brass lanterns were visible across the site. These are no longer visible on the site and their present location can only be speculated upon.

It is not known who removed the bronze propeller.

Operation Raleigh (1990). Operation Raleigh is a British-based organisation that runs volunteer work projects around the world. In 1990 Operation Raleigh, in conjunction with the then Conservation Commission of the Northern Territory, visited the *Australian*. (The Conservation Commission is currently titled the Parks and Wildlife Commission.)

The aim of this visit was to conduct a survey of the remains (Fig. 6.). The group was made up of 14 divers and 4 additional support staff. The team visited the site for approximately 10 days. The original survey strategy was to lay out a grid system over the site. Due to time constraints and the strong current this approach was abandoned. The revised strategy involved focusing on three sections, the bow, mid-section and the stern, conducting a survey using tape measures.

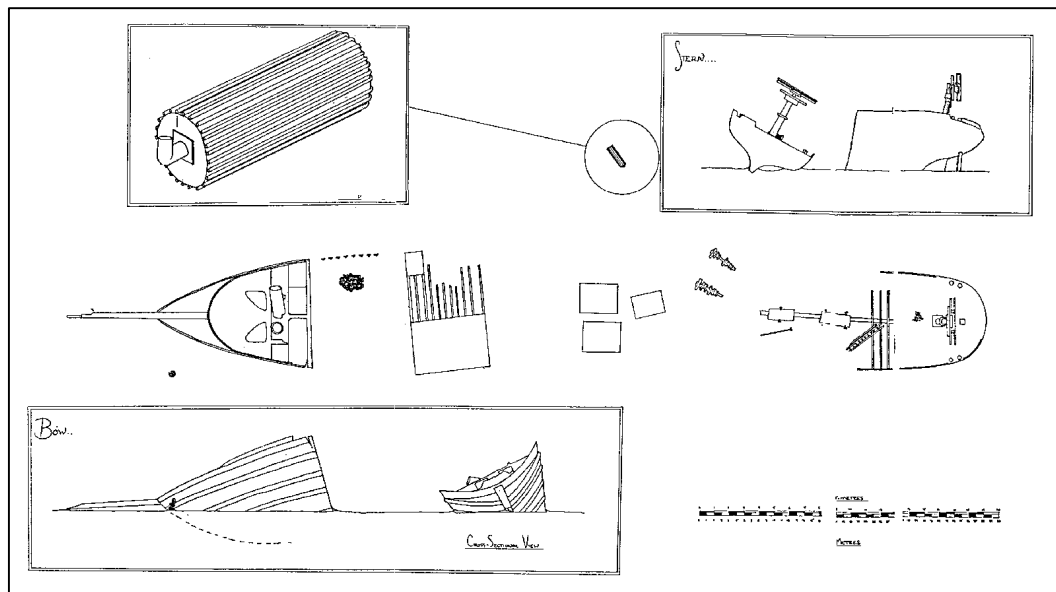


Fig. 6. Operational Raleigh site sketch, 1990

The cross section view accurately indicates the list to starboard of the bow and stern section. Accompanying the survey results was a description of the biology of the site by participant Steve Congreve. Mr Congreve's report is filed at the MAGNT.

Following the survey work the team attached a buoy to the site. The buoy was inscribed 'Op Raleigh, SS *Australian*, CCNT' (Conservation Commission of the Northern Territory). The buoy is no longer on the wreck, likely removed from its mooring by natural forces.

Regional survey of northern Cobourg Peninsula - MAGNT (1995). In 1995 the MAGNT conducted an archaeological survey at Cobourg Peninsula. The survey involved the further investigation of known submerged and land sites and the search for unlocated sites. The search was conducted within designated areas, based on historical information and local knowledge.

The team consisted of MAGNT archaeologists Paul Clark and Cos Coroneos, and volunteers including archaeologists Silvano Jung and Mark Staniforth and magnetometer expert Bob Ramsey.

The team conducted a brief survey of the *Australian* (Fig. 7). The site sketch records the distinctive clipper bow. The capstan and bollards located at the bow are also indicated. The site plan shows that there was a stack of cut timbers forward of the stern section. This is no longer visible. The survey report is filed at the MAGNT and titled 'Survey of the Maritime Cultural Resource of the Northern Cobourg Peninsula' (Coroneos 1996).

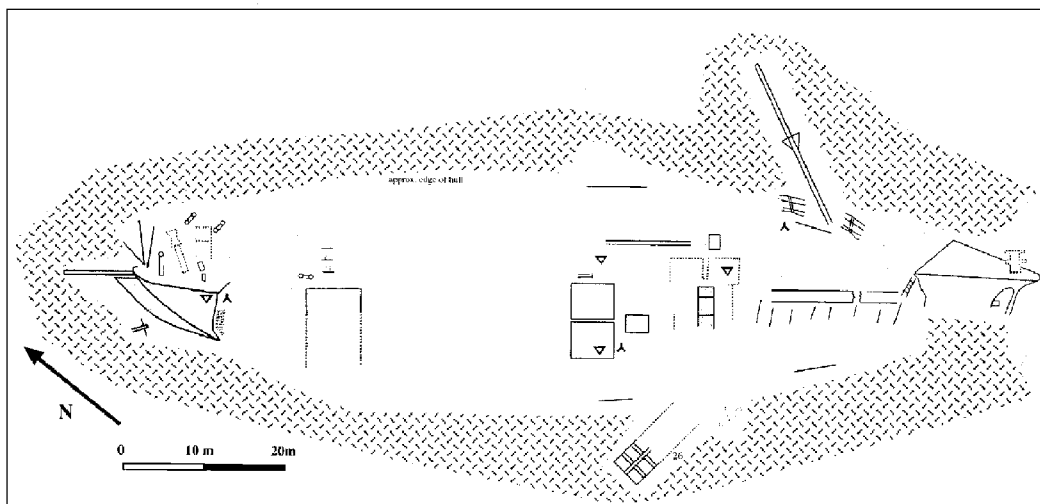


Fig. 7. MAGNT site sketch, 1995.

Site inspection MAGNT (1997). In November 1997 the MAGNT, in conjunction with the NT Parks and Wildlife Commission, visited the site for a period of 10 days. The team consisted of archaeologist David Steinberg, steamship expert John Riley and the rangers of Black Point ranger station, Cobourg Peninsula. The aim of the visit was to conduct a non-disturbance survey and develop sufficient understanding of the site to create a management plan.

CHAPTER 3: THE DESIGN OF THE *AUSTRALIAN* STEAMSHIP

3.1 Introduction

In order to understand the archaeology of this site and appreciate its significance, it is necessary to understand the *Australian* within the context of its design. This chapter is an overview of the ship's design, highlighting features which are indicative of the ship's function and of the period in which it was built.

3.2 Overview

The *Australian* was designed as a seagoing passenger and cargo steamship (Fig. 8). Its gross tonnage of 2838 tons signifies that, in comparison to other seagoing steamships of this period, it was a middle sized ocean-going steamship. Its cargo facilities included chilled compartments for frozen goods. The hull was constructed of steel, a material lighter and stronger than iron. Powered by a triple expansion engine and coal burning steel twin double-ended boilers the steamship had a registered speed of 15 knots. The single screw steamer could also be rigged as a schooner, the Captain taking advantage of sail assistance propulsion in favourable conditions. The design of the ship was not altered over the course of its working life.

The *Australian* could accommodate 100 first and second class passengers, with further unspecified accommodation for steerage class. The local Palmerston press described the ship as being 'beautifully furnished', equipped with electric lighting throughout, as opposed to only the essential areas being provided for (NTT&G 31 July 1896). The *Australian* was also designed with a distinctive clipper bow, a Figurehead of a white lady and a prominent bowsprit. When fully rigged the *Australian* would have certainly appeared more the graceful clipper than the steamer workhorse.

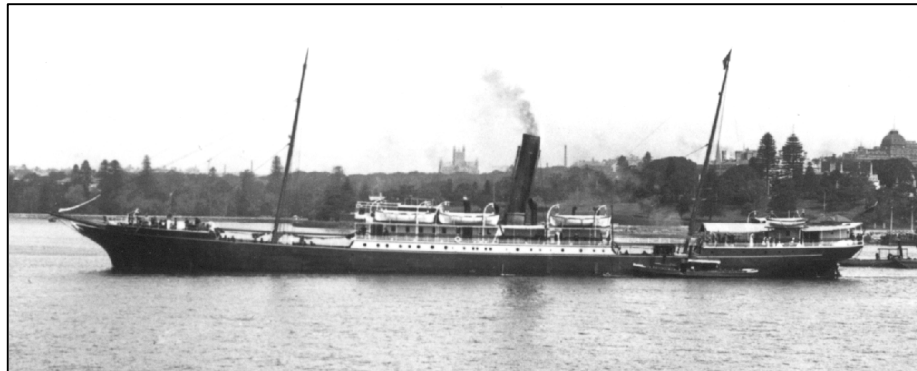


Fig. 8. The *Australian*. (Nichols Collection, State Library of NSW)

3.3 Sails and rigging

The *Australian* was a two masted fore and aft schooner. Fore and aft sails run with the line of the ship, yet can be adjusted to respond to wind direction. Photographic evidence (Fig. 8) and ship plans (Fig. 9) show that the *Australian* did not have a square topsail, an additional sail which gave further power by increasing the overall area of sail. This feature may have been decided against because of the necessary extra rigging. Rather, the

Australian had one triangular sail on each mast, supported by a jib sail and two stay sails. The shrouds and stays of the rigging were made of iron.

The sail plan of the *Australian* encourages questions as to the role of the sails on this vessel and what concerns were taken into account when incorporating a sail plan.

Figure 9 suggests that the sails were not large in proportion to the vessel. The reason for this may be related to the design of the vessel, it being unable to support the forces associated with taller masts and larger sails. If this is the case then it indicates the limited importance of the sail plan in the context of the vessel's overall design.

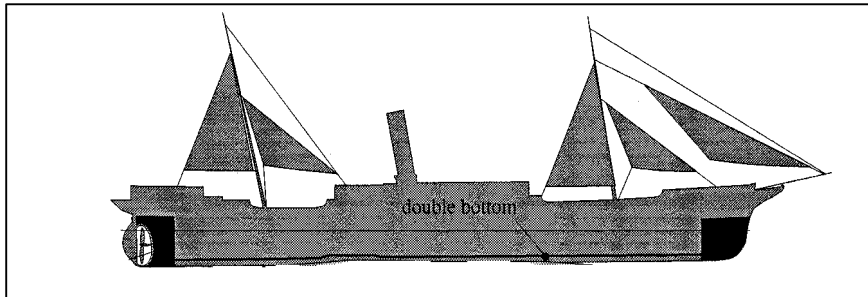


Fig. 9. Sail plan of the *Australian* (adapted from plans: National Maritime Museum, Greenwich).

The choice of simple triangular sails on the main masts, as opposed to the more popular and effective gaff sail, may have been based on ease of handling. A gaff sail required a second boom to be attached to the masts. In contrast triangular main sails may be rigged more easily, and could be stored around the throat of the mast or single boom. The importance of ease of handling is most likely a correct explanation, also explaining the absence of a topsail, as discussed earlier. However, following this explanation it should be noted that the jib sail and stay sails would have supplied substantial force with the right wind direction. Therefore the limitations of the small main sails were partially compensated by the additional sails, which were effective and also simple to hoist.

Another role of the sails may have been to assist in stabilisation. The vessel was long and narrow and drew a shallow draught. Its flat keel was compensated with bilge keels to reduce rolling. The sails may have been hoisted to promote stability in rough sea conditions. The sails would direct the momentum of the ship, and the vessel could rest on the full sails, reducing the rolling from side to side. The masts may also have had a second role, apart from supporting sails, that of supporting derrick structures, which were used as cranes to haul cargo in and out of the holds.

3.4. The steamship's structural design

The *Australian* had a length of 341.7 feet (104.15 metres) and had a gross tonnage of 2838 tons (Fig. 10). The deck design followed a standard pattern of a forward cabin, a saloon and a rear raised deckhouse. The saloon was three stories high and contained the bridge and accommodation for passengers. The ship contained four cargo holds, a fore-peak tank and an aft peak tank. These tanks were used for storing fresh water; the forepeak tank, the larger of the two, could store up to 62 tonnes. The hull was divided by 6 bulkheads, each lined with cement to increase its watertight capability and to protect it from deteriorative forces. The bulkheads rested on a cellular double bottom.

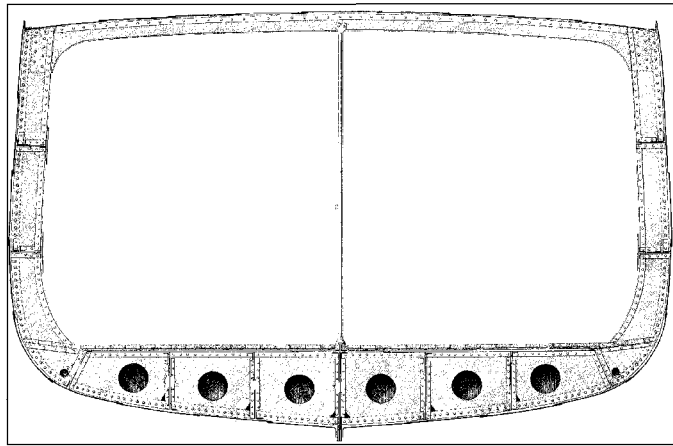


Fig. 11. An example of cellular double bottom design (Passach 1977: 30)

The *Australian* was designed with a flat keel and twin bilge keels. The bilge keels were fixed at the level of the bilge and ran the length of the ship on both the port and starboard sides. They were directed at a 45° angle and were approximately 1.5 feet out from the hull. The role of the bilge keels was to support the balance of the ship and reduce rolling. This was particularly necessary for the *Australian's* flat keel would have offered minimal stability.

3.5. Machinery and systems

The triple expansion engine. The *Australian* was powered by a 3 cylinder triple expansion engine capable of producing 400 nhp. To power this engine the ship contained two double-ended boilers which could produce 175 psi of steam pressure. Figure 12 shows the profile of a compound engine with condenser and crank.

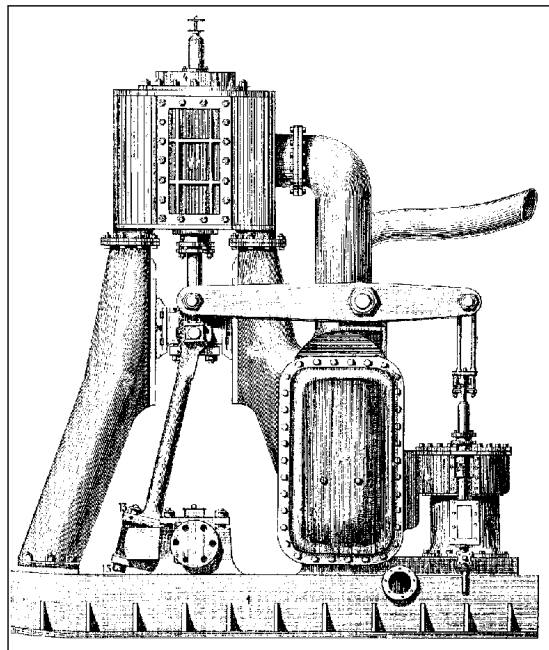


Fig. 12. An example of a compound engine (Paasch 1977: plate 53)

The logic behind the triple expansion engine is that the steam is expanded in three consecutive stages. In this case exhausted steam from a cylinder is used twice more, creating a more efficient and powerful engine.

The boilers of the *Australian* fed steam to the engine. The steam would first enter the high pressure cylinder and work the piston. Through the release of energy the steam would expand and cool. This steam would then be channelled into the intermediate cylinder, built with a larger diameter to accommodate this expansion in gas volume. The steam worked the intermediate cylinder piston, would again expand and cool, and be fed to the low pressure cylinder. The low pressure cylinder was larger again to accommodate the increased gas volume. It is interesting to note that though the consecutive cylinders differed in size the stroke remained 48 inches. This illustrates the need for the pistons to produce the same force, keeping the movement of the crank regular and fluid. The engine sat as one unit above the crank shaft. The piston rods from each cylinder would connect via a connecting rod and work the single crankshaft.

From the engine the steam was channelled to the condenser, the role of which was to condense the steam to water, to eventually be returned to the boilers. The surface condenser could have functioned in two ways. Brass tubes may have run cool water through a chamber containing the gas. The gas would then condense to liquid. The second option was for the steam to be pumped through the brass pipes which would lie around a water reservoir. Which of these surface condensers existed on the *Australian* is unknown as the condenser has been removed from the site by salvors. Further investigation of the remaining pipes may answer this design question. On-site investigation has concluded that the exhausted steam reached the condenser through the hollow portside support column.

Following the condenser the water collected in a chamber located adjacent to the condenser called the 'hot well'. The rapid condensation of the steam created a vacuum in the condenser which lead to the engine itself. This vacuum allowed the cylinders to work more efficiently and saved fuel costs. A pump system, most likely powered off the main engine, was used to remove the water from the condenser, to support the continuation of this vacuum. The pump fed the water through a feed water filter before returning it to the boilers. The role of the filter was to distil impurities, such as lubricating oils used in the engine. From the filter the water was returned to the boilers.

The boilers. The *Australian* was equipped with a pair of coal burning double-ended boilers and a horizontal cylindrical auxiliary boiler (Fig. 13). The auxiliary boiler, also coal burning, most likely ran the winches, windlass and other secondary machinery. It produced 55 psi of steam pressure, a substantial output for an auxiliary boiler of this period. The double-ended boiler was a boiler with furnaces on each end. The advantage was an increase in steam production whilst minimising the necessary use of space. The double-ended boilers of the *Australian* could produce 175 psi of steam pressure.

The double-ended boilers rested on 'knee plates' shaped to accommodate the boilers. The main boilers of the *Australian* were taller than the lower deck, therefore this deck was absent in the boiler room. To compensate the boilers were secured to the inner hull wall with stays. In some cases double-ended boilers shared combustion chambers. Further investigation of the site may indicate if this is the case. It is also unknown if these boilers were fitted with additional equipment, for example forced draught or superheating, which increases engine power output by increasing steam production.

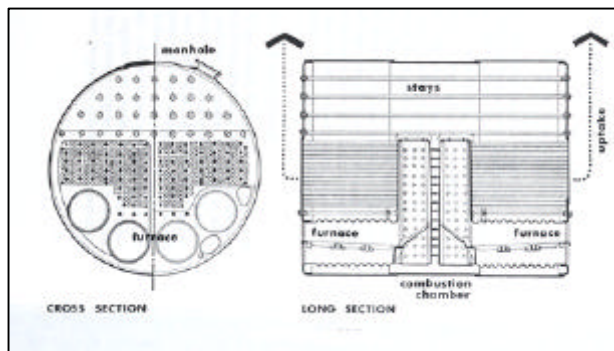


Fig. 13. An example of a double ended boiler (Patterson 1969: 240)

Figure 14 below gives a general impression of the stern section of a steamship similar to that of the *Australian*. It indicates the location of the boilers, engine, propeller shaft, double bottom and propeller. Above the engine and boiler room was the saloon house.

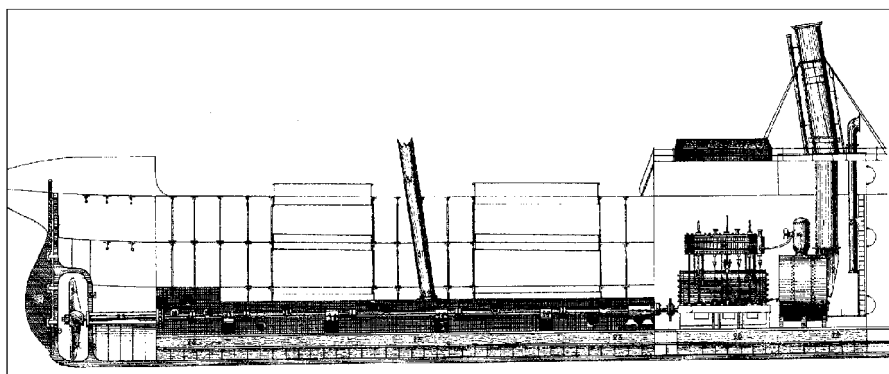


Fig. 14. The stern section of a similarly designed single screw steamship (Paasch 1977: plate 43)

The refrigeration system. There were three kinds of refrigeration systems being used by the early 20th century: compressed air, 'carbonic anhydride' and 'ammonia'. It is most likely that the system used aboard the *Australian* was a compressed air system (Fig. 15). Historical sources date the introduction of the 'carbonic anhydride' and 'ammonia' systems later than the working life of the *Australian* (Guthrie 1971: 278 & Sothern 1923: 30).

The diagram shows the design of a closed air system, a particular compressed air system in which the same air is recycled. It is possible that this system was in place.

The warmest air in the in the coldroom would rise. This air was drawn into the system through a suction vent. The air entered the compressor unit where it was compressed to 50 pounds and thus its temperature rose to approximately 138°C. The air was then delivered to the cooler unit. The air travelled through a series of pipes which were immersed in a cool water chamber. The cool water, circulated seawater, lowered the temperature of the air to near its own temperature, that of 25°-30°C if within Northern Territory waters.

Many closed air systems also had a drying unit. The drying unit would receive the air from the cooling system, and dry it prior to expansion. This was done by passing it in tubes close to the passage of air leaving the cool room. This further cooled the compressed air and deposited moisture onto the surface of the piping. The moisture would be removed through valves.

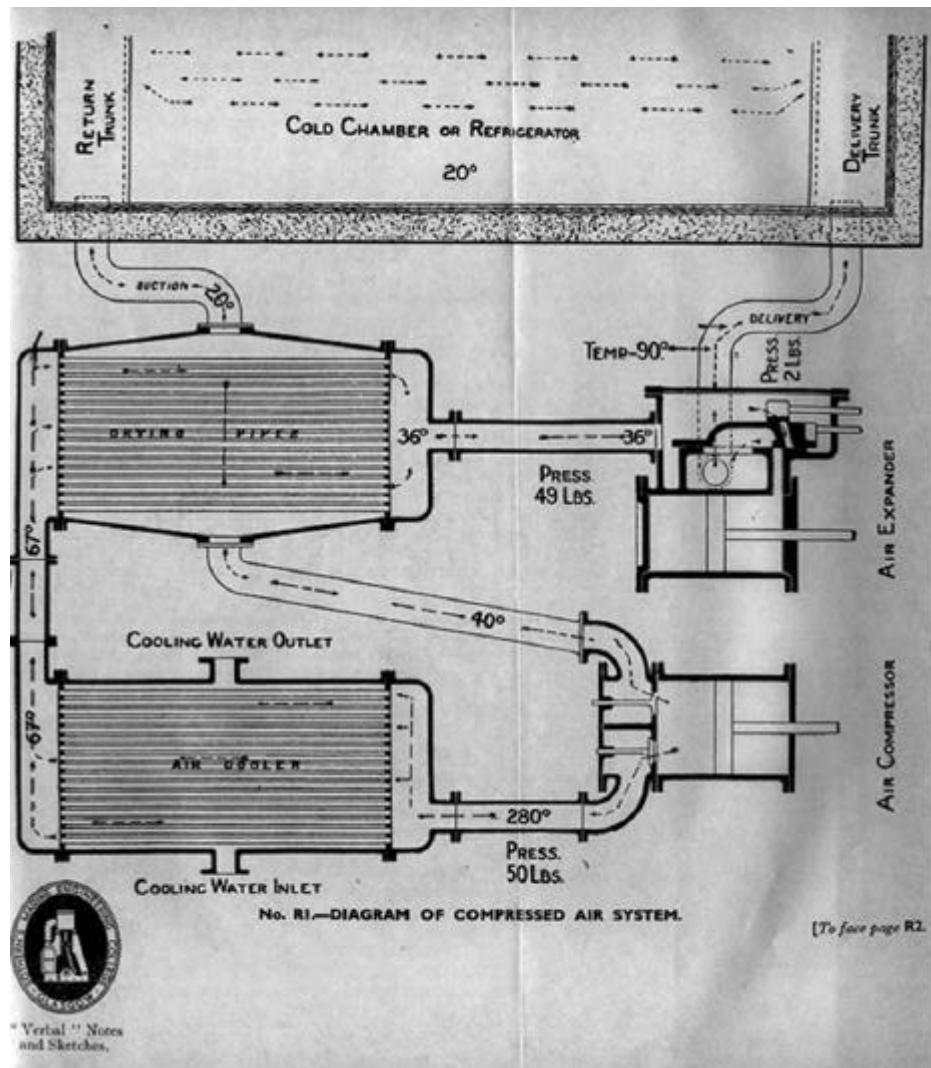


Fig. 15. Diagram of a closed air refrigeration system (Sothorn 1923: 81)

The air then entered the expansion unit. This worked the compressed air through a piston, the worked air expanding and cooling. This working piston contributed to running the air compressor unit. Following this final process the air had been cooled to -32°C . The air was then delivered to the cool room, circulated, and then following circulation would again be drawn into the air compressor (Sothorn 1923: 29 and Guthrie 1971: 278).

Air was distributed into the storage chamber through louvres (pipes with holes along its length). The chamber was lined with charcoal to provide insulation. The air-cooled system was bulky, and inefficient but relatively simple to run, and when necessary easy to dismantle. Another drawback however was that the temperature could not be regulated (Guthrie 1971: 278).

It was common practice to have two units working side by side, resting on the upper deck above the cargo chamber (Sothorn 1923: 30). The *Australian* wreck site has the remains of two units. In conclusion it was a reliable simple machine that, unlike later systems, did not involve dangerous toxic gases.

The windlass, winches and anchor machinery. The *Australian* was equipped with at least four winches, one for each cargo hatchway. The winches were used to haul cargo, and may have been utilised to raise and lower sails. Figure 16 below shows the design of a steam driven winch, similar to those installed on the *Australian*.

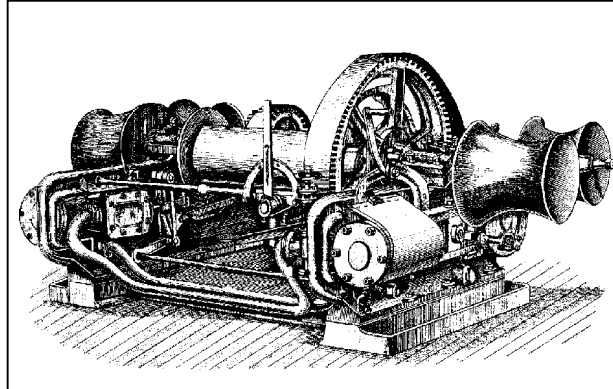


Fig. 16. A steam driven winch (Paasch 1977: plate 61)

The steam driven windlass was larger than the winch, and used for larger lifting requirements, for example driving the capstan and anchor crane. The capstan was used to haul the anchors and control other heavy lifting tasks. The winches and windlass were powered by the auxiliary boiler. Figure 17 shows the design of a windlass, similar to that installed on the *Australian*.

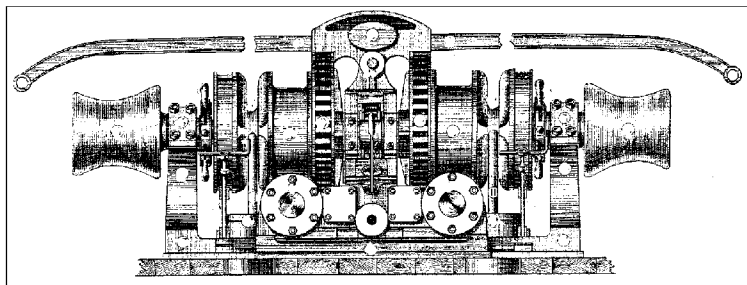


Fig. 17. A steam driven windlass (Paasch 1977: plate 71)

The bower anchors were lifted onto the deck from the level of the hawse pipe by the anchor crane. Photographic evidence shows davit supports were located on deck. These were definitely used to control the unloading of boats, but may also have been used to control placing the anchor on deck, as shown in Figure 18.

In regard to handling boats, davit structures were used aboard the *Australian* for both transporting all boats and permanently securing some boats, the latter demonstrated in Figure 8. There were 8 teak boats aboard the *Australian* some stored with davits and others secured onto the deck and the roof of the saloon. Lloyds' survey of the *Australian* in 1906 refers to 5 lifeboats and 'three others' suggesting that at that time these three were either not up to standard or had an alternative designated function.

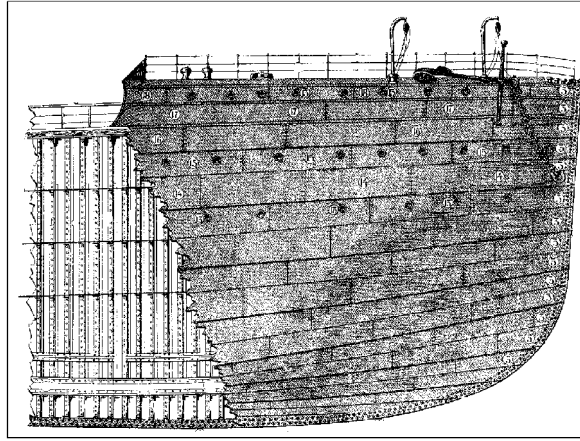


Fig. 18. Bow of a steamship with davit structure to hold anchor. (Paasch 1977: plate 23)

CHAPTER 4: THE SIGNIFICANCE OF DESIGN: A REVIEW OF DESIGN FEATURES IN RELATION TO TECHNICAL INVENTION OF THE PERIOD

4.1. The significance of design

Introduction. This discussion attempts to place various technologies that were used on the *Australian* within the context of the history of invention. It explores the technical significance of the shipwreck and includes information regarding major changes in steamship design. This chapter also includes a technical comparison of the *Australian* with the *Catterthun* and the *Brisbane* steamship wrecks.

Technology is not born within a vacuum, but is influenced by economic, social and political variables. For example McCarthy explains that the outdated technology that was operational on the *Xantho* was present because of the inability of the owner to afford improved design (McCarthy 1996: 79). Therefore the technology aboard was directly related to the financial limitations on the business for which the vessel was used. This kind of study, that draws together other themes of history, although warranted, is beyond the scope of this document. Therefore this discussion stands as a brief review of relevant technological change.

Sail propulsion. Many have described the transition from sail to steam as steam superseding sail in an explosive revolution. However this was far from the case. The eventual dominance of steam was a clumsy process marked by the eventual efficiency of engines, the availability of coaling ports on the routes and the emergence of valuable building materials such as steel.

The *Australian* was built late in this story, in a period when steamships controlled much of the trade and transport market in the world, the remaining sail ships reduced to carrying low value bulk commodities such as wheat. However the appearance of sail rigging on board these steamships begs the questions: what was the role of sails on these vessels and how were they adapted to accommodate their new restricted purpose? The adaptation of sails for steamships, to reduce the limitations and maximise the benefits, was a creative invention breaking free of the traditional role and design of sails (Gardiner 1993: 147).

The initial introduction of steam engines to sailing vessels, in the 1840s, has been described as the development of the 'auxiliary steamer', using wind as the primary means of propulsion (Gardiner 1993: 146). Its inefficient steam engine would be used only in particular circumstances; for example making way in restricted waters, propelling through waters that have unfavourable or weak winds, in battle or in poor weather when additional power would be beneficial (Gardiner 1993: 146). In contrast the 'fully powered steamer' used steam as the primary means of propulsion, perhaps equipped with some sail capability. With the improvement of engine efficiency and performance over time the latter became the norm.

The value of Gardiner's distinction, which heralds the introduction of a distinctly 'fully powered steamship' era, wavers when one looks at later steamships, some of which had powerful reliable engines, yet retained heavy cumbersome sail rigging. An example of this is the *Black Prince* of 1861 which, although it came before the introduction of highly efficient compounding engines, was clearly meant to be a fully powered steamship (Fig. 19).



Fig. 19. The *Black Prince* (Webster 1995: 11)

Complicating any simple distinction between sail and steam even further are vessels such as the *Great Britain* launched in 1843 (Fig. 20). Heralded as an early example of modern screw propulsion engineering, it finished its days as a cargo sailing vessel (Corlett 1990: 154).

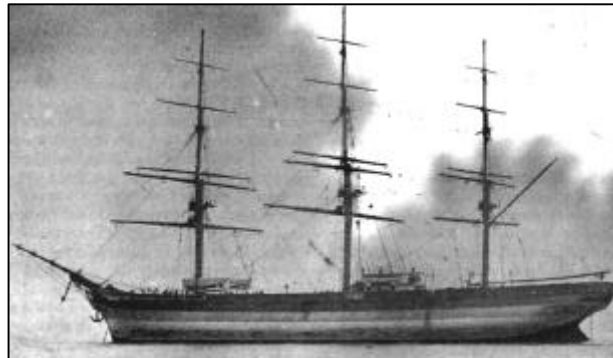


Fig. 20. The *Great Britain* (Corlett 1990:156)

From the beginning the advantage of a fully powered steamer carrying sails was a hotly debated question (Gardiner 1993: 146). The arguments against the presence of rigging were that the masts, spars and sails would produce wind resistance and contribute to dead weight, and that working the rigging would require additional crew. These concerns were not trivial in an aggressive cost driven industry. A popular judgement was that the disadvantages of carrying sails outweighed the advantages of sails in case of engine failure or as added propulsion (Gardiner 1993: 146).

Near the turn of the century, in the operational period of the *Australian*, the appearance of sails on steamships could be seen as a holdover from an earlier period, when engines were less reliable (Gardiner 1993: 118). However, the advantages of sails as a form of assistance in poor weather, as a stabilising feature, or as an emergency precaution, could not be ignored. It is also reasonable to argue that the appearance of sails on small passenger and freight steamships, like the *Australian*, had a marketing value. The passengers would expect the romantic appearance of masts and sails on a passenger ship. The clipper bow and fanciful figurehead of the *Australian* was arguably for this purpose.

The use of schooner rigs on many small steamships, and brig and barque rigs on larger steamships, was a practice that should be given close attention as an aspect of developing steamship technology. These features were there for clear reasons; the expense and labour

associated with rigs and sails dispute anything less. McCarthy argues that the schooner rig on the *Xantho* (1848-72) served to maximise the use of wind power whilst taking wind resistance and other factors into consideration (McCarthy 1996: 141).

Expanding on the notion of the schooner sail plan as an important technological response, the sail plan of a steamer may affect other aspects of design. For example advances in propeller shaft design allowed the propeller to flow with the wake of the ship whilst under sail, as opposed to creating a strong drag factor. Therefore the schooner rig on the early fully powered steamer was not technology in isolation, but was related to other design features.

The debate over including sails came to a head at the White Star Line which abandoned sails altogether beginning with their ships the *Teutonic* and *Majestic* (1889-1890) (Gardiner 1993: 118). In contrast the *Germanic* (1875), an earlier ship of the White Star Line, illustrates the value of rigging on large steamships. It had compound engines that gave the vessel 16 knots, yet it was regularly rigged as a four masted barque with a brailing gaff at the mizzen mast. Here the captain utilised wind power to make time and save fuel costs (Gardiner 1993: 149). The eventual loss of sail rigging on steamships is a separate technological concern to the dominance of steam over sail. In conclusion the schooner rig of the *Australian* played an important part in this saga, illustrating one variation of the popular schooner rig found on many medium sized steamships of this era.

Triple expansion engines. It is not an overstatement to claim that the introduction and popularity of the triple expansion engine significantly affected world shipping. It was less a marked leap in invention, than the logical next step from the two stage compound engine. Yet it became the accepted standard steam engine from the 1880s up to the introduction of internal combustion engines. The continued popularity of these engines persisted after the introduction of quadruple expansion engines and turbine steam engines. The introduction of economical and efficient compound engines was one factor that allowed steam to finally dominate the shipping market. Thus the engine on this shipwreck site is representative of this popular engine type, a kind not highly represented in such good condition within the Australian archaeological record.

The technology of the period was driven partly by the economic need to minimise engine size and increase speed and efficiency. Gardiner reflects that the reasoning behind compounding was that if temperature reduction could be minimised, there would be less condensation which could be left behind in a single cylinder. This would increase the efficiency of the next piston movement (Gardiner 1993: 106). In turn the lower pressure cylinders utilised previously exhausted steam and so reduced energy wastage.

The first compound engines divided the process into two stages; a high pressure and low pressure stage. Experiments included varying the number and location of the low pressure cylinders. Advances in compounding technology lead to the development of the triple expansion engine, where the steam is utilised in three consecutive stages. The clear advantages of the triple expansion engine were: the reduction in size of the engine by the introduction of an intermediate cylinder to reduce the work of the larger low pressure cylinder/s, a more even fluid mechanical motion and the reduction of stress placed on the low pressure cylinder/s by the introduction of an intermediate cylinder (Guthrie 1971: 122). Like most developments in steam technology, the triple expansion engine was introduced firstly to the rail service, then to the river boat service and eventually to sea-going steamers (Guthrie 1971: 123).

The triple expansion engine became the accepted compounding engine amongst engineers who appreciated the increase in speed and power, and reduction in fuel consumption. The performance of an early steamer, the *Aberdeen* (1881), helped persuade ship owners of the value of this engine type. The *Aberdeen* was built by Kirk at Napier and Sons, the builders responsible for the *Australian* (Gardiner 1993: 107).

Triple expansion engines varied in design; examples being the sister ships the *Arawa* and the *Tainui* built in 1884 by Denny of Dumbarton (Gardiner 1993: 109). These vessels had triple expansion engines with four cylinders, having twin LP cylinders. In turn the IP cylinder was located above the two LP cylinders, shortening the length of the engine. Invention beyond this kind of adaptation did not threaten the standing of the triple expansion engine. Guthrie reflects that, though quadruple expansion engines were introduced by the 1890s, they remained a feature of larger and necessarily faster cargo ships (Guthrie 1971: 133). In turn less dramatic inventions took precedent with innovations such as forced draught, steam cylinder jackets and superheating steam systems being tested. In conclusion the triple expansion engine was the popular engine, not just for its efficiency, but because of its relative simplicity and ability to perform well with minimal maintenance (Gardiner 1993: 123).

Steel (and high pressure boiler design). Once good quality steel was consistently available on a commercial level it became the dominant ship building material. Steel is lighter and stronger than iron, therefore builders could make stronger and lighter hulls. The reduction in dead weight was 12-15% (Corlett 1990: 199). This saving would be used to increase the cargo capacity. Steel as a building material also revolutionised boiler technology. Stronger steel boilers facilitated the creation of substantially higher steam pressures. These higher pressures were the stimulus for the compound engine technology, a technology that was a direct response to a marked increase in available steam pressures. These compound engines were 60% more efficient in fuel consumption than their predecessors (Gardiner 1993: 9). Gardiner argues that it was the introduction of commercial steel, which in turn led to the development of efficient compound engines, that ultimately brought about the dominance of steam over sail in world trade (Gardiner 1993: 9).

The introduction of steel is particularly relevant to the *Australian* because the ship was the first steel steamer of the fleet, and the engine, a small triple expansion engine, was indirectly a product of the introduction of steel to marine engineering.

The introduction of steel in ship engineering began in the 1870s, and Corlett argues that consequently iron died as the principal building material by 1880 (Corlett 1990: 201). The production of steel began with the invention of the air-blown converter in 1856 by Bessemer (Corlett 1990: 199). This apparatus blew cold air through molten pig iron removing carbon and other impurities. This method was improved by Siemens with his regenerative process (Corlett 1990: 199). Using either process also increased the melting temperature of the metal, making it easier to fashion, for example, in the production of large hull plates.

Initially steel was expensive to manufacture, and the production of a consistent quality was difficult for some time. In 1877 steel cost twice the price of iron. By 1880 however, steel prices were reduced to being 50% more expensive, and by 1891 steel was only 10% more expensive than iron (Corlett 1990: 200). Lloyds first set standards for steel ship design in 1888, which limited the reduction of scantling from iron standards to 20% and set standards on acceptable steel quality.

The advantages of steel as a material outweighed the disadvantages, primarily that steel corrodes faster than iron, ultimately limiting the age of the vessel.

Refrigeration systems. The *Australian* had a compressed air refrigeration system a board. The design of this kind of system is discussed in chapter 4. This was the earlier of the three kinds of systems that dominated the frozen or chilled cargo trade which began in the 1880s.

The alternative ammonia and carbonic anhydride systems both worked in a similar fashion. The ammonia system worked by firstly passing ammonia gas through the compressor where it was liquefied under pressure. It was then cooled by passing through a sea-water cooling unit. From a connected receiver the liquefied ammonia was released to evaporate into a brine cooler expanding and boiling off at a temperature below 0°F. The gas was then recycled back into the compressor and the brine was circulated into the chamber as the cooling agent. This allowed a more specific control on temperature, serving different kinds of goods housed in different compartments. The CO₂ unit worked in a similar fashion however this gas was worked at greater pressures. These later systems were more efficient, the temperature could be controlled, however both used potentially lethal gases (Guthrie 1971: 278).

4.2. The *Australian* steamship: a technical comparison with the *Brisbane* and the *Catterthun* steamers

Introduction. The aim of section is to analyse the technology of the *Australian* by a comparison with two other steamships, both of which are now historic shipwrecks. The comparison is brief and is only a glimpse of the variations and technological differences possible between steamers built for a similar function, in relatively similar periods. An in-depth comparison would require more information on each vessel and a larger sample of steamships. The information used derives solely from Lloyds survey data.

There is an historical element to this comparison, as these three steamships were owned and operated by the E & A, working a similar route. In turn the engine of the *Brisbane* was built by Napier and Sons, the company which built the *Australian*.

A brief history of the *Catterthun* and *Brisbane* shipwrecks. The *Brisbane* was built in 1874 in Glasgow, by A & J Inglis, and the engine was built by Napier and Sons. It was owned and operated by the E & A. The steamer worked a similar route to that of the *Australian*, servicing ports on the south and east coasts of Australia, Palmerston (Darwin), and ports in Asia. In October 1881 it struck Fish Reef, approximately 48 kilometres from Palmerston. It was returning from Hong Kong carrying 14 passengers and a cargo which included tea, opium, and rice. No one was killed in the accident, however attempts to refloat the vessel failed.

The *Catterthun* was built in 1881 by Meers Doxford and Sons, Sunderland, England. The ship was run and operated by the E & A. The steamer worked a similar route to the *Australian* servicing ports on the south and east coasts of Australia, Palmerston, and ports in Asia. In August 1895 the ship struck an outcrop near Seal Rocks north of Broughton Island, NSW. The ship had left Sydney heading north. It struck and sank, taking with it the lives of 54 people. Almost a year after the disaster a salvage operation was conducted, raising 7000 gold sovereigns.

Table 2. Technical comparison: *Australian*, *Catterthun* and *Brisbane* steamships

Feature	<i>Australian</i>	<i>Catterthun</i>	<i>Brisbane</i>
Date Built	1896	1881	1874
Wrecked	1906	1895	1881
Material	steel	iron	iron
Decks	2 decks	2 decks	1 deck and spar deck
Gross tonnage	2838 tons	2179 tons	1503 tons
Length	341.7 feet	302 feet	281 feet
Rigging	fore and aft schooner	f&a schooner & topsail	f&a schooner & topsail
Propulsion	triple expansion engine: 26,43,70-48"	compound engine: 40,70,-48"	compound engine: 40,71-42"
nhp	400 nhp	250nhp	250nhp
Knots capability	15 knots	12 knots	13 knots
Main boilers	175 psi	75 psi	70 psi
Auxiliary b	80 psi (horizontal)	55 psi (vertical)	no
Ballast bottom	cellular double bottom	older style	older style
Refrigeration	yes	no	no
electricity	yes	no	no
Thickness of bulkheads	(6)7/16 inches	(7) 7/16 inches	unknown
Thickness of frames	3 ½ inches	3 inches	unknown
Thickness of main sheerstrake plate	13/16 (40)	13/16 (40)	unknown

Discussion. The most noticeable differences between the *Australian*, the *Catterthun* and the *Brisbane*, based on Lloyds survey information, are in steam production and nhp. The steel boilers facilitated the production of higher pressures and the triple expansion engine produced the markedly different power output. Other explanations, for example the size difference between the ships, cannot account for these marked differences in output capabilities.

Interestingly the steam and nhp output differences do not translate into a matched increase in capable speed (knots). This may indicate that the increase in power output of the *Australian* was designed to respond to the increased net tonnage or weight. In addition to these differences there would be a further difference in coal consumption efficiency of the engines.

Table 2 shows an interesting detail regarding the response of the triple expansion engine to higher levels of steam pressure. The intermediate and low pressure cylinders of the *Australian's* engine are similar in diameter to the cylinders of the *Catterthun* and the *Brisbane*. In turn the stroke size is the same in the case of the *Catterthun* and similar in the case of the *Brisbane*. Therefore, it is arguable, based on this evidence, that the role of the high pressure cylinder of the triple expansion engine was to respond to the higher pressure produced by the steel boilers. Steam leaving the high pressure cylinder was then treated in a similar fashion, in regard to cylinder diameter and varying levels of expansion.

It is also an interesting fact that the *Australian* steamer had a horizontal auxiliary boiler able to produce 80 pounds psi, whereas the *Catterthun* has a vertical auxiliary boiler capable of only 55 pounds psi. One explanation for this difference maybe that the *Australian* ran secondary machinery that required more power, for example the refrigeration units. A comparative study of the different roles of these auxiliary boilers may yield interesting answers as to the way available energy was managed on these early steamers.

Another difference in the design of these ships is that the *Australian* contained a cellular double bottom ballast chamber. These chambers became the design norm, and therefore the

absence of this kind on the *Catterthun* and the *Brisbane* is an example of developing technology.

Lastly, the *Catterthun* could be rigged as a top sail schooner whereas the ship plans suggest the *Australian* could not. This difference demonstrates that within the tradition of schooner rigs on steamers, there was further technological variation. The role of the square topsail, as an accessory of fore and aft schooner rigs, was to increase the area of sail and thus increase speed or power.

CHAPTER 5: SITE DESCRIPTION AND ARCHAEOLOGICAL INFORMATION

5.1. Site location

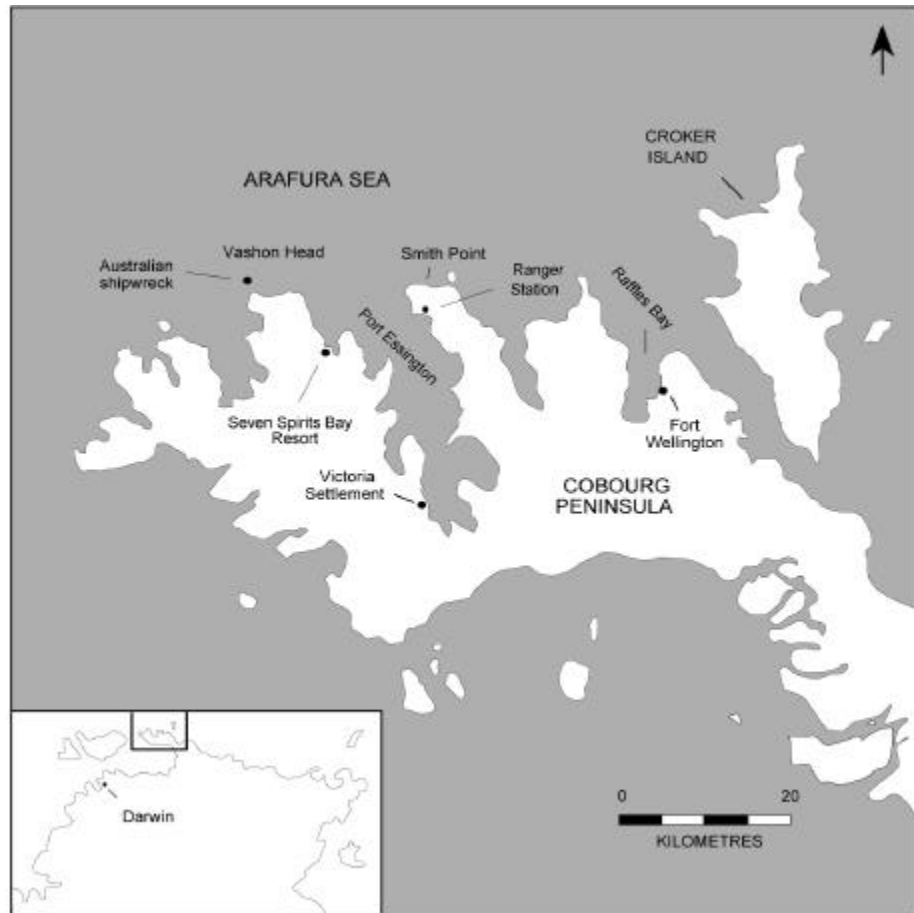


Fig. 23. Location of the site

Key location details.

	Vashon Head, Cobourg Peninsula, Northern Territory
Nautical Chart:	Aus 18 Port Essington - Australia North Coast
Scale:	1:75 000 at Lat 11°15'
Latitude:	11° 06.667' (GPS)
Longitude:	131° 58.533' (GPS)

Overview. The *Australian* shipwreck is located on Vashon Head reef, which protrudes away from Vashon Head to approximately 1.5 nautical miles. Vashon Head is the western entrance point to Port Essington. The mouth of Port Essington stretches 8 nautical miles marked by Vashon Head at the west and Smith Point as the eastern marker. Port Essington is located along the northern coastline of Cobourg Peninsula.

Cobourg Peninsula is located approximately 220 kilometres NE of Darwin. It extends from northern Arnhem Land and forms the eastern border of Van Diemens Gulf. The peninsula

constitutes Gurig National Park and the surrounding water makes up the Cobourg Marine Park.

At low tide Vashon Head reef is covered by approximately 5 metres of water therefore, though a shallow reef, it remains submerged. At high tide the water is approximately 8 metres deep. Vashon Head is also the location for the remains of the wooden sailing barque the *Calcutta* (1868-1894) (Coroneos 1996).

Vashon Head itself is a small peninsula approximately 3 kilometres wide. It is mostly coastal swamp but also includes open forest and sand dune areas. There is a hill 48 metres high 3.6 kilometres south from the tip of Vashon Head (*Australian Pilot* 1972:57).

Cobourg Peninsula also includes the remains of the failed British outposts; Victoria Settlement, Port Essington (1838-1849) and Fort Wellington, Raffles Bay (1827-1829).

5.2. Site formation sequence

The vessel ran aground on Vashon Head reef on 17 November 1906. The ship passed over the reef and first struck a series of large boulders lying on the reef floor. The bow passed clear over the boulders and the vessel first struck at its midships, the ship coming to a standstill. The ship teetered, balancing on its midships, accounts describing that the vessel tended to dip forward with the stern slightly raised. Immediately following the impact cargo hold one, located in the forward section, flooded with water. The initial impact caused considerable damage to the forward section of the bilge, historical accounts explaining that there were at least three large holes or tears in the hull. Over the course of the first evening the ship swung on this axis, the bow coming to rest in a NW direction. The ship was described as being very unstable, the hull continuously bumping against the reef floor (Fig. 22-1).

Over the first few days the ship developed a considerable list to starboard. The lower deck sections were flooded by breaches in the hull and from water washing over the starboard deck and then through the hatchways. Reports also indicate that the ship had begun to buckle, suggesting that the keel, arguably the backbone of the ship, was giving way. The stress placed on the keel would have been excessive, considering the continued battering against the reef and boulders, the weight of the flooded vessel and the awkward balancing of the vessel on the damaged midship area (Fig. 22-2).

In August 1907, as part of a failed refloating attempt, salvors briefly raised the vessel from its sunken position. Prior to this some machinery was removed from the steamer to lighten its weight. A winch was set up on the stern deck, its role being to pump water out of the hull once the ship was afloat. Divers also inspected the extent of damage to the hull.

As the pumps were insufficient for the task, the vessel was relowered. At this time, there was no report of a loss of any superstructure, the vessel described as being relatively undamaged except for the obvious tears in the hull. Though reports indicate that the ship was lowered again in the same location there is a suggestion that it was not lowered back onto the bed of boulders. The salvors described its new position as on a bed of sand, with the bow facing in a NW direction. Recent inspections show that the wreck does not lie amongst boulders but on a bed of coarse sand.

By September 1908 reports indicated that once again the vessel was lying with a considerable list to starboard. The extent of the list to starboard is described by the fact

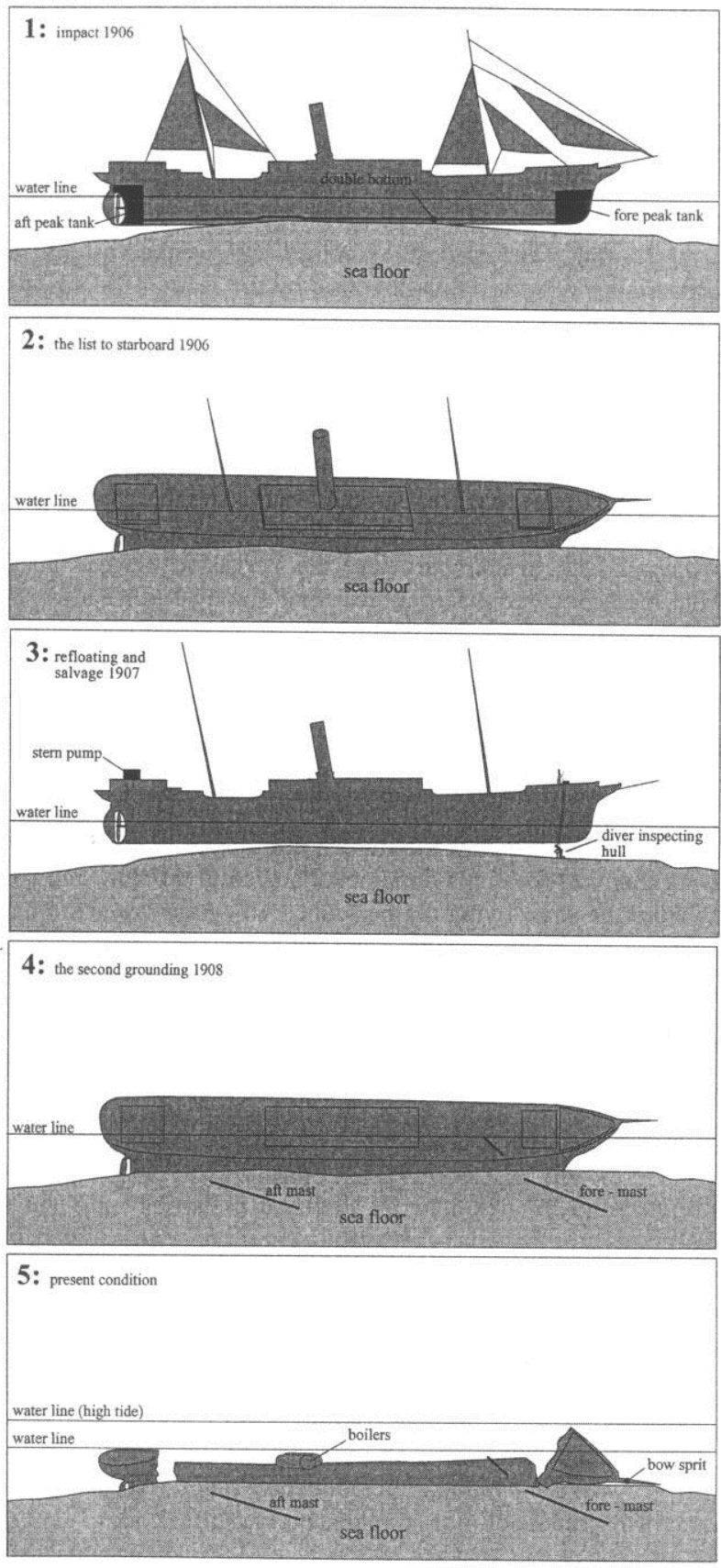


Fig. 22. Site formation sequence (S. Jung 1998)

that, at half flood tide, the sea would wash over the starboard deck and pour into the hatchways. The level of water in the flooded lower deck would immediately respond to the changing tide, indicating that the breaches in the hull were extensive. The saloon had been described as appearing buckled with the midship area rising above the forward and aft sections by a number of feet. This 'hogged' position suggests that, by this time, the main keel had given way. Accounts also report that the stays and supports of the masts and funnel were gone and that these features were also canting aft-ward at an acute angle.

Over time the masts and the funnel, the thinner and weaker of the deck structures, collapsed to starboard, prompted in this direction by the lean of the vessel and the strong NW winds. Today there is no evidence of the funnel however the masts are visible on the site (Fig. 22-4).

Eventually the deck collapsed and material fell to the floor of the ship, retained in this area by the hull walls. In his theory of iron ship disintegration Riley describes this process as the 'hull becoming a receptacle for fittings and artefacts as they fall' (Riley n.d.: 1). Following the loss of the deck structure, particularly the support of the bulkheads, the hull walls eventually collapsed. Both sides of the hull collapsed to starboard, again influenced by the vessels overall lean to starboard and the pervasive NW winds. The port side collapsed onto the main body of material, covering amongst other areas a section of the engine room. The starboard side collapsed further to starboard, to become deposited to the right of the ship floor. Recent investigation has located examples of the starboard hull with the inner frames still attached to the plates.

Without the support of the hull the bow and stern broke away from the keel. The bow fell forward and to starboard. The stern is upright with a slight lean to starboard. The foredeck has deteriorated and the bow, which rests on its starboard side, is a cavern attracting fish life. Interestingly, the capstan and anchor crane remain partially positioned inside the bow structure indicating that these features remained attached to the bow and collapsed with it, as it broke away from the ship. Lying on the seabed aft of the raised stern section is a fan pattern of deck plating. This indicates that, over time, sheets of the deck have broken away and fallen to the sea floor.

Weakened by strong tidal current and the weight of the collapsed deck features, the lower extremities of the hull flattened onto the sea floor. This returned the ship floor to a near upright position as indicated by the upright position of the machinery. This hull is not buried in the sand to its waterline, as would occur according to Riley theory, because the ship rests on a hard reef that has only a minimal sand cover (Riley n.d.: 1).

Over time the lighter and thinner material that had collapsed onto the ship floor and starboard of the site was swept away by prevailing conditions. This includes the remains of the deck houses. During the process of structural collapse a portion of the ship floor and ballast section has been pulled away from under the body of debris, making it visible for inspection (Fig. 24-5).

Salvage in the 1970s contributed to changes to the site. Salvors used explosives to remove the condenser. In doing so they demolished the port hull section that had collapsed and covered the engine. The explosion or series of explosions also cracked the engine into two pieces. The condenser was removed and the condenser pipes were collected into a bundle but were not raised. This bundle of pipes remains on the site.

5.3. Site description

Overview. The shipwreck lies on a reef which protrudes from the coastline. This reef floor is covered with coarse sand and at the location of the shipwreck the reef is without gullies or pits therefore relatively flat. Historical accounts describe large boulders present however these were not sighted in the vicinity of the shipwreck. The site is a home for a variety of fish, for example snapper species, and a variety of plant life, for example fanning corals.

The remains of the ship are best understood as consisting of three main sections. These are the bow, the midship-section which rests on the remains of the ship floor and the upright stern counter. Small amounts of debris are located at short distances from this main body of material, however in general these three sections constitute the shipwreck. The superstructure and deck of the ship is gone and the hull has broken away to the sand floor. The bow and stern counter have broken away from the keel of the ship. The bow rests on its starboard side and retains much of its hull integrity and shape. The midship section comprises the ship's keel and floor. Resting on the ship floor is material originally from the lower deck or that which has fallen from the upper deck as the ship collapsed. This material includes the three boilers, a selection of machinery and ship design features such as the propeller housing. Located in the aft portion of the shipwreck site, close to the vicinity of the stern counter, are ceramic tiles from the galley or bathrooms, a brass padlock and a bone, the remains of meat cargo. The preservation of the bone suggests that it has only recently been uncovered.

The full length of the site, from the remaining bow to stern, is approximately 110 metres in length with an average width of 8 metres. At high tide the shipwreck lies at a depth of 7-8 metres, which can fall at low tide to 4 metres. At low tide an upturned section of the bow breaks the waters surface. Visibility varies greatly, at best reaching 4-5 metres, yet can be considerably poorer. The poor visibility is partly produced by organic particles in the water stirred up by the strong current and from land run off.

The shipwreck site demonstrates aspects of Riley's theory on iron ship disintegration (Riley n.d.: 1). As predicted the deck and bulkheads collapsed. The upper ship features collapsed onto the remaining ship floor, the remaining hull walls acting as a 'repository'. Over time the hull broke away. Also, as predicted, the bow and stern sections have broken away from the keel, these no longer supported by the ship's hull. The ship is not buried to its waterline, as the theory predicts, because the sand layer above the hard reef floor is too shallow.

A thin, dull-coloured layer of concretion and small hard corals' cover the exposed ferrous remains of the wreck. The concretion layer may partially buffer the surface from physical abrasion, caused by strong tidal current and seasonal monsoon conditions. The shipwreck is located in shallow highly oxygenated water.

The bow section. The bow has broken away from the ship and has fallen forward and to starboard (Fig. 24). The bow at present still retains its rounded three dimensional form. The upturned port side of the bow maintains all of its hull plating and displays a hawse pipe, distinctive mould lines and a set of fairleads, the latter was used to secure the bowsprit to the foredeck. Also attached to the structure, alongside the port side, is the remains of the sheerstrake frame for the raised deck. Except for a small, forward steel portion, the deck of the bow is absent creating a cavernous region, which is highly populated by fish life. At low tide the rear port portion of the bow breaks the surface of the water.

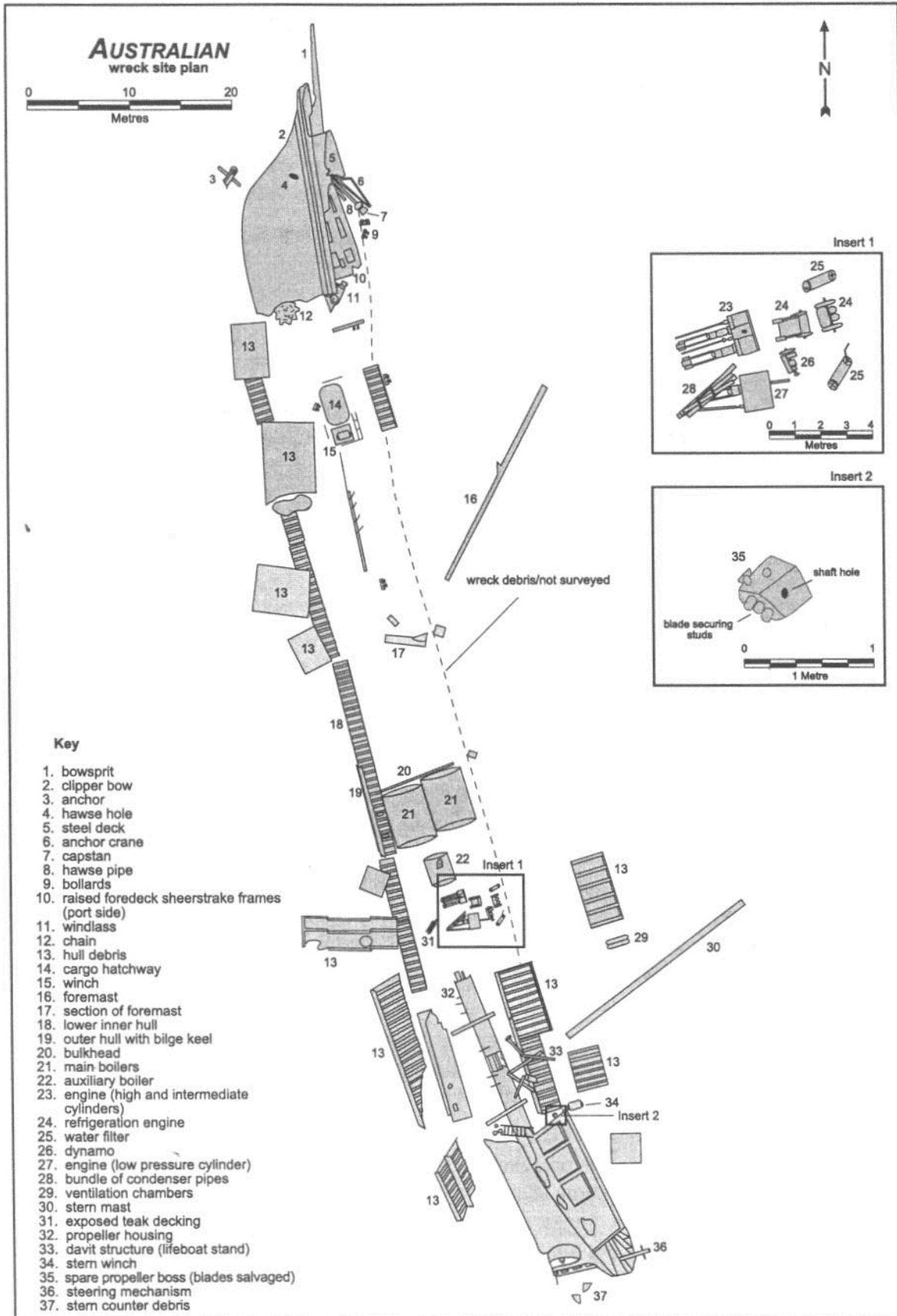


Fig. 23. Site plan of the *Australian*, 1997.



Fig. 24. The remains of the bow (photo: J. Riley)

The forward section of the bow is exposed and one may trace the distinctive clipper shaped bow. The bowsprit remains intact measuring 7.6 metres long. The wood is considerably degraded though there was not visible evidence of burrowing worm damage. The bowsprit is made of a round section of wood, formed square at the base, where it is still attached to the remaining bow structure with square staples. The figurehead, that of a white lady, is gone.

Located 5 metres to the west of the bow is a Trotman's anchor standing upright and half buried (Fig. 25). This may be the port bower anchor. A length of the shank and the stock is exposed. An anchor ring or shackle also remains attached to the anchor through its eye. The height of the exposed portion of the shank is 1.5 metres and has a diameter of 0.7 metres. The anchor ring has a diameter of 0.3 metres.



Fig. 25. The anchor *in-situ* (photo: J.Riley)

Much of the foredeck has collapsed leaving a swim-through into the interior of the bow. All that remains of the foredeck is a small portion of steel decking, known as the deck hook, which is fixed at the very peak of the bow. The head of the capstan and the top of the anchor crane are deposited on the seafloor outside this cavern (Fig. 26). The legs of the anchor crane and the shaft of the capstan still reach into the remains of the bow's lower deck section. Also protruding from the internal bow structure are the port and starboard hawse pipes. The remains of the collision bulkhead are visible within the bow and this probably contributes to much of the structure's remaining strength.



Fig. 26. The capstan and anchor crane *in-situ*, located at the bow. (photo: J. Riley).

Two chain stoppers are visible; one near the capstan and the other near the hawse pipes. A set of twin head bollards are also present. The supportive frame of the bollards measures 1.15 metres by 0.35 metres and the diameter of the bollard heads is 0.35 metres. There are a number of bollard sets throughout the shipwreck site, in varying sizes and degrees of condition.

Resting against the rear portion of the bow structure is a steam driven windlass, the starboard anchor chain locker and chain from the port anchor chain locker. The windlass, no-longer secured to the foredeck, has fallen and now rests on semi-collapsed support beams. Lying over the windlass is another collapsed support beam. Beneath the windlass is the starboard chain locker which still contains a pile of chain, that has partly spilled out. Leading from the chain locker to the winch are a set of pipes. These were the pipes feeding the chain from the locker to the foredeck. Two lengths of chain still run through these pipes indicating how the system worked.

Lying adjacent to the locker is a pile of chain corroded and fused into a shape which appears to have been that of the port chain locker, now corroded away. Leading from this pile of chain are also two pipes feeding chain length to the windlass above. The piles of chain and the remains of the chain lockers rest aft of what appears to be the rear bulkhead of the forepeak tank. From this bulkhead starts the length of the hull double bottom.

Forward midships: aft of the bow and forward of boilers. Between the bow and the stern counter the remains of the ship follow the old line of the vessel, doing so because the material rests on the remains of the keel and the ship floor. Between the bow and the main boilers is a section of the shipwreck which comprises both nondescript girders beams and steel plating and important examples of machinery and ship design.

Approximately 10 metres from the rear of the bow is the remains of the forward cargo hatchway and its allied winch (Fig. 27). The winch sits upright and aft of the hatchway. Partial exposure of floor beams indicates that these two features remain fixed together. The upright position of the winch and hatchway suggests that at least the portion of deck, to which they were fixed, fell down flat.

The winch is bordered by a raised frame, measuring 2.15 metres square. The winch itself appears in good condition. Its overall dimensions are approximately 1.15 metres by 2.8 metres in length and is 1.10 metres in height. The warping ends (spools that work the chain or rope) and the main piece, (part of the driving mechanism), are distinguishable and visibly impressive features. There is a foot pedal reaching out into the water. The hatchway is a rectangle of 2.50 metres x 3.60 metres. However, it is possible that these are not the original dimensions. The raised frame of the hatchway is intact.



Fig. 27. The forward winch *in-situ* (photo: J. Riley).

Scattered along the length of the shipwreck are sections of hull plating and the remains of the collapsed hull walls. Both the starboard and port hull sides collapsed in a eastward direction due to the angle of the stranded ship and the direction of winds. These broken sections show examples the outer hull plating and, on the opposite side, the frames and side stringers of the hull's scantling. Some of these broken sections are right angles, one side showing the plating or internal frames of the hull wall and the other arm of the right angle illustrating a section of deck with a pair of bollards still secured to its face. This material is instructive in regard to technical design and is important in distinguishing the shipwreck's break-up sequence.

The most revealing remains of the hull are found along the port side of the wreck. Here a significant portion of the ship floor and hull double bottom is exposed for investigation. This section is approximately 70 metres long. This visible material allows one to investigate the design of the ship floor, lower hull and the cellular double bottom. In turn this section of the remaining hull is raised off the seabed to the extent that the port bilge keel is exposed and can be studied (Fig. 28). The role of the bilge keel was to contribute to ship stability.

Lying east of the forward midship section is the steel foremast. This lies at a 45° angle to the line of the shipwreck, with the base of the mast lying closer to the stern of the steamer. The length of this portion of the mast is 22.80 metres and has a diameter of 0.75 metres at



Fig. 28. The port bilge keel *in-situ* (photo: J.Riley).

its widest end. There is a cheek, approximately 12 metres along the mast's length, as measured from the base. No wire rigging was visible. A separate section of the foremast, a length close to 5 metres, rests on the main body of wreckage and it appears by its thickness to have been closer to the base than the longer portion.

Returning to the main body of wreckage there is a large twisted section of steel that was once part of the deck. It is 18.30 metres long and begins 42 metres from the bow. It is a narrow twisted length of steel deck that has bollards secured to its face. Supportive beams remain fixed to its underbelly.

Just forward of the boilers are the remains of the engine room bulkhead. There is little height remaining to this bulkhead however it is clearly visible from an aerial perspective because of its thickness and the marked drop in height from the forward midship section to the floor of the boilers. In the close vicinity of the bulkhead are the remains of the ventilator system and the lifeboat davits.

The boilers. The three boilers of the *Australian* remain visually dominant features of the site. They consist of two (twin) double-ended steel boilers and a horizontal steel auxiliary boiler. Each face of the larger boilers was equipped with three furnaces, each measuring 0.4 metres square. Many of these furnaces still have doors that open and close. As is common on steam shipwrecks that have been underwater for a considerable period of time, only the boilers themselves remain, the surrounding smoke box, uptake funnel and all other additional structures are gone. The boilers rest on supportive seats referred to as 'boiler bearers'. These remain intact and still support the boilers in position. The auxiliary boiler measures approximately 2.2 x 2.2 x 2 metres. A section of the top plating has corroded away exposing the inner stays and fire tubes. Returning to the main boilers the position of the furnaces indicate that they are orientated close to an upright position. The port boiler rests 65 cms to the rear of the starboard boiler indicating that some movement has occurred.

Figure 29 shows one side of twin double-ended boilers. The number of hatches and the hull bottom are incorrect in relation to the *Australian*, however it remains a general guide. Take note that the boilers are supported by stays that are connected to the hull. Within the *Australian* these stays were particularly necessary to support the boilers, because the lower deck was absent in the boiler room to accommodate the size of the main boilers.

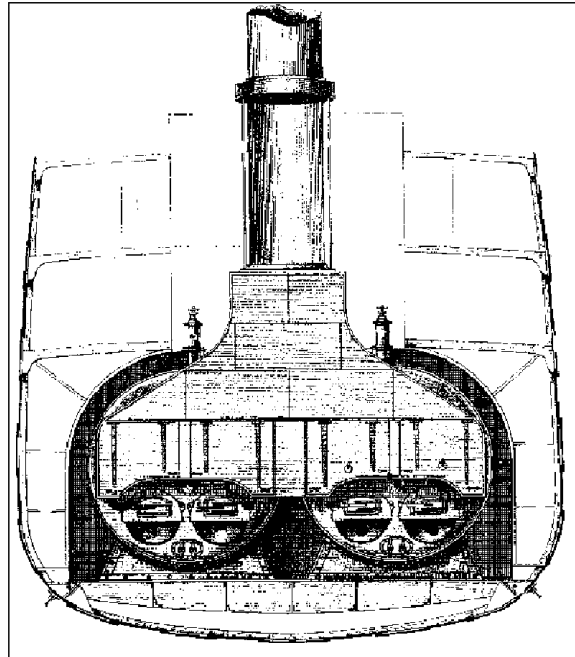


Fig. 29. Frontal view of similar boilers, a general guide (Paasch 1977: 44)

The engine room and machinery. Aft of the auxiliary boiler is the area that once constituted the engine room. Various machinery remains intact and visible for inspection. This includes the engine (in two parts), dynamo, twin refrigeration engines, two water filters and a section of the main crank. The feed water filters would filter oil and other impurities from the condensate produced after expansion in the engine, prior to its return to the boilers. Sothorn argues that refrigeration units were stored on deck however the position of these units suggests otherwise in the case of the *Australian* (Sothorn 1923: 30). The engine has been damaged by salvor's explosives in the 1970s. There was also no evidence of the twin bilge pump system, which was positioned in this area (ship plans: National Maritime Museum, Greenwich).

The engine lies on its side with the low pressure cylinder detached and resting 0.6 metres away (Fig. 30). Once intact and upright the engine was cracked into two pieces by salvors explosives. The tail rod of the low pressure cylinder is protruding from the roof of the cylinder. The high and intermediate pressure cylinders do not have protruding tail rods, indicating that in contrast these pistons are in the down position. This indicates further internal damage as these two pistons should be in contrasting positions. The circulating pump, the condenser and the support column of the condenser have been removed from the engine by salvors. The condenser pipes remain present on the site, tied as a bundle. In addition to the break of the engine into two segments, a support column of the engine that once led to the condenser is gone.

The high and intermediate cylinders constitute the smaller section of the engine, the low pressure cylinder being substantially bigger (Figs 30, 31). Inspection of the engine has indicated that the exhausted steam from the low pressure cylinder valve chest was routed through the hollow cast iron port support column to be fed into the condenser. This is an adaptation in design to save valuable space.



Fig. 30. The low pressure cylinder section of the propulsion engine *in-situ*. (photo: D.Steinberg).

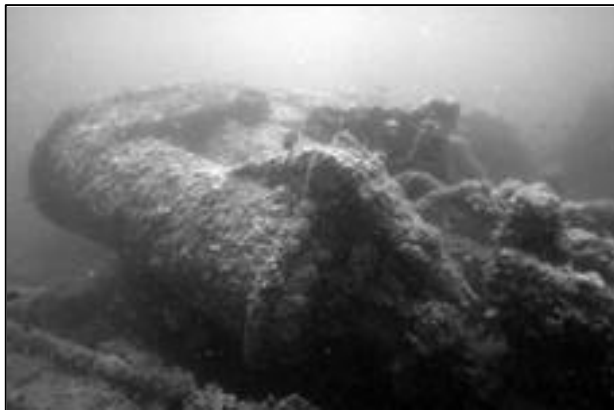


Fig. 31. The high and intermediate pressure cylinders section of the propulsion engine *in-situ* (photo: D.Steinberg)

The remains of the water filters, dynamo and twin refrigeration machines appear in good condition. The outer surface of these still remain intact. These surfaces are covered in small hard corals and a thin layer of concretion. In particular the dynamo illustrates much of its design with the driving shaft and cylinder still intact and clearly visible (Fig. 32). Further investigation may indicate if the dynamo pulley was fitted for belts or ropes, this distinction in design highlighted by Guthrie (Guthrie 1971: 277). The remains of the refrigeration systems show the flywheels, once powered by the cylinder of the expansion unit (Fig. 33). As part of the refrigeration process the working of a cylinder was to expand and cool the steam.

A small but significant example of teak upper deck planking is located near the remains of the engine room. This is located 2.4 metres aft of the auxiliary boiler. This planking is nearly hidden from view, found underneath debris and partially covered by sand; which may have protected this wood from a substantial degree of deterioration. Each plank measured to a width of 0.22 metres.



Fig. 32. The dynamo *in-situ* (photo: D. Steinberg).



Fig. 33. A refrigeration unit *in-situ* (photo: J. Riley).

The stern section including propeller housing and the mizzen mast. Further aft, beyond the engine room, is the remaining stern section. This is dominated by an upright portion of the hull constituting the stern counter with a portion of the extreme aft hull walls and deck still attached. Other features include the propeller housing (with propeller shaft), the stern winch, a spare propeller hub, davit structures and the mizzen mast.

The steel mizzen mast is located east of the ship floor. It still retains its original length of approximately 22 metres and similar to the fore-mast it rests at a 45° angle to the line of the shipwreck. Located 2 metres forward of the mizzen mast are the remains of two ventilator chambers, resting side by side, creating a 'shotgun' type appearance.

Also located east of the ship floor are sections of hull, found scattered on the seabed. These examples show the outer plating on one side and the remains of the frames and side stringers on the other. In this area are a number of brown square ceramic tiles, arguably from the galley or bathrooms. They are approximately 60cms by 60cms in length. These tiles are clearly visible and are threatened by potential salvage. Also located was a small brass padlock. This was located nearer to the propeller housing and was half buried in the sand.

The propeller tunnel is a distinctive feature of the aft portion of the shipwreck. It runs from the remains of the engine to eventually disappear into the aft peak tank, having an overall length of approximately 12 metres. The propeller shaft within the tunnel is off-set to port to allow a person to enter and perform maintenance or repairs. A water pipe also runs the length of the housing parallel with the shaft. Lying over the shaft tunnel are the remains of lower deck support beams.

Resting just forward of the stern section lies a winch. Historical accounts suggest it was used to run salvage work initially following the stranding. Close to the winch is a ladder, still connected to the stern section. The remaining ladder is approximately 2 metres long and was originally a ladder leading from the lower deck area to the upper deck. Where the propeller shaft disappears into the remains of the aft tank, one can see a spare propeller hub.

The stern itself stands with a minor list to starboard. It still remains structurally intact because it gains significant strength from the remaining steering column. Hull plating remains attached however a substantial degree of the deck floor is gone. This has exposed the tie-plates and deck beams. The hull plating curving around the raised counter has fallen off, and is lying on the sand in close proximity.

The steering mechanism is partially intact and the rudder is turned fully to starboard past its stops. The bronze propeller has been salvaged as have the bronze blades of the spare hub. In correspondence dated December 1997, Riley has stated that normally the propeller could not have been removed without removing the nut and withdrawing the shaft. Therefore he argues that the propeller was removed using explosives to shatter the hub. A small excavation would be necessary to expose the area and prove this argument.

Artefacts. The site has a number of significant relics, most obvious is the collection of late 19th century machinery. Smaller items include the ceramic tiles, the bone (remains of cargo) and the brass padlock. Investigation of the bone remains may indicate butchering techniques.

In a telephone conversation in April 1998, John Chadderton stated that when he visited the site in 1970, the brass lanterns were visible. This is possible, however initial salvage work following the stranding was extensive and items such as these were more likely collected and sold at public auction (NTT&G 28 August 1908).

5.4 Site deterioration

In addition to the aim of recording the visible remains of the shipwreck in 1997, effort was made to both document the condition of the remains and identify the environmental variables which affect their condition. From this, inferences have been made as to the process of site deterioration and to what visible signs of deterioration will be seen in the near future. It must be noted that neither a conservator nor marine biologist accompanied the fieldwork team. Also, no measurements were taken of marine or environmental conditions, only observations. Therefore, these conclusions are not extensive and further study is recommended.

Three processes that promote the deterioration of this shipwreck are corrosion, physical abrasion and structural stress, the latter from strong tidal current, winds and seasonal cyclonic conditions.

Corrosion is a complex subject and corrosion rates are unique, not just for each shipwreck, but items scattered across each shipwreck. However, basic rules in regard to environmental variables can be followed and these suggest that the *Australian* is undergoing rapid corrosion. The *Australian* is located in shallow constantly flushed seawater suggesting that the dissolved oxygen rate is high. It is located in tropical water where the seawater temperature and the salinity level are high (salinity in tropical waters - Pearson 1987: 17). These factors increase the rate of corrosion (Pearson 1987: 74-76). The vast majority of the remaining material is steel, which corrodes faster than other metals such as copper alloys and iron, supporting the notion that rapid corrosion is occurring. The long term corrosion rate for mild steel in seawater is 0.11 mm/year (Pearson 1987: 77). Lastly the corrosion of the bow and stern sections, in particular, are increased by differential aeration, caused by an interface between the air and water environment. Therefore, in conclusion, it can be argued that the *Australian* is undergoing rapid corrosion.

Two factors which may assist the partial protection of the metal from corrosion are the presence of a concretion layer and fouling assemblage. A concretion layer may reduce the rate of corrosion by creating an enclosed local environment with unique conditions between the metal's surface and the sea (Pearson 1987: 77). A fouling assemblage may also act as a buffer between the metal's surface and the outside environment (Pearson 1987: 14). However, Pearson cautions against any quick conclusions stating that the presence of lifeforms attached to surfaces may, in contrast, increase the rate of corrosion (Pearson 1987: 14).

The site also experiences physical abrasion by the sandy bottom which act as a scouring and abrasive agent. This is precipitated by a strong tidal current. The site also suffers structural stress from current action, which is amplified by the ongoing corrosion which weakens the structure.

Obvious signs of site deterioration in the future will be the dramatic collapse of the bow and stern sections. The machinery will suffer ongoing loss of surface detail and will breakdown where they are presently located. The boilers and machinery, being distinct from other material, will remain intact for some time due to their thickness. An unpredictable factor is cyclonic activity which has the potential to cause immediate and extensive damage.

5.5 Environmental conditions

Climate and weather. The annual cycle includes two major seasons, the Wet season (Nov-April) and the Dry season (May-October). The Wet season is associated with high rainfall and cyclonic winds. The Dry season is associated with calmer wind conditions and drier air conditions.

From April to September the South East Trade Winds dominate the area. These winds are also referred to as the South East or the Eastern Monsoon. The winds develop from a east to south-east direction. Within 30-35 miles of the coastline the winds are relatively calm and this period is associated with generally fine weather (*Australian Pilot* 1972: 16).

From December to February the West Monsoon Winds dominate the area. It is a period identified with cloud, rain and thunderstorms, especially at its onset. The winds and general conditions are variable going from calm hot days to periods of rain and strong squalls. During this time, including the transitional period between February and April, cyclones and cyclonic depressions can develop.

Tropical revolving storms (cyclones), appear between December and May with February and March the period of maximum frequency. On average one or two appear in the Arafura and Timor Sea each year. The rotating winds can reach 50 knots, and occasionally in gusts up to 85 knots. They do not stay in one location for long, usually less than 12 hours, however the degree of destruction possible in that time is immense (*Australian Pilot* 1972: 17).

The temperatures experienced at Cobourg Peninsula are high throughout the year, on average between the low 30s (C°) and high 20s (C°). It is the high levels of humidity during the Wet season that can make working outdoors extremely uncomfortable. In the Dry season humidity levels are on average 60 %. During the Wet season, particularly during January, February and March, humidity levels reach an average of 75% (Northern Territory Parks and Wildlife Commission 1993b: 13).

The average annual rainfall in Cobourg Peninsula is 1,350 millimetres. The rainfall is highly seasonal, with approximately 95% occurring between November to May. Episodes of rainfall can be intense, for example the highest rainfall in one day recorded at Cape Don was 217 millimetres (Northern Territory Parks and Wildlife Commission 1993b: 13).

The marine environment. Vashon Head reef is covered in a bed of coarse sand and rocks. The floor is also scattered with large boulders. The reef floor is relatively flat without gullies or pits.

The mean sea surface temperature in summer is 29 (C°).

The mean sea surface temperature in winter is 25 - 26 (C°)

The mean salinity surface value in summer is 34 parts per thousand.

The mean salinity surface value in winter is 35 parts per thousand.

(*Australian Pilot* 1972: 12)

On the northern coast of Cobourg Peninsula the tide flows from east and south during the flood tide and flows from west and south during the ebb tide (*Australian Pilot* 1972: 57-58). The reef is not exposed during the low tide period. The tidal range in the Cobourg Peninsula region is approximately 3 metres, less than that experienced in Darwin (Northern Territory Parks and Wildlife Commission 1993b2: 14).

In general the direction of the currents respond to the seasonal changes in monsoon and wind. During the West Monsoon Period (December-March) the current flows in an E NE direction across the Arafura Sea. During the SE Monsoon Period (April-November) the current flows in a W SW direction across the Arafura Sea (*Australian Pilot* 1972: 13). The mean current strength in this region is 1/2 knot along the north-coast of Cobourg Peninsula (*Australian Pilot* 1972: 57). However this average is not reflective of what can be experienced. The varying strengths of the monsoonal winds directly affects the strength of the current. Additionally, in local areas, the strength of the current can be affected by the geography of the coastline.

The sea and swell in this region are low to moderate throughout the year. Isolated strong conditions are possible during tropical storms and cyclone periods. The cyclone period corresponds with the Wet season (November-April) however it is most prevalent during January, February and March. The *Australian* site does not experience strong wave action.

CHAPTER 6: ASSESSMENT OF THE SITE'S SIGNIFICANCE

6.1 Preamble

One role of this management plan is to assess the significance of the site. A significance assessment is crucial in the development of a management program. An assessment functions as a position from which decisions regarding management can be reached. As an analytical process it allows one to reflect upon a site in a new light.

The criteria used in this assessment were developed from two suggestive sources. The first is the information detailed in the Burra Charter. This charter is a guide developed for the management of cultural places, and has been adopted by ICOMOS (International Council for Monuments and Sites) Australia (Marquis 1994). The second resource was the 'Guidelines for the management of Australia's shipwrecks' (Australian Institute for Maritime Archaeology 1994). This was developed by the Special Advisory Committee of the Australian Institute for Maritime Archaeology (AIMA). These sources are suggestive not prescriptive.

The assessment is divided into two sections. Firstly the site is assessed under each of the criteria and these are then summarised in a clear and brief synopsis referred to as the Statement of Significance.

6.2 Criterion 1 - Historic significance

Significant in the evolution and pattern of history. Important in relation to a figure, event, phase or activity of historic influence.

The Australian is historically significant. It contributed to coastal trade between Palmerston (Darwin) and more populated areas of Australia and contributed to early international trade between Australia and Asia.

In regard to coastal trade between isolated Palmerston and Australia the history of this vessel's working life has a strong bearing to the colonial themes of isolation and distance. In terms of international trade the cargo of the Australian illustrates that national export markets were diverse but in their infancy. In turn, with refrigeration capabilities, this steamer was involved in the booming export of chilled and frozen goods. This industry introduced a much needed export market and significantly changed our economic relationship with Britain.

The Australian functioned as an immigration vessel to Australia from China, whilst being worked by a Chinese crew. This occurred during a period of national debate over non-European immigration and non-European labour in Australia.

6.3 Criterion 2 - Technical significance

Significant in possessing or contributing to technical or creative innovation.

The Australian is technically significant because it illustrates innovative and important developments in the history of invention. The technical significance of the shipwreck is increased with the good condition of its remains.

The shipwreck presently demonstrates a number of machines that date to the end of the 19th century. These include double-ended boilers, twin refrigeration units, a triple expansion engine, winch, windlass and a dynamo (which produced lighting).

The refrigeration units are a specialised technology that appeared at the turn of the century. It was the first kind (but not first model) of cargo refrigeration systems and its kind is no longer represented in contemporary vessels. It demonstrates a technological achievement that appeared at the end of the 19th century and which significantly changed the economic market of the time. The triple expansion engine is in good condition. This kind of engine revolutionised the role and status of the steamer by making these vessels substantially more powerful and efficient.

In addition to individual machinery the remaining construction features of the ship contribute to the technological significance of the shipwreck. The Australian still maintains its clipper bow which was an aesthetic feature of considerable creative value. The role of the clipper bow was to impersonate the long curved bow of the memorable golden clippers of yesteryear. Another important design feature is the cellular double bottom hull. This hull type was, in that period, an important advancement in hull and ballast design.

6.4 Criterion 3 - Social significance

Related to a contemporary community's sense of identity or is of particular significance for cultural, social, religious, aesthetic or spiritual reasons.

The Australian has little social significance to the Northern Territory. The shipwreck was used by the then 'government in residence' as a case in argument for additional navigational beacons along Cobourg Peninsula. Yet this appears to be the only official reference to the shipwreck and little mention of importance is found in other sources. In conclusion the ship does give insight into the trading practices of the settlement and the employment of Asian maritime crews in Australia. However this does not have direct relevance to the contemporary Northern Territory community thus does not have a particular social significance.

6.5 Criterion 4 - Archaeological significance

Concerned with the research potential of material remains

The Australian is of archaeological significance because the site presents an opportunity to investigate various technologies and design features as found on a late 19th century steamer. In turn there may be evidence of early salvage and refloating attempts. The scope for archaeological research is large with this shipwreck because the remains are in good condition and they are exposed for investigation.

As the superstructure of the ship is gone, and little evidence of personal belongings or cargo have been located, the archaeological significance of the site rests in these interests of ship construction, machinery and evidence of early salvage and refloating.

Of particular archaeological value are the remains of machinery including the triple expansion engine, double-ended boilers, windlass, winch, cargo refrigeration machinery and dynamo. The engine and refrigeration units were significant technological developments of their time, and are not common in the Australian Archaeological Record. These features are in good condition, and further investigation would uncover details about their design.

The archaeological value of the shipwreck includes the remains of construction features such as the cellular double bottom and the clipper bow. The clipper bow was an innovative feature which is not greatly represented in the Australian Archaeological Record. These design features remain in good condition and are exposed, therefore easily investigated.

Archaeological research may also investigate the evidence of early salvage and attempts to refloat the ship. This work is well documented historically and a comparison of this account with the archaeology of the site may yield significant results.

6.6 Criterion 5- Scientific significance

Concerned with the research potential through repeated measurable results.

The Australian shipwreck is of scientific significance because it may contribute to studies in insitu conservation. In this regard the Australian experiences the unique tidal and water temperature conditions of northern Australia therefore can contribute data on the preservation of shipwrecks that are located in this environment. The Australian is also abundant in marine life, therefore is a good case-study for research into the chemical reactions between the material remains of a shipwreck and the marine environment.

6.7 Criterion 6 - Interpretative significance

Concerned with public recreational and educational values.

The Australian is of particular interpretative significance. It is an excellent recreational asset and interpretation aimed at divers should be provided. The material remains are visually exciting for a diver and are interesting from a technical point of view. In turn the site is abundant in marine life. Therefore divers would benefit and appreciate interpretation aimed at site visitation.

As the site is located within the Cobourg Marine Park there is the opportunity for site interpretation to be incorporated into a wider program. In terms of the wider community who do not visit Cobourg Peninsula, the history of the steamer and the images of its remains are excellent material for the interpretation of Northern Territory history.

6.8 Criterion 7 - Degree of significance; rarity

Concerned with the uncommon or exceptional.

The Australian is of rare significance because it exhibits machinery and ship design that are not well represented on shipwreck sites in Australia. This includes the refrigeration units and the clipper bow (steamer version). These features are rare both because of what they are and because of their condition.

6.9 Criterion 8 - Degree of significance; representative

Concerned with the typical or characteristic. Significant in representing the characteristics of a class of cultural items.

The Australian is representative of the machinery and construction associated with a late 19th century steamer. The shipwreck displays propulsion machinery, cargo storage machinery, boat deck machinery and individual features such as the propeller shaft and anchor. As this shipwreck shows a range of construction and machinery features from a class of steamer it is therefore considered as representative of its kind. However the

representative significance of this shipwreck as a class of steamer is lessened because much of the superstructure and the hull is gone.

6.10 Statement of significance

The *Australian* is historically significant because of its role in facilitating coastal trade between Palmerston and other ports in Australia and in facilitating early international trade between Australia and Asia.

The *Australian* is also historically significant because it was used as a Chinese immigration vessel and was worked by a Chinese crew. Therefore the history of this steamer contributes to our understanding of the history of Australian immigration and Chinese labour at a time of national debate over non-European immigration and non-European labour.

The *Australian* is the most intact wreck of a steamer located in the Northern Territory and can offer a great deal of archaeological information regarding ship construction and machinery as found on late 19th century steamers. The variety of machinery and ship construction remains, which are in good condition, deem this shipwreck as representative of a class of steamer. Evidence of early salvage and refloating will offer a further level of archaeological data.

The remains of the refrigeration machinery (used in cold cargo storage) demonstrates a technology that markedly changed Australia's export market and most noticeably changed Australia's economic relationship with Britain.

The *Australian* is protected under the *Historic Shipwrecks Act*.

CHAPTER 7: MANAGEMENT POLICIES AND RELEVANT ISSUES

7.1 Preamble

This section discusses the issues that are relevant in the management of this shipwreck. These issues have been decided upon following research into all relevant matters. A policy addressing each issue is included. These are the recommended MAGNT policies on these issues, for this particular shipwreck. These policies guide the discussion.

As discussed in chapter 1 the recommendations have been reached via a four stage process.

The Statement of Significance highlights the archaeological and technical significance of this shipwreck. Therefore the following policies, position on relevant issues and the following recommendations have a strong bias towards addressing this matter. This translates to a program with an emphasis on conservation, protection and interpretation.

7.2 Management of the *Australian* through provisions stipulated in the CMPPM.

Policy. The involvement of other government bodies in the management of an historic shipwreck should be encouraged. A management program must not compromise the fundamental principles of site protection as stipulated in the *Historic Shipwrecks Act*.

Issue. The *Australian* is located within the Cobourg Marine Park and so the plan of management for the marine park may include provisions for the protection and management of this shipwreck. The CMPPM has a role in instigating controls because the site is located within the marine park boundaries. Therefore an important aim of this shipwreck management plan is to clearly indicate the role of the CMPPM in relation to the *Australian*.

The role of the CMPPM is stipulated in the *Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act 1998 (NT)*. This legislation identifies that one concern of the plan should be:

'the preservation of the sanctuary and/or marine park in its natural condition and the protection of its special features including objects and sites of spiritual, biological, historical, palaeonto-logical, archaeological, geological and geographical interest...'
(Part IV: e).

The role of the CMPPM in regard to the management of the *Australian* shipwreck is to contain provisions that promote public access to the site whilst protecting the physical remains. The plan also has a role in offering partial logistic and financial support to a conservation program. The plan must also ensure existing forms of public information about the shipwreck are promoted, and that shipwreck information is included, where appropriate, in general interpretation dealing with the park.

The particular provisions that will ensure that the CMPPM achieves this are laid out in the recommendations of this report.

7.3 The preservation of material remains - from natural forces

Policy. A shipwreck management program must contain provisions for the establishment of a conservation program. In brief, the role of a conservation program is firstly to identify the condition of the remains, secondly to identify the environmental variables in the local

environment that affect the condition of the remains and thirdly to identify the chemical processes occurring on the surface of the remains and the role of fouling assemblages in site preservation. The conservation program should be ongoing, involving monitoring of the site over time and include the implementation of strategies to reduce site deterioration.

A conservation program will approach the issue of natural deterioration from a calculated strategic position.

A conservation program should be based on an assessment by a conservator.

The preservation of the remains is linked to this shipwreck's archaeological and technical significance.

Issue: Environmental Assessment. An environmental assessment of the site by a trained conservator has not been conducted nor have any site preservation initiatives been implemented. As part of the site inspection in 1997 the issue of site deterioration was investigated (see chapter 6.4). In summary the site is undergoing a high rate of corrosion and undergoes physical abrasion and structural stress.

An environmental assessment by a trained conservator should be conducted on the site and a conservation program needs to be implemented. The assessment should include an in situ corrosion study. The program should include ongoing site monitoring which will record changes in the site over time and should also involve the implementation of protective measures.

Issue: Site Monitoring. Site monitoring should be conducted annually by staff of the MAGNT and rangers of the NT Parks and Wildlife Commission. The following is a guideline for this monitoring. If a conservator is made available and specialised equipment made accessible site monitoring should be more advanced. Guidelines for site monitoring:

Recording the condition of remains

- visible signs of structural stress or collapse
- visible changes in the surface of the relics e.g. loss of fine detail, density of concretion, changes in the colour of the concretion.
- recent cover or exposure of items
- if possible, an *in situ* corrosion study (measurements include extent of graphitisation, pH, redox potential, dissolved oxygen, salinity)

Recording environmental factors

- measurements of current (force and direction)
- water temperature (surface, depth, profile across site)
- wind (speed and direction)
- changes in fauna and fouling assemblages
- water sample (materials in suspension)
- scouring of sand bed around items
- salinity

Evidence of human impact include:

- structural damage caused by boats, anchors and anchor chain
- the removal or disturbance of relics
- presence of fishing lines, hooks and boat anchors

7.4 The preservation of material remains - from human threats

Policy. The shipwreck is protected under the *Historic Shipwrecks Act*. Under this legislation it is illegal to interfere with, damage or remove an historic shipwreck or related items. The protected status of the shipwreck defines the MAGNT stance on protection against human threats.

Issue: Salvage and looting. The *Australian* has been partially salvaged. This first occurred in the early history of the stranding, but more relevant to management issues the site was salvaged in the 1970s (see chapter 3.6)

The shipwreck is vulnerable from those that may collect the copper alloy material for scrap metal value. This places all copper alloy remains under threat including the brass condenser pipes. Brass lanterns have not been located but may be buried on the site.

The remains of the shipwreck are also under threat from souvenir hunters. All features are arguably vulnerable from this threat. Those features under the greatest threat, because of their individual appeal, are the ceramic tiles, the anchor and recognisable features of the machinery such as handles and gauges. Though lanterns, personal belongings and other valuable items have not yet been located, they may be buried, therefore discovered by others.

One effective response to salvage and looting is an education program that raises people's awareness of the significance of our historic shipwrecks.

Issue: Accidental interference whilst diving. Damage could be caused by divers who are unaware of appropriate wreck diving practices. Divers could handle, move or accidentally damage the material remains because they do not know that interference is illegal under the Act. Divers may also accidentally knock fragile material with fins, tanks or their bodies whilst swimming amongst the remains.

Therefore divers need to be made aware of the appropriate diving practices expected when visiting this site. This includes the idea of a 'look but don't touch' policy and a request that divers pay keen attention to their diving, so as to not accidentally damage material.

Issue: Anchoring on the site. Visitors drop their anchors onto or drag their anchors across the remains of the shipwreck to moor over the site. Anchors dragged across or dropped onto the *Australian* cause damage to the remains. Therefore anchoring on the site is interpreted as interference and damage to an historic shipwreck, interference and damage is illegal under the *Historic Shipwrecks Act*.

In addition to specifically anchoring 'tying off' to the exposed remains of the wreck also causes interference and damage. Therefore 'tying off' to the remains is interpreted as illegal under the *Historic Shipwrecks Act*.

The destructive effect of anchoring directly onto a shipwreck has been documented in other cases. The *Clonmel*, located in Victoria, has been damaged by boat anchors, this being one reason why a protected zone was declared around the boiler (Anderson 1998:27). The

Zanoni, located in South Australia, has been damaged considerably by anchors (Jeffery 1995). Also the *Pandora*, located in Queensland, has been damaged from boat anchors, this being a concern stipulated in the site's draft plan of management (Gesner 1994).

Issue: Boat manoeuvring. The boilers, stern section and bow section of the *Australian* are close to the surface of the water, the bow and stern breaking the surface at low tide. A boat being manoeuvred around the site may accidentally collide with the remains and cause major structural damage. Therefore a boat collision with the remains of the *Australian* would constitute interference and damage with an historic shipwreck, both acts illegal under the *Historic Shipwrecks Act*.

The most effective way to deal with this issue is for public education which promotes caution whilst manoeuvring around the site.

Issue: Fishing. Fishing is currently permitted on the site. The first concern regarding fishing is that fishing line, weights and hooks may become entangled around the remains of the wreck. These objects are not part of the original remains of the shipwreck and therefore threaten the archaeological integrity of the site.

A further concern, of a legal nature, is that the entanglement of fishing line, weights and hooks may constitute 'interference' as stated in the *Historic Shipwrecks Act*.

The most effective way to deal with the entanglement of fishing equipment is for public education which promotes the preservation of the site and instructs on methods of accessing the site without causing damage. Evidence of human disturbance should be monitored as part of a monitoring program.

7.4 Protective legislation

Policy: The most effective method of challenging destructive behaviour in regard to the preservation of historic shipwrecks is to educate people about their importance and frailty. However, working in conjunction with this, an historic shipwreck should be protected under effective legislation. The *Australian* is currently protected under the *Historic Shipwrecks Act*.

A management plan for an historic shipwreck should review the possible ways that the protective legislation can be made most effective. This is not a call for harsher restrictions but a reference to applying the legislation most effectively. It is also important to investigate complementary forms of protection. This may mean recognising the location of the shipwreck within, for example, a marine park or expand on the significance of the shipwreck and protect the site for those reasons.

Issue: Enforcement of the Historic Shipwrecks Act. An obstacle in the effectiveness of the *Historic Shipwrecks Act* within the Northern Territory is that at present there are no effective inspectors under the Act. Although members of the police force are automatically inspectors under the Act, they are located at a great distance from the *Australian* shipwreck and have other duties. Therefore it is advised that inspectors under the *Historic Shipwrecks Act* be trained.

Issue: The Australian shipwreck as a site of natural significance. A later recommendation (no. 21) deals with research into the natural significance of the *Australian*. This is an appropriate recommendation for this plan of management. The local natural environment in which a shipwreck is located and the fouling assemblages that make a shipwreck its home have direct bearing on issues of site deterioration and

conservation. Therefore aspects of this shipwreck's natural environment are of paramount concern. In turn a shipwreck can create a unique local environment for fauna and flora to thrive and this has a bearing on defining the site's significance and issues of research and interpretation. These three concepts are fundamental concerns of this report. Therefore this plan of management must recommend the need for further understanding of the site's local environment.

Research may indicate that the site is of natural significance and should be protected as such. It is the role of this plan to outline how this issue could be incorporated into the management of the site.

There are no provisions within the Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act to identify the site as an aquatic reserve or equivalent. However access to the site maybe be controlled under provisions of the marine park plan of management.

The protection of historic shipwrecks under complementary legislation, which takes into account the significance of the site as a unique natural habitat, is not unprecedented. The *Yongala*, located in Queensland and the *Clan Ranald*, located in South Australia, are protected under natural conservation legislation (Appendix 2).

7.5. The impact of development

Policy. A management program should record the impact that development has had on the condition of this shipwreck in the past. A management program should also include an evaluation of present threats to the preservation of the site from development.

Issue. There are at present no known plans for development in the vicinity of the *Australian*. Therefore there will be no impact by development on the preservation of the shipwreck in the near future.

At present there is a pearling company operational at Port Bremer, a significant distance from the location of the *Australian*. Recently a private investor has opened a seasonally operated fishing charter service at Cape Don, the most western point of Cobourg Peninsula. This is also a significant distance from the location of the site.

7.6. Site identification for passing traffic

Issue. This shipwreck is not an obstacle to boat activity. It is not located within a shipping channel. The shipwreck rests on a shallow reef, which is clearly marked on the nautical charts of the area. Therefore passing boats should navigate clear of the reef, regardless of the presence of the *Australian*.

The shipwreck is partially exposed at low tide, when the bow and stern structures break the waters surface. At high tide the bow, boilers and stern sections are visible from the surface of the water (Fig. 34). There is no fixed buoy or marker on the site. There are also no signs at boat launches in the vicinity which indicate the location of the *Australian*.

7.7 Visitation to the *Australian*

Policy. Visitation to the *Australian* should be encouraged.

Issue. The majority of visitors to the site are either anglers or divers, the later using either scuba or snorkel equipment. The majority of people who visit the site reach the shipwreck on privately owned vessels. Figure 35 shows a typical visit by divers with a yacht in the background and an inflatable dingy to accommodate divers.



Fig. 34. Aerial photograph of the *Australian*; the bow, boilers and stern are visible (photo: NT Parks and Wildlife Commission 1998).



Fig. 35. Visitors to the site, 1997 (photo: R. Marshall, 1997).

There are no data which give visitation numbers specifically for the shipwreck site. However visitation to the site is related to visitation to the marine park, as visitors to the site are registered as guests of the marine park. Therefore information regarding marine park visitation is of indirect value.

Visitors may enter from land, sea or air. Many drive through Gurig National Park to reach the marine park, camping in the designated areas. Others stay on their water crafts, and others again are guests at the Seven Spirits Bay resort, located in Port Essington. All visitors to Gurig National Park and the marine park must gain a permit, and a limited number of permits are issued each year. Administration of visitors to both parks is controlled at Black Point ranger station, located on the east coast of Port Essington.

Gurig National Park is visited on a seasonal basis, the tourist season being the Dry season, occurring between May and September. A management policy to restrict the number of visitors each season has been implemented. Figure 36 indicates the regulated seasonal visitation to Gurig National Park.

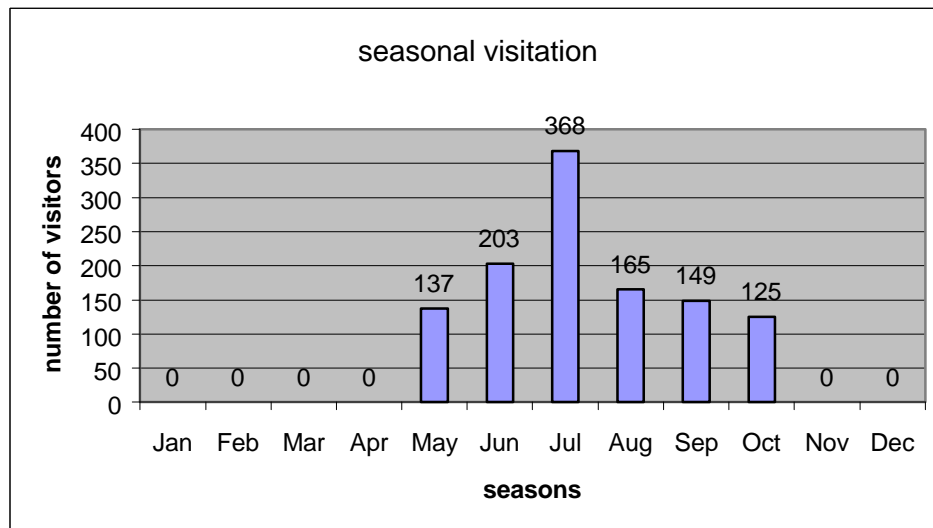


Fig. 36. Seasonal visitation to Gurig National Park (NT Parks and Wildlife Commission).

Figure 37 indicates the number of visitors to the Park between 1991 to 1997. It shows that the number of visitors each year was approximately 1000 people and there has not been a significant increase between 1991 and 1997.

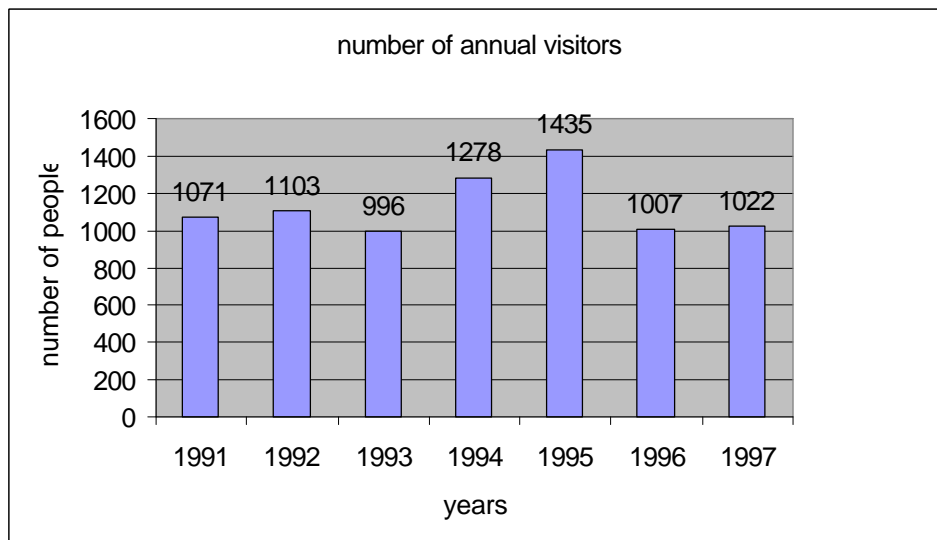


Fig. 37. Annual visitation to Gurig National Park (NT Parks and Wildlife Commission)

There are no commercially operated recreational fishing or recreational diving charters based within the area of the shipwreck site. This does not discount the possibility that they enter the area from elsewhere.

How popular the *Australian* is to fishers visiting the marine park is unknown.

The remains of the Victoria Settlement, located within Port Essington, is also a popular destination for visitors who have access to a boat. Black Point is also the base for commercial hunting safaris.

Malcolm Sinclair, manager of Seven Spirits Bay Resort, was contacted and he stated that the resort does visit the site as a fishing spot with guests. Mr Sinclair also stated that the resort is planning to develop a diving program, which will include the *Australian*. He was sent information regarding the management of historic shipwrecks.

Visitation: a visitors registration scheme. It is a recommendation of this report that a registration system be introduced as a means to collect information about site visitation.

Prior to visitation visitors would contact the Black Point ranger station and indicate that they are proceeding to the site. This is not a means of controlling who visits, but only a non-obtrusive method of monitoring site visitation.

The information gathered from registration would include boat registration, the skipper's name, number in the party and planned activities. Depending on the advice of the rangers, who are most familiar with visitation to the area, this information may be gathered over the radio. This is not a difficult approach in regard to logistics nor is it intrusive, because visitors to Gurig National Park and the marine park are required to register with the ranger station regardless. The benefits of this approach are:

- rangers will be able to gather information without having to visit the site
- it is an opportunity for the rangers to distribute interpretation and site access literature and for visitors to access other forms of interpretation on the shipwreck based at the station
- registration, as a means of collecting visitation information, is an effective yet non-intrusive method
- participation in a formal registration process will affect the behaviour of visitors when on the site.

7.8 Interpretation material on the *Australian*

Policy. The dissemination of information about the shipwreck should be widespread, catering for those that will access the site directly and for the general public. Interpretation should promote an awareness of the shipwreck's significance and of the need to preserve it.

Issue: brochure. A brochure on the *Australian* was produced in June 1999. It includes a site plan and information about the history of the ship. It also states that the site is protected and what this means in regard to site access. Distribution of this brochure has begun, and should continue.

Issue: display. The MAGNT has gained permission from the Cobourg Peninsula Sanctuary Board and the NT Parks and Wildlife Commission to produce a display panel on the shipwreck and house it at the Black Point ranger station. Traditional owners have approved the plan and have contributed information for the display. A display was installed in September, 2000.

7.9 Artefacts and records

Policy. Artefacts that came from the *Australian* shipwreck are protected relics under the *Historic Shipwrecks Act*. Therefore the management of this shipwreck should include an inventory of all known recovered material.

Issue: artefacts. The MAGNT has not raised material from this shipwreck. The location of raised material is unknown. Salvors who attempted to raise the condenser for scrap metal worked the site in the 1970s. They reported that there were brass lanterns visible but they did not take these as they were focusing on the condenser. An inspection in 1997 did not locate lanterns. Items that are visible on the site and have been singled out as being vulnerable are ceramic tiles, the padlock and the bone (remains of cargo). Interpretive material should note that relics recovered from the *Australian* are protected under the Act.

Issue: records. Copies of the ship plans and the Lloyds survey data remain in the possession of the MAGNT. These were supplied by the National Maritime Museum, Greenwich, England.

7.10. Research

Policy. Research that will enhance an understanding of the historical and archaeological significance of this shipwreck should be encouraged. Research that explores other areas, for example the natural significance of the site, should also be encouraged as these expand and develop our understanding of the overall significance of the shipwreck.

CHAPTER 8: MANAGEMENT RECOMMENDATIONS - IMPLEMENTING POLICY

8.1 Preamble

The implementation of management policy is subject to the resources available. At present the Maritime Archaeology and History section of the MAGNT has one permanent member of staff. Funding for the management of the *Australian* is currently restricted to Commonwealth funding through the Historic Shipwrecks Program. The recommendations take these financial and personnel restrictions into account by retaining a strong focus on the role of the marine park plan of management and that of the rangers of the NT Parks and Wildlife Commission.

8.2 Preservation of material remains from natural forces

Recommendation 1: that an environmental assessment of the *Australian* be conducted in the near future. This should include an insitu corrosion study. From these results it will then be possible to develop a conservation program that takes a range of variables into account (see chapter 8.31). The CMPPM should stipulate the need for a conservation program and offer partial logistic and/or financial support.

Recommendation 2: that following an environmental assessment a conservation strategy be designed and implemented (see Chapter 8.31). The CMPPM should stipulate the need for a conservation program and offer partial logistic and/or financial support.

Recommendation 3: that the MAGNT and the NT Parks and Wildlife Commission instigate an ongoing site monitoring program to monitor changes in the site over time (see Chapter 8.31). The CMPPM should stipulate the need for this program as part of its commitment towards a conservation program.

8.3 The preservation of material remains from human threats

Recommendation 4: that select rangers from the NT Parks and Wildlife Commission whom work at Gurig National Park be trained as inspectors under the *Historic Shipwrecks Act* (see Chapter 8.41).

The CMPPM should indicate approval of this proposal.

Employees of the MAGNT should not be appointed inspectors under the *Historic Shipwrecks Act*. The value of appointing Museum staff as inspectors is questionable because the distance between the museum and the shipwreck site means that staff could not participate in ongoing surveillance. It is also not in the museum's interest nor capacity to function as a compliance agency.

Recommendation 5: that the MAGNT and the NT Parks and Wildlife Commission establish a visitor registration system to collect information on site visitation as part of the visitor monitoring program for the CMP. This should be reflected in the CMPPM.

Recommendation 6: that anchoring directly onto the shipwreck be prohibited as a provision of CMPPM. This restriction should include using the bow or stern as a mooring fixture, when these features are exposed at low tide (see chapter 8.32).

At what distance a boat can anchor in relation to the shipwreck would need to be determined.

An alternative mooring system may need to be established.

Recommendation 7: that certain items be recovered as they may be stolen. These are the ceramic tiles, the remains of the bone cargo and the brass padlock (see chapter 8.9).

Recommendation 8: that fishing that does not involve anchoring on the site be permitted. Therefore trolling and drifting should continue to be permitted (see chapter 8.3).

8.4. Interpretation

The following are recommendations regarding interpretation material for the general public.

Recommendation 9: that an education package be made available at the Black Point ranger station. This package will be a resource for the rangers. It will include a prepared lecture with slides and video footage. There will also be an education program for young children developed with a marine-maritime theme. This should be reflected in the CMPPM.

Recommendation 10: that information be placed at the boat launch and jetty at Black Point. This will indicate that it is illegal to interfere with, damage or remove an historic shipwreck or related items. This should also include information regarding the prohibition of anchoring on the site. This recommendation should be reflected in the CMPPM.

Recommendation 11: that the brochure on the shipwreck be widely distributed, in particular made available to visitors at the Black Point Ranger Station. This should be reflected in the CMPPM.

Recommendation 12: that there be a consistent inclusion of information about the shipwreck in publicity and publications dealing with the recreational and historic resources of Gurig National Park and the CMP . This should be reflected in the CMPPM.

8.5 Archaeological Research

Recommendation 13: that further non-disturbance survey work be conducted to increase our overall knowledge of the site. Particular attention may focus on the midship area.

Recommendation 14: that the machinery and important aspects of ship construction be recorded in greater detail. Aspects of ship construction include the propeller housing, cellular double bottom and the clipper bow.

Recommendation 15: that further survey work include the search for evidence of salvage and refloating repairs.

Recommendation 16: that a small excavation in the stern section be conducted to reveal how the propeller was removed during salvage.

Recommendation 17: that a probe survey east of the exposed material be conducted to indicate the extent of buried material.

Over the course of the vessel's deterioration material was deposited east of the length of the shipwreck. This occurred due to influence from wind and tide and the lean of the ship. The location of galley tiles and the masts east of the main body of material support this.

Recommendation 18: that a detailed comparison between the technology and archaeology of the *Australian* and similar steamer wrecks be conducted.

Historical and archaeological comparison will increase our understanding of varying technology and design. It is important to go beyond recording the remains of technology on individual sites. Comparative studies can form a basis for asking more probing questions that relate to the role of finance, function, invention and design trends in the construction of these historic steamers. The *Australian* is an excellent case-study for this because of its value in demonstrating various technologies. Also comparative work may contribute to site formation modelling.

8.6 Historical research

At the time of this report the following research directions distinguished themselves as important. Other topics of historical research may develop in the future.

Recommendation 19: that records relating to the *Australian*, whilst it was at ports other than Darwin, be collected. This may include customs and port authority documentation from outside of Australia.

Recommendation 20: that the experiences of ethnic or foreign crews on early Australian steamers be investigated, using the *Australian* as one example. The *Australian* had a Chinese crew, visited Asian ports and brought Chinese immigrants to Australia, all during a time of national debate over non-European immigration and non-European labour.

8.7 Scientific Research

Recommendation 21: that research into the natural significance of this site should be encouraged by both the MAGNT and the NT Parks and Wildlife Commission. One example of this kind of work is a marine biological survey of the site (see chapter 8.10). This recommendation should be reflected in the CMPPM.

CHAPTER 9: ADMINISTRATIVE STRATEGY

9.1 Established policies

The delegate of the *Historic Shipwrecks Act* in the Northern Territory is the director of the MAGNT. Therefore the director has the delegated authority over the management and protection of this site.

Activity that will result in disturbance of the remains must have prior approval from the delegate of the Act and, in some cases, the Minister. In turn some proposals regarding site management can only be actioned following approval from the Minister, for example the declaration of a protected zone under the *Historic Shipwrecks Act*.

The management of this shipwreck must abide by the standards as laid out within the Burra Charter and as upheld by AIMA.

Funds to manage this site should be canvassed from different organisations and departments. The Historic Shipwrecks Program may contribute on a project by project basis, but does not offer funds for ongoing running costs.

9.2 Objectives

That the CMPPM identifies the role set out for it in this report in relation to the management of this shipwreck.

That the CMPPM repeat the practical recommendations offered in this report that relate to its role in the management of this shipwreck.

That the MAGNT and the NT Parks and Wildlife Commission continue to work together conducting shipwreck inspections, regional surveys and instigating shipwreck management programs.

CHAPTER 10: COBOURG MARINE PARK AND GURIG NATIONAL PARK

10.1 Establishment of the parks

Gurig National Park and the Cobourg Marine Park are located approximately 220 kilometres north-east from Darwin. Combined the parks occupy an area of 4,500 square kilometres. Gurig National Park occupies 2,207 square kilometres and includes most of the Cobourg Peninsula and some of the surrounding islands. The marine park extends around the coast of Cobourg Peninsula enclosing 2,290 square kilometres of surrounding waters.

Conservation principles were first introduced into the Cobourg Peninsula region in 1919 when Cape Don was declared a reserve. In 1924 Cobourg Peninsula was declared a reserve. In 1981, with the enactment of the *Cobourg Peninsula Aboriginal Land and Sanctuary Act* (NT), Gurig National Park was established, under the management of the Cobourg Peninsula Sanctuary Board.

The marine park was declared under Section 12 of the *Territory Parks and Wildlife Conservation Act 1983*(NT) to be managed by the then Conservation Commission (NT). In 1995, when the Cobourg Aboriginal Land and Sanctuary Act was amended to become the Cobourg Aboriginal Land Sanctuary and Marine Park Act, the board became the management authority for both the Cobourg Marine Park and Gurig National Park.

The marine park is managed under the provisions of both the Territory Parks and Wildlife Conservation Act and the Cobourg Aboriginal Land, Sanctuary and Marine Park Act.

The land remains under the ownership of the traditional owners and is leased to the government to facilitate a national park. The Sanctuary Board is made up of eight members, four of whom are nominated by the Northern Land Council from amongst the traditional owners of the region. The other four members are nominated by the NT Minister for Conservation. The NT Parks and Wildlife Commission is responsible for the management of Gurig National Park and the marine park. The management of the fish resources within the marine park is administered by the Fisheries Department of Primary Industry and Fisheries (NT). In 1998 a committee, the Cobourg Fishery Management Area Advisory Committee, was formed to facilitate development of a fishery management plan under the *Fisheries Act 1999* (NT) and to contribute to the development of the Cobourg Marine Park Plan of Management.

The board manages the marine park as a multiple-use park providing for the protection of the ecology whilst facilitating reasonable recreational and commercial use of the resources.

A plan of management for the marine park is currently being prepared by the NT Parks and Wildlife Commission, the board and traditional owners.

10.2 The maritime archaeological resource of Cobourg Peninsula

Despite an extensive history of maritime activity in Cobourg Peninsula, only minimal archaeological work has been conducted. Historical evidence indicates European presence in the area dates back to early Dutch exploration in the 17th century (Mitchell 1994: 58). The area received a substantial degree of early colonial shipping activity related to the failed settlements of Victoria (1839-1841) and Fort Wellington (1827-1829) both located along the coast of Cobourg. Once the settlement of Palmerston was established Cobourg

Peninsula became situated on a route linking this settlement with communities, outstations, missions and businesses in Arnhem Land. In a similar fashion it formed part of a route that connected Palmerston with coastal trade in Australia.

The area was also a destination for Macassans and European and Japanese pearlers and trepangers. The maritime history of Cobourg Peninsula also includes the long and continuous history of coastal occupation by Aboriginal peoples.

Contact scenarios in Arnhem Land had seen the sharing of maritime technology, for example the Aboriginal adoption of the Macassan outrigger. Known sites that are not specifically European nor Aboriginal include Macassan trepang processing and base-camp sites. There may be evidence of Japanese, Torres Strait Islanders and others non-European pearlers and trepangers dating from the early to mid 20th century.

The extent of specifically underwater survey work conducted in the Cobourg Peninsula area prior to this work is limited to the 1995 regional survey, a brief survey based within a small geographic region (Coroneos 1996). In this survey items believed to be the remains of the *Calcutta* (1868-1894) were located on Vashon Head reef (Coroneos 1996).

10.3 Reasoning behind the Parks and Wildlife Commission's involvement in site-management

Various recommendations of this plan deal with the involvement of the NT Parks and Wildlife Commission in site management and relate to the marine park plan of management. This section summarises the range of this involvement and offers an explanation for this arrangement.

Relevant recommendations:

- Recommendations 1, 2 and 3 which deal with conservation.
- Recommendations 4, 5 and 6 which deal with human disturbance.
- Recommendations 9, 10, 11, 12 which deal with interpretation.
- Recommendation 21 which deals with scientific research.

Reasoning behind this arrangement:

The shipwreck falls within the jurisdiction of the marine park.

It is advantageous that site protection and other management issues be managed through the CMPPM, particularly considering the practical limitations of the *Historic Shipwrecks Act*.

The Rangers of the park have an inherent interest and concern for this shipwreck as it is an historical asset of the marine park.

In regard to logistics and geography, the Rangers of Cobourg Peninsula are the most logical choice for monitoring and other aspects of 'hands on' site management .

The NT Parks and Wildlife Commission adhere to the guidelines for the management of historic places as established within the Burra Charter (Marquis 1994). Therefore there is no distinction in the standards each organisation holds in the management of historic sites.

REFERENCES

- Australian Institute for Maritime Archaeology. 1994. *Guidelines for the management of Australia's shipwrecks*. Australian Institute for Maritime Archaeology Inc. and the Australian Cultural Development Office: Canberra.
- Anderson, R. 1998. P.S. Clonmel *conservation plan*. Heritage Victoria: Melbourne.
- Australian Pilot Volume 5, 1972. Hydrographer of the Navy: New South Wales. Bach, J. 1976. *A maritime history of Australia*. Thomas Nelson Limited: Melbourne.
- Blainey, G. 1966. *The tyranny of distance*. Sun Books: Melbourne.
- Campo, J. à 1991. From far neighbour to good friend. The birth of the Java Australia Line. *The Great Circle. Journal of the Australian Association for Marine History* **13**(1): 1-20.
- Corlett, E. 1990. *The iron ship: the story of the Brunel's SS Great Britain*. Conway Maritime Press: London.
- Coroneos, C. 1996. Survey of maritime cultural resources of the northern Cobourg Peninsula (draft). Unpublished Report, Museum and Art Gallery of the Northern Territory: Darwin, Australia.
- Foley, C. 1982. *Reef pilots: the history of the Queensland Coast and Torres Strait Pilot Service*. Banks Bros. & Street: Sydney, NSW.
- Government Resident. 1907. The Government Resident's Reports, Northern Territory Archives: Darwin, Australia.
- Gardiner, R. 1993. *The advent of steam: the merchant steamship before 1900*. Naval Institute Press: Great Britain.
- Gesner, P. 1994. *Management plan: HMS Pandora*. Maritime Archaeology Section: Queensland Museum, Brisbane.
- Guthrie, J. 1971. *A history of marine engineering*. Hutchinson: London.
- Hardwick, G. 1983. The Eastern and Australian Steamship Company Limited. *The Log. Quarterly Journal of the Nautical Association of Australia Inc.* **16**(1), Issue 71, new series.
- Harlow, S. 1997. *Tin gods: a social history of the men and women of Maranboy*. Historical Society of the Northern Territory: Darwin, Australia.
- Hume, R. 1975. *Clyde shipbuilding: from old photographs*. B.T. Batesford Ltd: London.
- Inquiry 1907. Archival material held in the Ephemera File, Northern Territory Collection of the Northern Territory Library [Title of file: 'The Australian ship'. Title of folder: The wreck of the *Australian*]: Darwin, Australia.
- Jeffery, B. 1995. *Zanoni* (brochure). State Heritage Branch, Department of the Environment and Natural Resources: Adelaide, South Australia
- Laxon, W. 1963. Story of the Eastern and Australian Steamship Co. Ltd. *Sea Breezes* **October Issue, 1963**.
- Lewis, G. 1973. *A history of the ports of Queensland: a study in economic nationalism*. University of Queensland Press: Brisbane, Australia.
- Marquis, P. 1992. *The illustrated Burra Charter*. Prestige Litho: Brisbane, Australia.

- McCarthy, M. 1996. *SS Xantho: towards a new perspective (an integrated approach to the maritime archaeology and conservation of an iron steamship wreck)*. Unpublished PhD thesis, James Cook University: Queensland.
- Mitchell, S. 1994. Culture contact and indigenous economies on the Cobourg Peninsula, north western Arnhem Land. Unpublished PhD thesis, Northern Territory University: Darwin.
- NSW Heritage Office. 1996. *Underwater heritage: principles and guidelines*. Publication No. ISBN 07310 3024 9, Heritage Office: Sydney, Australia.
- Nicholson, I. 1996. *Via Torres Strait: a maritime history of the Torres Strait route and the ships' Post Office at Booby Island*. Roebuck Society Publication No. 48: Australia.
- Northern Territory Parks and Wildlife Commission 1993. Gurig National Park Plan of Management Plan (draft). Parks and Wildlife Commission and the Government Printer: Darwin, Australia.
- Northern Territory Times and Gazette*. Stored in the Northern Territory Library: Darwin, Australia.
- Olson, W. 1976. *Lion of the China Sea*. P & O Australia Ltd: Australia.
- Paasch, H. 1977. *Illustrated Marine Encyclopedia*. Argus Books: Watford, Herts., England.
- Parsons, R. 1981. *Australian coastal passenger ships*. Ronald H. Parsons, P0 Box 33, Magill, SA 5072: South Australia.
- Patterson, A. 1969. *The golden years of the Clyde steamers (1889-1914)*. Davids & Charles: Newton Abbot, UK.
- Pearson, C. 1987. *Conservation of marine archaeological objects*. Butterworths Series in Conservation and Museology: Butterworths, Sydney.
- Powell, A. 1982. *A short history of the Northern Territory*. Melbourne University Press: Melbourne, Victoria.
- Riley, J. n.d. Iron ship disintegration: the waterline theory. In: McCarthy, M. (ed.) *Iron ships & steam shipwrecks: papers from the first Australian seminar on the management of iron and steam shipwrecks*, Western Australian Museum: Perth, Western Australia.
- Shields, J. 1947. *Clyde built: a history of shipbuilding on the River Clyde*. William Maclellan: England.
- Sothorn, J. n.d. *Verbal notes and sketches: a manual of marine steam engineering practice*. J.W.M. Sothorn.
- Webser, J. 1995. *Famous ships of the Clyde, Glasgow*. Royal Concert Hall: Scotland.

APPENDIX 1: A GUIDE FOR DEPARTMENTS PARTICIPATING IN THE MANAGEMENT OF THE *AUSTRALIAN* SITE

1.1 Maritime archaeology

Maritime archaeology is a branch of Archaeology that deals with the study of our maritime past through material remains. What constitutes maritime history and what constitutes relevant material remains should be defined in the broadest sense. To have a restricted definition of Maritime archaeology, for example, a discipline concerned only with the lives of sailors or dealing only with the classic shipwreck, only limits research and fails to see the interconnectedness between disciplines.

Shipwrecks as archaeological sites can offer essential information that is not obtainable from historical documentation. As a simple example McCarthy (1996: 22) cites two steam shipwrecks, the *Hansteen* and the *Xantho*. During the course of their working life both of these ships were transformed in design. The original ship plans would not show this evolution in design. Also highlighting the limitations of available historical information is the fact that much of the maritime records available to the researcher were written for a particular purpose or in a particular style which is limiting in what they illustrate. These records may indicate events but fail to illustrate the detail to inform on themes that maybe considered significant in contemporary academic discourse, for example the role and status of women or minority groups.

A shipwreck is only one kind of maritime archaeological site. The remains of submerged planes and flying boats, for example the Catalina wreck sites located in Darwin Harbour, are also relevant. The Japanese submarine, the *I-124*, located north of Darwin in the Arafura Sea, is protected under the *Historic Shipwrecks Act*. Furthermore the scope of Maritime archaeology is not restricted to sites located in the water. The archaeology of our maritime past also includes land sites such as jetties and wharfs. Associated with the Dutch shipwreck, the *Zuytdorp* (1712), located in Western Australia, are a series of survivor camps found in the surrounding cliffs. Other kinds of land sites, for example, dockyards and whaling stations, are also applicable. Therefore maritime archaeologists study a wide range of material remains to develop a better understanding of the past. Lastly, one should recognise that maritime history does not exist within a vacuum, but is one theme extracted from the larger picture of Australian history. Therefore the study of the material remains from maritime archaeological sites can contribute to our understanding of larger themes, for example, the history of industry, economics and social development in Australia.

1.2 The Commonwealth's Historic Shipwrecks Program

This report was funded by a grant from the Historic Shipwrecks Program. The Historic Shipwrecks Program was administered by the Department of Communications and the Arts until November 1998. Following this, the program was transferred to the Department for the Environment and Heritage. This program embodies a national commitment to protect and conserve historic shipwrecks and associated material. An important focus of this program is the development of public interpretation material. The program also encourages a commitment by other government departments to the protection and preservation of this cultural resource.

1.3 The management of historic shipwrecks

The distinction of a site being 'historic' tends to refer to the implementation of protective legislation. However, the term historic could also be used to signify that a site has historical or archaeological significance. A site may be declared historic under Commonwealth, State or Territory legislation. Each historic shipwreck should be managed through a program designed specifically for the particular conditions relating to that case.

Within each State or Territory there is a delegate for the *Historic Shipwrecks Act*. This person may work within a museum environment, for example the MAGNT, or a State or Territory government heritage body, for example Heritage South Australia. Although each organisation would approach the management of historic shipwrecks from a unique position, there exists common standards which are adhered to.

In the case of shipwrecks protected under the *Historic Shipwrecks Act* the Historic Shipwrecks Program does provide grants to fund work, however alternative funding should be canvassed. Sources of alternative funding could include State or Territory governments. The delegate may also work with other departments in an ongoing site management program. Local councils may also contribute to the management of sites by, for example, funding interpretative or conservation work.

A management program must encompass a wide range of policies and issues. A review of all the details of a management program is beyond the aim and scope of this document, however a brief overview will demonstrate the kinds of issues that are relevant. A management program should include:

- the implementation of a conservation program;
- the identification of human threats to the site and the implementation of protective measures;
- a policy and strategy to disseminate information about the site to the public;
- encouraging responsible public access to the site, and interpretation initiatives which may also enhance the visitors' experience;
- a research program;
- the management of raised artefacts; this includes an inventory, a conservation report and addressing concerns of ownership.

1.4 The *Historic Shipwrecks Act 1976*

This section explores practical aspects of the *Historic Shipwrecks Act*, it should not be taken as a comprehensive review of the legislation.

Which shipwrecks are protected under this Act? This legislation has jurisdiction over those shipwrecks located within Commonwealth water. Commonwealth water is defined as that water beyond the low water mark to the edge of the Continental Shelf. It does not include river systems, lakes or harbours.

Those shipwrecks that are 75 years old or more are automatically protected under the Act. This includes shipwrecks that have not yet been discovered. The 75 years is a rolling date, meaning that with time shipwrecks will eventually become automatically protected.

The Act also contains a provision for the protection of shipwrecks that are located within Commonwealth waters but are younger than 75 years. The Minister may declare a shipwreck of any age protected under the Act. An application to the Minister would include an assessment of the significance of the site.

A shipwreck need not be located within water to be declared an historic shipwreck. A shipwreck that is located partially or fully out of the water may still be protected. This includes the whole or parts of a shipwreck that may have been recovered or relocated.

What is defined under the Act as illegal behaviour? The Act states it is illegal to interfere with, damage or remove a historic shipwreck or related items. A protected site may also, because of particular circumstances, have a protected zone declared around it.

So what are the practical restrictions in regard to recreational access to an historic shipwreck? Historic shipwrecks may be visited and enjoyed by the public. The policy for visitation is 'look but don't touch'. Handling or moving material or disturbing conservation equipment could be considered interference with a site. Therefore a diver may take photographs and video of the wreck. Also a diver visiting an historic shipwreck has a responsibility to practice competent diving protocol so as not to interfere or damage material through negligence.

This policy also relates to other activities on the site for example boat handling. A boat anchor should not be lowered onto a historic shipwreck as this may cause damage. This also applies to the handling of the boat itself, which may collide with or drift against the remains. Therefore responsible boat handling is essential.

Does this Act cover material related to a shipwreck and does it pertain to other kinds of water related structures? This Act provides for the protection of material associated with an historic shipwreck. This includes material that is in close proximity to the site, or has been moved or recovered. If an article or section of the ship has been removed from the water or relocated to State or Territory waters it remains protected material under the Act. If an item is found and it is believed to be associated with a historic shipwreck, it is considered protected under the Act.

This Act does cover other sea-based craft, for example submarines. The *I-124*, a Japanese submarine wreck located in the Northern Territory, is protected under the Act. However the Act does not address the protection of other water related structures such as jetties or wharfs. These sites may be protected under relevant Commonwealth, or State or Territory legislation.

What is a protected zone? Within the Act is the provision for a protected zone to be declared surrounding an historic shipwreck. A zone is declared by the Minister when there is an agreement that additional protection is necessary. The zone is of a prescribed size and the Act lists the kinds of activities that are not permitted within it. In summary a protected zone may not be entered without a permit. A permit may be issued to a recreational dive group, for one visit or valid for a period of time. Therefore a protected zone does not necessarily restrict all public access. The conditions of access for a permit holder may depend upon the public access policies tailored specifically for that site.

What is the status of material that was recovered prior to the Act or prior to the introduction of the 75 years automatic declaration? Material that was recovered prior to these restrictions are still considered protected historic relics. The Act states that a person in possession of an historic relic must notify the relevant authority. When the automatic

declaration was introduced some delegates instigated an amnesty period, when a person/s could declare material without prosecution. In some cases a compromise was developed where, following the register of the relics, people were able to maintain custodianship. However strict protocol regarding the transfer of custodianship was established.

What occurs if a member of the public discovers or knows of an historic shipwreck or related items? A person who discovers an historic shipwreck is obligated to inform the Minister of its location as soon as is 'practical'. An individual that knows of the location of an historic shipwreck or historic relic, or knows a person who has this information, is also obligated to inform the Minister. In short it is an offence to withhold information regarding the location or possession of an historic shipwreck or historic relic.

Over the years public recognition and awards have been given to people who had discovered and declared historic shipwrecks.

Under what circumstances may a historic shipwreck be disturbed or material raised? A permit or permission must be obtained before an historic shipwreck or related items may be disturbed. This includes individuals or organisations who may have ownership or custodianship over a shipwreck site.

How are the restrictions and penalties of the Act enforced? The Act lists indictable offences, which are offences that require an appearance in a court of law. The penalties are not minor. This reflects the weight of an offence committed under the Act.

The Act contains the provision for the appointment of inspectors, whose role is to facilitate the implementation of the Act. The inspector is delegated certain powers to investigate and halt a crime under the Act. Members of the police force are automatically inspectors.

Is other legislation applicable to the protection of shipwrecks and related items? Shipwrecks located within State or Territory waters also may be protected under State or Territory legislation. In the Northern Territory eight shipwrecks are protected under the *Heritage Conservation Act 1991(NT)*, all located within Darwin Harbour. Shipwrecks may also be protected under complementary legislation. For example the *Yongala* shipwreck, located in the Great Barrier Reef, Queensland, is protected under the *Historic Shipwrecks Act* and protected under the Great Barrier Reef Marine Park Act. A shipwreck may also be regarded as significant by influential organisations yet not be protected as such. For example, the *Young Australian*, located in the Daly River in the Northern Territory is on the National Trust register.

Under the Commonwealth's *Navigation Act 1912*, if a person discovers a wreck, they are obligated to inform the appropriate authorities. If located within Commonwealth waters the person must inform the Receiver of Wrecks, the Surveyor Manager of the Australian Maritime Safety Authority.

1.5 Other relevant legislation

Navigation Act 1912 (Commonwealth). Person/s who discover shipwrecks or related material in State, Territory or Commonwealth waters, are required to notify the Receiver of Wrecks. The Receiver of Wrecks for material located in Commonwealth waters is the Surveyor Manager of the Australian Maritime Safety Authority.

Moveable Cultural Heritage Act 1986 (Commonwealth). Includes provisions to limit the sale or transfer of custody or ownership of cultural heritage to an overseas person or the importation of material protected under foreign legislation.

Judiciary Act 1903 (Commonwealth). The court of a State or Territory is invested with jurisdiction over offences committed against the laws of the Commonwealth. This means that offences committed under the *Historic Shipwrecks Act* may be heard in the courts of the Northern Territory. In turn an offence committed against the Act in the Northern Territory may be heard in a court of another State or Territory.

Heritage Conservation Act 1991 (NT). This is the heritage legislation of the Northern Territory. An application must be made to the Heritage Advisory Committee and the Minister for Conservation for a site to be declared protected under this Act. The *Ellengowan* (1866-1888), located in Darwin Harbour, is one of seven shipwrecks protected under this legislation. Terrestrial sites Fort Wellington (1827-1829) and Victoria Settlement (1839-1841) located at Cobourg Peninsula within the vicinity of the *Australian*, are protected under this Act.

Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act 1996 (NT). This Act details the establishment of Gurig National Park and the Cobourg Marine Park. As a feature of the marine park the *Australian* historic shipwreck is protected under this legislation.

National Parks and Wildlife Act 1974 (Commonwealth). This Act deals with heritage sites and related items located within a national park. Permission from the Commonwealth National Parks and Wildlife Service must be obtained prior to any disturbance of these sites.

APPENDIX 2: A DISCUSSION ON THE *YONGALA* AND THE *CLAN RANALD* SHIPWRECKS

2.1 Preamble

The purpose of this discussion is to briefly acknowledge the management of two shipwrecks protected under the *Historic Shipwrecks Act* where complementary legislation protects aspects of the local natural environment.

2.2 The *Yongala* shipwreck

The *Yongala* was built in 1903 and wrecked in 1911 off Cape Bowling Green, Queensland. This single screw steamer was making its way from Brisbane to Townsville. She lies approximately 12 nautical miles off Cape Bowling Green at a depth varying between 16 and 30 metres. The *Yongala* is protected under the *Historic Shipwrecks Act* and the *Great Barrier Reef Marine Park Act*.

The *Yongala* is a popular recreational dive destination, considered by many to be one of the most favourable wreck dives in Australia. The management of the site takes into consideration the demands and impact on the site as a result of visitation, particularly commercial dive charters. One management concern is the damage caused to the wreck by the mooring of boats. In response, the Queensland Museum is developing a mooring system.

The *Yongala* is protected under the *Historic Shipwrecks Act* following declaration in 1981. In addition to the standard protection that the *Act* offers, a protected zone was declared surrounding the site. A protected zone, as found within the *Act*, restricts entry using a permit system.

The area surrounding the *Yongala* has been declared a Marine National Park B Zone (Great Barrier Reef Marine Park Authority 1980). Under this zoning plan, no activities that cause interference, damage or removal of any material are permitted. This includes cultural material and natural material. Access is permitted without a permit into a B zone under the condition that the kinds of activities are non-intrusive. To conduct scientific research and tourist operations, a permit is necessary. This permit is in addition to the permit required to enter a protected zone under the *Historic Shipwrecks Act*.

The park rangers conduct a regular surveillance program on the site (Richard Quincey, pers. comm., February 1998). This is conducted by boat and air. Interference of the wreck in any form can be dealt with under the regulations of the Marine Park B zone as opposed to the regulations under the *Historic Shipwrecks Act*. Monitoring of human impact to the site is conducted by the staff of the Queensland Museum.

The Queensland Department of the Environment also conducts ongoing marine research on the site running a marine survey program (Richard Quincey, pers. comm., February 1998). The *Yongala* is considered an artificial reef of high value, containing both a large number of fish and a large variety of species (Richard Quincey, pers. comm., February 1998). Therefore the marine environment of the site is considered of high value in the overall management of the shipwreck site.

The *Yongala* is an example of a shipwreck site in which the management plan recognises its natural significance. The monitoring and surveillance program has been adapted to afford the greatest effectiveness utilising the skills and abilities of each organisation involved.

2.3 The *Clan Ranald* shipwreck

The *Clan Ranald* was built in 1900 and was wrecked in 1909. She was a steel-hulled turret steamer that was travelling from Port Adelaide, South Australia, to South Africa. The wreck is located in Gulf St. Vincent, South Australia, lying capsized in 18-20 metres of water (T. Arnott, pers. comm. February 1998).

The *Clan Ranald* remains one of the best wreck dives in South Australia and contains significant archaeological material. It is also an outstanding feature of the Troubridge Hill Aquatic Reserve. The reserve was declared under the *Fisheries Act 1982* (South Australia) on 22 September, 1983, and covers approximately 4 square kilometres. The primary function of the reserve is to protect marine benthic organisms and to provide a relatively unspoilt coastal marine area for passive recreational and educational activities. The removal of shell, sand or plant life is illegal except by rod or handline. This therefore excludes activities like dredging and collecting. Management priorities are aimed towards education and conservation. In 1992, an inter-agency working party, instigated by South Australian Fisheries, recommended that the area was worthy of total protection and therefore should be designated a marine protected area.

APPENDIX 3: 1997 FIELD WORK DETAILS

3.1 Background to the field work

The fieldtrip was based at the Black Point ranger station at Cobourg Peninsula. The shipwreck site is isolated, and the ranger station is the most viable site, on land, to base field operations. The site was reached each day from the station by boat. The MAGNT gained use of the station's accommodation facilities and boat. The fieldtrip was run over a period of 10 days. David Steinberg and John Riley flew to the station from Darwin.

3.2 Field work details

Aim and methodology of fieldwork. The aim of the fieldwork was to conduct a non-disturbance survey of the visible remains of the shipwreck. An understanding of site formation and site deterioration was to be developed and key environmental factors that effect material remains identified.

Due to restrictions in time and personnel the methodology of survey was simple and aimed for a broad impression of the site with a limited degree of accuracy. The results therefore serve as a good beginning to further more detailed survey work.

The location of key features to each other was quickly recorded using a simple bearing/compass process. From one object the distance and bearing to another was recorded. Therefore there was no central datum structure. The dimensions of key features were measured with hand held tapes and a measuring rod divided in the imperial scale. A baseline was laid along the centre, down the length of the site. Right angle off-sets at 10 metre intervals were measured recording the extent of exposed material.

Dive team.

Diver	Role and affiliation
David Steinberg	(Archaeologist, MAGNT)
John Riley	(Steamship expert)
Libby Sterling	(Diving Supervisor, PWCNT)
Alan Withers	(Head Ranger, Black Point Ranger Station, PWCNT)
Rowan Marshall	(Ranger, Black Point Ranger Station, PWCNT)
Mark Ingram	(Ranger, Black Point Ranger Station, PWCNT)

1997 fieldwork dive times

Diver	Number of dives	Total bottom time
Alan Withers	4	4 hrs
David Steinberg	10	10 hrs
John Riley	10	10 hrs
Rowan Marshall	5	5 hrs
Libby Sterling	6	6 hrs
Mark Ingram	4	4 hrs
Totals	39	39 hrs

Boat and diving safety standards. The boat used during the fieldwork was the *Lorus*, owned and operated by the NT Parks and Wildlife Commission.

The boating standards upheld during fieldwork were based on regulations stipulated in the MAGNT Boating Policy. This policy is endorsed by the MAGNT Occupational Health and Safety Committee.

The diving procedures practiced in the course of the fieldwork were based on the regulations stipulated in the MAGNT Diving Operations Procedures Manual. The dive tables adhered to were the Professional Association of Diving Instructors (PADI) recreational dive tables. Libby Sterling, a dive instructor, acted as dive supervisor.

3.3 List of fish.

This list has been compiled by Rex Williams, technical officer of the Natural Sciences Department of the Museum and Art Gallery of the Northern Territory. It follows his viewing of footage of the site taken in 1997. Alan Withers, ranger at PWCNT Black Point Ranger Station contributed information regarding the fish present on the site. This is not a complete list of species found on the wreck site.

Common name	Scientific name
Diagonal striped sweet lip	<i>Plectorhinchus multivittatus</i>
Rabbit fish	<i>Siganus guttatus</i>
Six banded angelfish	<i>Pomacanthus sexstriatus</i>
Blackspot tusk fish	<i>Choerodon schoenleinii</i>
Sergeant major (stripey)	<i>Abudefduf bengalensis</i>
Red -bellied fusilier	<i>Caesio cuning</i>
Spanish flag / Stripey seaperch	<i>Lutjanus carponotatus</i>
undetermined <i>Heniochus</i> species	<i>Heniochus</i> sp.
Estuary cod	<i>Epinephelus coioides</i>
Snapper (yellow margined sea perch)	<i>Lutjanus fulvus</i>
Diamond fish	<i>Monodactylus argenteus</i>
Moon wrasse	<i>Thalassoma lunare</i>

APPENDIX 4: HISTORICAL AND TECHNICAL DETAILS OF THE *AUSTRALIAN***4.1 Historical details**

Built	1896
Location	Glasgow, Scotland
Builder	Napier and Sons
Description	Schooner-rigged steel steamer
Owner	Eastern & Australian Steamship Company
Port of registry	London
Function at time of loss	cargo and passenger steamer
Cargo at time of loss	mail, frozen foods, bulk and exotic cargoes
Port of destination	Palmerston (Darwin), Northern Territory of Australia
Location when lost	Cobourg Peninsula, Northern Territory of Australia
Explanation of event	stranded
Cause of loss	navigational error
Date of loss	1906
Location	11° 06.667' (latitude), 131° 58.533' (longitude). Aus Chart AUS 18. 1: 75 000
Legal status	Protected under the <i>Historic Shipwrecks Act</i>

4.2 Technical details

Built	1896
Location	Glasgow, Scotland
Builder	Napier & Sons (ship and engine)
Port of registry	London, England
Hull type	steel
Propulsion	single screw steamer - fore and aft schooner
Gross tonnage	2838
Under deck tonnage	2327
Net tonnage	1784
Water ballast	cellular double bottom.
Keel	flat keel & bilge keels
Length	341.7 feet (104.15 m)
Breadth	42.2 feet (12.86 m)
Depth	22.5 feet (6.86 m)
Forecastle length	46 feet (14.02 m)
Saloon length	112 feet (34.13 m)
Poop length	60 feet (18.29 m)
Engine	3 cylinder triple expansion engine: 26, 43 and 70 inch diameter cylinders; 48 inch length of stroke; 400 NHP (nominal horse power).
Boilers	two double-ended boilers (175 lbs boiler pressure) one auxiliary horizontal boiler (80 lbs boiler pressure)
Registered top speed	15 knots
Auxiliary machinery	Refrigeration system (compressed air); dynamo (electric lighting throughout); anchor crane; capstan and windlass; cargo winches
Structure	2 deck (steel and teak upper deck); 6 bulkheads; 4 cargo hatches
Passenger facilities	70 first class; 35 second class; steerage class (unknown capacity)
