A Study of the Riverine and Underwater Archaeological Landscapes of Rocky Bay, North Fremantle, Western Australia

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DECLARATION

This thesis represents original research undertaken for the Masters in Maritime Archaeology Degree at Flinders University, Adelaide. I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

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Darren Buckley Cooper
August 2012

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ABSTRACT

The Swan River has been poorly researched with respect to underwater archaeological sites. To date, no systematic archaeological survey has been undertaken of the riverbed, and only one volume collating sunken vessels has been compiled.

In order to address this lack of research, a systematic archaeological investigation of the Rocky Bay area was undertaken. Rocky Bay is a small bend in the Swan River located approximately two kilometres from Port of Fremantle, within the suburb of North Fremantle. In recent years North Fremantle has undergone a dramatic transformation from coastal light industrial area to a high value residential neighbourhood.

The survey found a number of previously unrecorded archaeological sites that represents various phases of industrial development dating to the initial establishment of the colony in 1829. Many of these sites have been adversely affected by redevelopment of areas overlooking and surrounding the bay, which has seen industrial estates give way to residential housing.

The aim of the thesis is to demonstrate that the Swan River has the potential to contain undiscovered archaeological sites, other than sunken watercraft, that can provide tangible links with the past that are no longer found on its shores. I posit that such sites reflect changes in society of the surrounding areas and can provide information towards a broader understanding of land and river usage.

Finally, the dissertation addresses the question of whether the archaeological signature of Rocky Bay can be meaningfully accommodated within the conceptual framework of a *maritime cultural landscape*. In particular, I argue that current broad-brush applications of the concept need to be tempered by due consideration of site context and function rather than the mere propinquity of sites to maritime and riverine areas.

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Abbreviations

AHIS	Aboriginal Heritage Inquiry System
DIA	Department of Indigenous Affairs
DOLA	Department of Land Administration
GIS	Geographical Information System
GPS	Geographical Positioning System
LISWA	Library and Information Service of Western Australia
MAAWA	Maritime Archaeological Association of Western Australia
MADS	Maritime Archaeology Databases Search
PWD	Public Works Department
SEW	State Engineering Works
SRO	State Records Office
UTM	Universal Transverse Mercator
WAM	Western Australian Museum
WAMM	Western Australian Maritime Museum

Chapter 1 – Introduction

1.1 Introduction

Riverine industry was an important part of the development of the Swan River Colony in the nineteenth century and the growing Perth city in the early twentieth century (Murray 1949, 2004; Nind 1981). However, in the latter part of the twentieth century the use of the Swan River changed, reflecting changes in industry, technologies, improved infrastructure and also a greater demand for riverside property for residential purposes (Q.C. 1947). These changes have impacted on sites of potential heritage value and raised questions regarding how they are managed. Few Swan River foreshore industrial sites remain today. This thesis highlights this lacuna and provides descriptions of extant archaeological features as examples of what may be the only testament to past activities relating to riverine industry along the Swan River. For this purpose the area known as Rocky Bay was chosen for its representativeness of a declining riverside industrial area within an encroaching residential environment.

1.2 The Study Area: Rocky Bay

Rocky Bay is located in the Swan River approximately two kilometres inland from the Port of Fremantle. It is a small bay located between Point Direction and Minim Cove (Figure 1). When Europeans first established the Swan River Colony, Rocky Bay was described as “the most beautiful bay in the Swan River with its high cliffs overhung with peppermint trees, cypress pine and many shrubs” (Downey 1971:40). It was overlooked by seven large limestone hills called the Seven Sisters which was the dominant geographic feature in the area (Figure 2). The waters in the bay were clear and abundant with fish, crabs and prawns.

Figure 1: Rocky Bay Study Area (Source: DOLA).

Figure 2: Seven Sisters overlooking Rocky Bay (Source: Finnerty 1890).

Today the western part of the bay is characterised by vertical limestone cliffs with intermittent limestone ledges and small sandy inlets, while the northern part consists of a level, artificial embankment that leads down to the water's edge. Adjacent the embankment is a shallow intertidal flat approximately three metres wide. The deep-water channel of the Swan River follows the northern edge of the bay and is between six

and eight metres deep. The bay typically has a tidal range no greater than one metre. The waters below the cliffs contain several large limestone boulders that have fallen from above.

The western cliffs and northern embankment are vegetated with peppermint trees and smaller shrubs. Much of the original vegetation has been cleared for development, but would have included tuart (*E. gomphocephala*), jarrah (*E. marginate*) and marri (*E. calophylla*) woodland (Chalmers 1997:4). Along the water's edge are native communities of samphire (*Halosarcia sp*.) which have been largely replaced by exotic weeds and grasses. Early images of the bay indicate the cliffs originally had little vegetation (Figure 3). Planting was undertaken in the past twenty years as an attempt by the Shire and local industry to beautify the bay (NFCMCHP 1992).

State Library of Western Australia

Figure 3: Rocky Bay 1923 (Source Battye Library Online Collection 111744PD)

1.3 Historical Context: The Development of Riverside Industry in Rocky Bay

Rocky Bay is situated on the eastern boundary of North Fremantle, a suburb located on an isthmus of land immediately north of the City of Fremantle. It is bounded by water on

three sides – the Indian Ocean to the west, the Swan River to the south and Rocky Bay to the east, itself part of the Swan River. Rocky Bay was once a light industrial area that provided a variety of goods to the local community and industry. However, over the past fifty years the character of this inner city suburb changed with many industries disappearing to be replaced by residential housing and apartments. As a result, much of the physical industrial fabric overlooking Rocky Bay disappeared.

North Fremantle was established in the 1850s as part of the wider Fremantle area. It was originally a residential area but quickly transformed into a light industrial suburb. In 1895, a petition was made for the area north of the Swan River to split from the City of Fremantle to become the City of North Fremantle (Ewers 1971:101). The landscape of the suburb was also transformed with the quarrying of limestone for the new Fremantle port. Rocky Bay was described as one of the most beautiful places along the Swan River (Downey 1971:40).

By the early twentieth century, North Fremantle became the location of a large number of manufacturing industries that supplied not only the construction of the new port, but also surrounding businesses and households with a wide range of goods. In 1912, the suburb was described as:

> being mainly residential but is now becoming an active manufacturing centre…[comprising] two tanneries, timber mill, joinery works, two large bulk oil stores, boot factory, two soap and candle works, a large steam laundry, cordial factory and galvanised iron works. On the reclaimed portion of the Rock Bay Quarry land are erected a large engineering works, carriage building and chemical works (Battye 1912:555).

The concentration of all these industries in one place produced a discernible odour that gave North Fremantle the distinction of being called “Pong Alley” (D. Houston cited in Hartley 2008:50).

Many industries were set high upon the limestone cliffs overlooking Rocky Bay. In 1913, the State Engineering and Implement Works (later called the State Engineering Works [SEW]) was established on the site of the Rocky Bay Quarry. This was soon followed by the establishment of the Mt Lyell Chemical Works. These two companies provided equipment and fertilisers for rural industries, and while the chemical works closed in 1959, the engineering works operated until 1986. The employees of the SEW provided valuable support to the war effort during World War Two carrying out repairs to naval ships and producing wartime machinery such as Bren Gun Carriers. After the war, the SEW focused on supporting many government construction projects and became a leading training facility for apprentice machinists and metal fabricators (Hartley 2008:38-42; Metcher 2005: 77-86).

By the 1980s many local businesses had closed down. The lands once occupied by the SEW, the Mt Lyell Chemical Works, and the boats yards of Point Direction were bought by real estate developers for residential housing. After removing all the standing buildings, the land was sold and a period of residential construction ensued. As one observer noted “within one generation the face of North Fremantle has changed from being a rough and tough industrial suburb to one with an upmarket residential image” (Hartley 2008:4).

This thesis investigates the riverine cultural landscape of Rocky Bay based on the physical remains found along the waters’ edge and below the water of the Swan River. It examines how people used the river as part of industry situated adjacent the river, how these activities changed the physical landscape of the bay, what evidence still exists of

past industrial activities and how the changing land use affected the material remains of these industries.

1.4 Significance of Project

The significance of this study is to understand the relationship between industrial development and the natural landscape against a backdrop of human a developing colony, and how changing socio-demographic patterns can be reflected in a small concentration of archaeological sites. The study will also demonstrate that archaeological sites do exist within the Swan River but are often overlooked, or not searched for at all, and provide a tangible link to the early development of the Swan River Colony and the local community of North Fremantle. Few archaeological studies have examined underwater cultural sites in the Swan River. To date, these consist of a compilation of sunken vessels (Scrimshaw 1981) and of monitoring works along the Perth foreshore (Nayton *in preparation*). The sites discussed in this study have the potential to generate data that can be used to address a number of research questions and to expand our knowledge of an otherwise neglected archaeological resource.

1.5 Research Questions

Three research questions are proposed for this project. These are:

- What can the archaeological and historical investigation of Rocky Bay's riverine and underwater landscape reveal about the area's industrial past?
- How does the archaeological signature of the Rocky Bay area reflect changes over time with regards to the community of North Fremantle?
- What can the study of Rocky Bay's riverine and underwater landscapes contribute to a broader understanding of the use of this inland waterway and the development of the state of Western Australia?

1.6 Chapter Descriptions

This thesis consists of six chapters. Chapter One introduces the project and outlines the research questions addressed. It provides a brief historical background to Rocky Bay, the Swan River and the North Fremantle area. A statement of significance is given detailing why this research is important.

Chapter Two briefly reviews the theoretical concept of the maritime cultural landscape as a method of understanding and interpreting archaeological sites found within a maritime context. The history of the various industries that were located along the shores of the bay are examined through documentary sources.

Chapter Three outlines the methodology employed during the project. It details the search of archival materials and statutory databases, and the examination of historic and contemporary aerial photography. The various components of the fieldwork are described including the use of side scan sonar to identify underwater structures and features, meandering pedestrian transects along the shorelines of the survey area and the underwater examination of specific identified targets. The results of the survey are compiled within a Geographical Information System (GIS), which is also detailed.

Chapter Four presents the results of the project. The results of the archival search with respect to historic maps, plans and photographs are presented. The findings of aerial imagery and side scan survey data are outlined highlighting specific targets for further investigation. The general findings of the terrestrial survey are discussed. Specific sites are discussed incorporating the above results.

Chapter Five uses the results presented in Chapter Four to address each of the research questions, highlighting how people utilised the river from past to present. This chapter highlights the importance of the sites located during this survey as links to past activities

that are underrepresented in the heritage environment of the local Fremantle area, and provides insight into the potential of underwater sites of the Swan River.

Chapter Six provides a summary of the project. It reviews the thesis in general and makes a series of concluding remarks and observations.

Chapter 2 – Maritime Landscapes and Literature Review

2.1 Maritime Cultural Landscapes vs. Archaeological Landscapes

The application of landscape perspectives in archaeological investigation provides a "conceptual framework that enables us to address human pasts in all their contexts and goes beyond a purely environmental archaeology" (David and Thomas 2008:38). The consideration of sites not as individual entities, but as part of a continuous distribution of activity centres (Ebert 2001; Dunnell and Darcy 1983) allows a broader understanding of how people interact within their society. Beyond that, it looks at the way in which people see themselves and how they are perceived within their environment. The use of 'landscapes' to interpret human behaviour is now widely accepted in archaeology (Ashmore and Knapp 1993; Ebert 2001; Rossignol and Wandsnider 1992). While the use of landscapes as a framing device has been widespread in terrestrial archaeology (see edited chapters in David and Thomas 2008), parallel developments can be observed in maritime archaeological literature (for example Ford 2011). The most pervasive of these is Westerdahl's (1992, 2011) concept of a maritime cultural landscape. This is an inclusive concept encompassing

> The whole network of sailing routes, old as well as new, with ports and harbours along the coast, and its related constructions and remains of human activity, underwater as well as terrestrial (1992:6)

Therefore, the concept promotes the inclusion of terrestrial sites of sea going communities within the investigation of spatially and/or functionally associated sites. For example, within Australia many studies have examined maritime related archaeological sites outside of the sphere of the shipwreck. Examples of this wider focus include the study of port and defensive infrastructure (Duncan 2006), shipyards (Souter and McCarthy 1998), whaling and whaling stations (MacIlroy 1986; Nash 2003; Gibbs 2010),

riverine environments (Kenderdine. 1993), and jetty structures (Khan 2006, McCarthy 2002).

A characteristic of the application of the 'maritime cultural landscape' concept is that it is easily applied to distinctly maritime sites such as the types mentioned above. It can also be applied to related sites such as sources of raw materials utilised in maritime industries. Westerdahl (1992:12) cites the sourcing of timbers within Swedish forests for the construction of ships as an example of this. The maritime landscape extends from the shipyard back to the region, and even the particular forest from whence trees were sourced for the construction of a particular vessel. Likewise, rivers used to access these raw materials also fall within the scope of the maritime cultural landscape (Westerdahl 1992:6). Therefore, distinctly maritime sites found along coastal fringes, riverine environments and some inland areas (for example, Aberg and Lewis 2000, McErlean *et al*. 2002) are included within maritime cultural landscapes.

The ambiguity of cultural landscape studies, maritime or otherwise, means that such studies can be applied in many ways to achieve certain aims (see Duncan 2006:10-11). Duncan notes that many researchers, particularly archaeologists, focus on material remains within a distinctive area (the study area), and that such a focus can result in investigations being "confined to economic practices and their subsequent archaeological signatures" which are more appropriately described as archaeological landscape studies (2006:12). Westerdahl (2011:338-339) likewise observed the multiplicity of distinct studies being conducted relating to coastal communities under the heading of maritime cultural landscape studies, when it is more appropriate that they be defined as a smaller sub-field of a maritime cultural landscape.

The constitution of maritime cultural landscapes can perhaps be best understood in terms of what Ingold termed "taskscapes" which are defined as "an array of related

activities" (1993:158). Ingold argued that the idea of landscape is a cognitive one which should relate to the activities of people rather than to the idea of land, which is a geographical viewpoint. With this in mind, the activities that took place within a site (for example Swedish shipbuilding (see above)) are its defining characteristic.

These activities encompass a range of 'tasks', whether they are social, technical or another form of activity. Ingold notes that "every task takes its meaning from its position within an ensemble of tasks, performed in series or in parallel, and usually by many people working together" (1993:158). Therefore, for a site to be included within a maritime landscape, the activities taking place within that site should be of an inherently maritime nature- for example, shipbuilding or associated activity.

If the type of activities that occurred within a site is used to define its purpose, then that definition should recognise that multiple types of activities can occur in a single location. For example, a shipyard is a place where ships are built and repaired, but is also the location where workers socialise and interact, or it may also be a location where people lived if workers lived on site. The number of variations is unlimited and therefore, to avoid an ever-expanding activity list, it is necessary to set a limit; a level of activity used within a study with the aim of satisfying the outline research questions. For the purpose of this study, the primary function of each site is used to define the type of site it is.

The types of activity within the geographical location of a site can and does change through time, especially where land use changes. In this case, the single location is viewed as a series of individual sites that are connected only in space, not time, and that the primary activity of one site differs from that of another, even though the sites occur in the same location.

Sites investigated as part of this study are defined as part of an archaeological landscape, even though many are of a distinctly maritime nature. In this case it would be inappropriate to try and confine all sites into a maritime cultural landscape because not all sites have a primary purpose associated with the maritime world.

2.2 Literature Review

2.2.1 Aboriginal Land Use in Rocky Bay

Local Indigenous groups utilised the natural resources of the Swan River for over 40,000 years (Pierce and Barbetti 1981). Archaeological investigations demonstrate that Rocky Bay, the traditional name for which is *Garungup*, has been utilised foro 10,000 years (Dortch 1975). Living a seasonally nomadic lifestyle, the Nyungar peoples used a calendar of six seasons that governed when and where they moved to take best advantage of seasonally available resources (Green 1984:10). In the colder months, they occupied the hills to the east of the Swan Coastal Plain, whilst in the hotter months they moved towards the coast. Aboriginal groups camped on the banks of the rivers and estuaries to take advantage of the cooling winds that came off the waters and from the ocean. Green (1984:11) notes that in "spring and summer fishing was popular in the sheltered bays of Mandurah, Fremantle and Albany, and groups of 20 or more women and children armed with branches drove schools of mullet into the shallows to be speared by the men". They stayed in these locations for as long as conditions and food allowed (Hammond 1933).

Local traditional owners described Rocky Bay as being a place of significant mythological and ceremonial importance. A large cave on the west side of the bay is called *Garungup* (from which the bay gets its traditional name) and is associated with the story of the Rainbow Serpent. The cave is believed to be "the place where the Rainbow Serpent slept after the great flood flooded all the land between *Wadjimup* (Rottnest Island) and the

coast" (K. Colbung cited in NFCMCHP 1992:6). This pattern of lifestyle was only interrupted by the permanent settlement of the Swan River Colony in 1829.

2.2.2 River Transport

The Swan River Colony was concentrated along the fringes of the Swan River from Fremantle to Perth up to the agricultural centre of Guildford. The environment surrounding the colony was harsh, consisting of sandy dunes and dense coastal thicket. Early roads were little more than roughly cleared sandy tracks which made the overland journey, typically on horseback or on foot, from Fremantle to Perth long and difficult. The river afforded the colony the only viable means for transportation of passengers and bulk goods and was the lifeblood of the colony> Access to the river was facilitated by granting of settlement lots each containing a small frontage onto the river (Nind 1981; Murry 2004). Regular passenger services between Perth and Fremantle commenced in 1829 and by the mid-1830s several ferry services were established (Nind 1981:55).

In the initial years of the colony, the primary form of river transport between Perth and Fremantle was the sailing barge (Nind 1981). In shallower waters goods were transferred onto skiffs and pontoons to go further upstream. The sailing barges were later supplemented, and then superseded, by the introduction of steam-powered craft (Murray 2004). These vessels could tow barges up and down the river without being reliant on favourable winds or tides (Figure 4).

Figure 4: Paddle steamer towing box barges through the Narrows, Swan River, 1905 (Source Battye Library Online Collection 006191PD)

2.2.3 Boat Building

The riverine trade relied upon the availability of suitable watercraft. Initially, boats were either brought out from England with settlers or were imported from the eastern colonies. Typically these were small skiffs, row boats or small sailing vessels. In these early years, good money could be made from the transportation of goods and passengers up and down the river and a profit was readily made by people who rented vessels to newly arrived settlers (Dickson 1994:3; Halls 1961; Hind 1981:54).

The arrival of carpenters and shipwrights to the colony in 1830 resulted in commencement of the local boat building industry. Small yards were established on the Perth foreshore and, later, other yards were developed at Arthurs Head in Fremantle. The yards in Perth built sailing barges, flats and box boats, and small recreational craft. In 1854, Messer's Mews, Cook and Stevenson built the colony's first steam-powered craft *Speculator* (Dickson 1994:4). Steam-powered craft guaranteed regular ferry services and in the next twenty years several large paddle steamers were built for ferry services on

the Swan River. The larger paddle steamers also carried passengers on recreational day trips and special occasions (Parsons 1980:13). For example, the paddle steamer *City of Perth* was used as an observation platform for the 1876 Perth Regatta, where it "thronged with gazers" as it was moored off Mill Point (*The West Australian Times* [WAT], 21 April 1876).

Shipbuilding in the North Fremantle area was established in the late 1880s. Due to the swampy nature of the northern river foreshore and the limestone cliffs of Rocky Bay, the only place suitable was Point Direction. The first boat builder to operate in this area was Joseph Butson. He is listed as a "boat builder from 1888 through to 1899" and "he built steam launches, pearling dinghies, skiffs of all description and pleasure boats" (Dickson 1994:34).

The Swan River's "most prolific boat and ship builder" was Mr Alfred E Brown (Dickson 1994:28). In 1910 he moved his shipyard from Fremantle to North Fremantle He established a jarrah slipway and large shed of corrugated iron so that building could continue in all weather (Figure 5). Some of the Swan River's more iconic vessels such as the steam ferries *Perth* and *Westralian,* both constructed in 1913, were made at this yard (Dickson 1994:29). Brown retired in 1921 and sold his business to the Swan River Shipping Company.

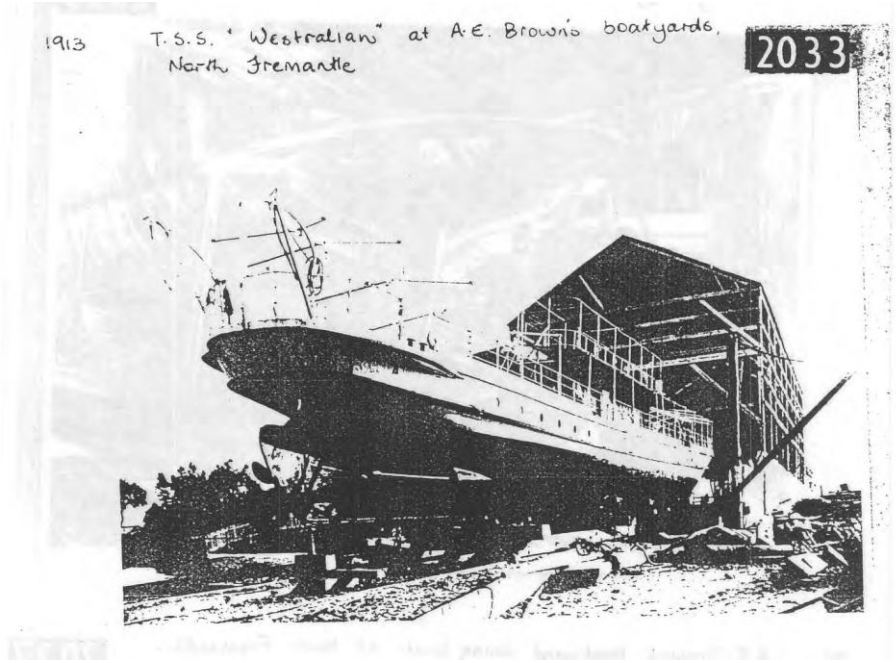

Figure 5: A.E. Brown boat yard, North Fremantle (Source: Dickson 1994).

2.2.4 State Shipbuilding Yard

In 1943 the State Shipbuilding Yard (SSY) was established on Point Direction. This was preceded by a smaller slip in Rocky Bay built in 1942. This simple slip was located on the north shore under the site of the SEW. It was used for the construction of steel barges that were used as fenders for visiting aircraft carriers, but which also saw service in northern Australia and the Pacific (Hartley 2008). The barges were built side-on to the water's edge (Figure 6) and when completed were pulled by tugs into the water (Figure 7).

In 1943 this slipway was abandoned when a more permanent facility was built on Point Direction. The new yard included a large shed and a concrete and steel rail slipway. The construction of the slipway required dredging of the adjacent shallows. During the dredging two sunken barges were uncovered.

> A good deal of dredging was required out from the launching way and along the frontage…However, they immediately struck trouble in no

> uncertain manner when two sunken barges were discovered on the river bed, just where the dredging was required most. These barges were blown to pieces, just one small piece after the other until they were finally removed (Kenny n.d.:1).

The remains of these barges are seen in the centre of Figure 8. These were not the only sunken barges found at Point Direction. Residents who grew up in North Fremantle (e.g. Brennan n.d.) note that many sunken or abandoned barges were located at Point Direction and that these were a good place from which to fish. Five or six other barges were located in the shallows on the adjacent block next to the SSY (Hartley 2008:32).

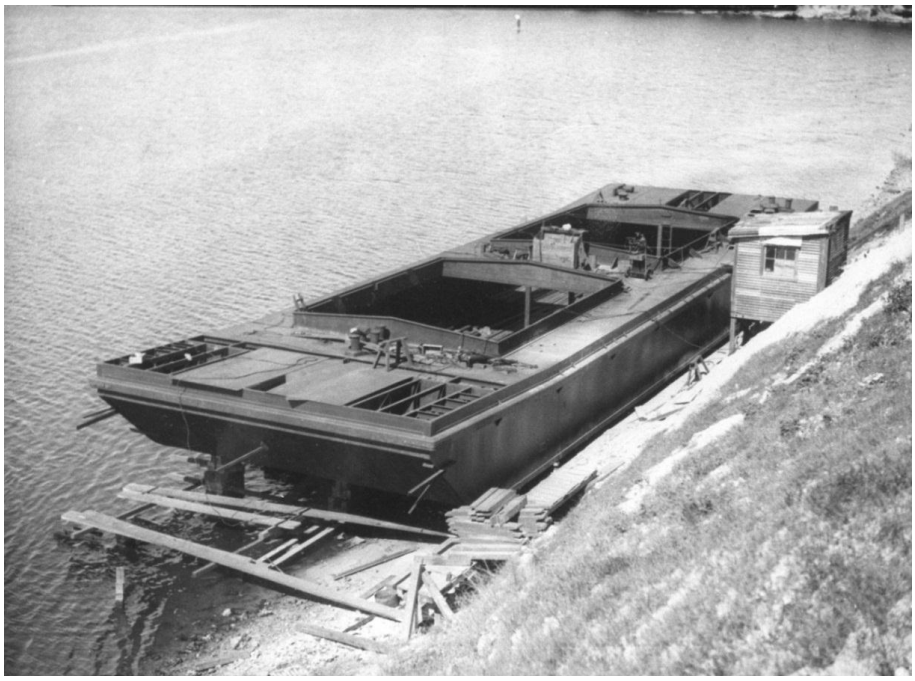

Figure 6: Steel Barge SPL302 under construction ca.1942 (Source WAMM: MHA / 4577 / 22)

Figure 7: Steel Barge SPL302 being launched ca.1942 (Source WAMM: MHA / 4577 / 23)

Figure 8: Remains of Point Direction barges destroyed during slipway construction, 10th March 1943 (Source: Kenny n.d.)

The original slipway site was left to slowly deteriorate. The karri beams were removed from the site to form the foundations of the slipway for the new Swan River Yacht Club on the opposite side of the river (Redfern Pers. Comm.). A small hut overlooking the site, long disused and having become a "dilapidated shed," was removed ca. 1960 (SRO 4074 1960/133).

After World War Two, the northern river bank between Point Direction and Fremantle Harbour was the location of many shipyards. Other yards appeared in the vicinity of Point Direction. These include yards operated by F. Coleman and Sons, McLlwraith, and a Greek born boat builder named Manolias (Hartley 2008). In addition to ship building, ship breaking was also undertaken in the 1960s at Point Direction by the Arthur Ball Salvage Company. Vessels were striped of equipment and other salvageable materials in the shallows of Rocky Bay before the vessels were towed out and scuttled in the deep waters off Rottenest Island.

2.2.5 Construction of a Fremantle Port

The Swan River mouth was once blocked by a large limestone bar which prevented shipping from entering the river. Ships berthed alongside the Long Jetty where goods were unloaded and moved to a smaller jetty on the inside of the river mouth for loading into smaller boats and barges. The Long Jetty and its anchorage were fully exposed to the violent storms of the Indian Ocean, causing vessels to drag their anchors which resulted in more than one vessel being wrecked (see Henderson 2007).

The idea of constructing a channel connecting Rocky Bay to the ocean through the limestone bedrock was considered as early as 1829, but was not actively pursued until 1873-4. The feasibility study for the proposal was undertaken by the Reverend C.G. Nicolay, a noted geographer who arrived in the Swan River Colony in 1870 (Playford and Pridmore 1969:31). Other engineers proposed various designs for construction of an external port at the river mouth, as well as for the development of Cockburn Sound, a few kilometres south of the river mouth (Ewers 1971:92). The project was hindered by indecision which continued until 1892 when plans were ultimately settled upon by the new Engineer–in-Chief for Western Australia, Mr C.Y. O'Connor (Ewers 1971:93).

O'Connor proposed the removal of the limestone bar and the construction of a deep-water port within the river mouth. The port would be protected by two long stone breakwaters extending from the northern and southern points of the river mouth. The stone for the northern breakwater would be limestone sourced from nearby Rocky Bay, specifically targeting the Seven Sisters formation.

2.2.6 Limestone Quarrying

Limestone from the hills overlooking Rocky Bay was quarried from the 1870s until the 1960s. It was the primary raw material for many of the early buildings in the colony, particularly Fremantle. However the volume required for the construction of the port was extensive. Quarrying for the port project began in the early 1890s and finished in 1897.

The limestone was transported to the construction site by both rail and barge. A dedicated rail line was built between the quarry and the works, and a jetty was established on the river at the base of Stone Street for loading of quarried stone onto barges (Tuettemann 1991:88). When the port was completed, six of the seven hills had been totally removed and the seventh was severely impacted. A large limestone terrace now exists in their place (Figure 9).

Figure 9: Looking West across the level limestone platform resulting from quarrying, Rocky Bay. Rail was one method of transporting the limestone blocks to the work area (Source Battye Library Online Collection 3045B22)

Limestone was also processed in Rocky Bay. With either no knowledge of its significance to local Indigenous communities or with complete disregard for its importance, *Garungup* Cave was used as a lime kiln by T.H. Briggs and Company around 1900 (Tuettemann 1991:89). The cave was used to burn down limestone in the production of quicklime for use as mortar. Lime kilns were also operated by the same company on a site near the Mt Lyell Chemical Works.

2.3 Other Rocky Bay Industries

In addition to the boatbuilding yards at Point Direction, a soap factory, bulk oil storage facility, the State Engineering and Implement Works, and the Mt Lyell Chemical works were established on the cliffs overlooking Rocky Bay. While the bulk oil facility was largely self-contained, the other factories required access to the river.

2.3.1 W.H Burford and Sons Soap Factory ca.1890 – 1959

In 1886 the Swan Soap and Candle Company, then owned by Mr J.W. Bateman, applied to the government for permission to build a landing in Rocky Bay to allow access to his

proposed building site for the transportation of goods by water (SRO 527 1886/2418). While there is no record of the landing ever being built, the factory was constructed. By 1896 it was taken over by W.H. Burford and Sons, and by 1905 a distinctive three storey, red brick building was constructed (Figure 10). The factory produced a range of goods including a variety of soaps (hand soap, laundry soap, soft soap and kerosene soap) and stearine candles for underground miners in the evolving Western Australian gold mining industry (*Western Mail* [*WM*], 21 October 1911). The mining industry required approximately 27,000 candles per day for its underground workings (Hartley 2008:34).

The factory boasted numerous production machines. Soap tablets were produced and wrapped at a rate of 7000 tablets per hour. Thirty candle making machines produced 300 candles from raw material to finished product in 20 minutes (*WM*, 21 October 1911:47). This process required a considerable amount of water. Steam was used to melt down raw tallow to make soap, and approximately 4,000 gallons of water per hour were needed in the glycerine plant to cool the candles (*WM*, 21 October 1911:47). Effluent was discharged directly into the river. Agitation from waves and propeller wash produced a large volume of soap suds, giving the bay the colloquial name “Soapy Bay” (NFCMCHP 1992).

In 1930 the company was taken over by Kitchen and Levers, a combined English/Eastern States firm, and operated under the name of the Perth Manufacturing Co. Ltd,until its closure in 1959 (Hartley 2008:35). In the following 20 years the building was used as a margarine factory and later as a sail loft before being converted into residential accommodation in 1981 (Catomore 1986:13).

Figure 10: Burford Soap Factory ca.1923 (Source Battye Online Collection 111743PD)

2.3.2 Mt Lyell Chemicals (ca.1910 – 1969)

The Mt Lyell Chemical Works was established at the eastern end of the former Rocky Bay Quarry (*The West Australian* [TWA], 04 November 1910:10). This location was attractive to the company because of the solid, flat ground, the proximity to the river, and the established rail infrastructure leading to the site allowing for easy movement of goods and raw materials. The factory produced acids and superphosphate fertilisers for farming. The soils of Western Australia were poor in nutrients, and fertilizers were essential for crop propagation. In the first decade of last century, Mt Lyell Chemicals was one of only two fertiliser manufacturers in Western Australia, the other being Cumming Smith and Company located in Bassendean. Prior to this, fertilizers had to be imported from Victoria (CSBP 2010:3). In 1927 the two companies merged, and in 1964 British Petroleum (BP) acquired a third of the company forming Cumming Smith British Petroleum (CSBP), which the company still trades under today (CSBP 2010:7).

The plant ceased operations in 1969 when it moved south to the Kwinana Industrial Estate. This move was brought about by the state government which wanted the site closed due to the proximity of a steadily expanding residential presence.

2.3.3 State Engineering and Implement Works (1913 – 1987)

In 1913 the Western Australian State Government established the State Engineering and Implement Works on the western part of the former Rocky Bay Quarry site. Like the Mt Lyell site, the area had limestone foundations and an established rail network. The factory was originally tooled to supply local WA farmers with machinery for crop production. The government aimed to develop a local machinery industry whilst at the same time making eastern states and foreign imports too expensive for local farmers to purchase, thereby ensuring their dependence on the locally made equipment (Hartley 2008:40). In 1930 production of farming equipment stopped due to market competition and instead focused on supporting government engineering projects. At this time the name was changed to the SEW. The SEW became a primary training establishment for tradesman through its long-lasting apprenticeship scheme.

During the Second World War the SEW carried out vital naval repair contracts on Allied submarines and surface combatants based in Fremantle, and produced wartime equipment such as Bren Gun Carriers (Metcher 2005). The SEW also serviced the large number of merchant ships that frequented the port. After the war, the SEW continued to operate on Government and commercial contracts.

In the 1980s the SEW produced the famous winged keel for the Australian yacht *Australia II*, which went on to win the 1983 America's Cup yacht race. State budgetary cutbacks decided the fate of the SEW and in 1986 the SEW closed; the buildings were demolished in 1988 (Hartley 2008:41-42). The land was then redeveloped for residential housing.

The SEW, like the Mt Lyell Chemical Works, was a major employer of North Fremantle residents. Two or more generations of one family working in the same company at the same time was not uncommon. Boys who finished their schooling often found

themselves in the same trade classes at the SEW. The closure of SEW was a turning point in the demographic character of the suburb.

Mt Lyell Chemicals and the SEW were extensive operations with many buildings occupying the ground overlooking the river (Figure 11). Together these two factories dominated the landscape of Rocky Bay.

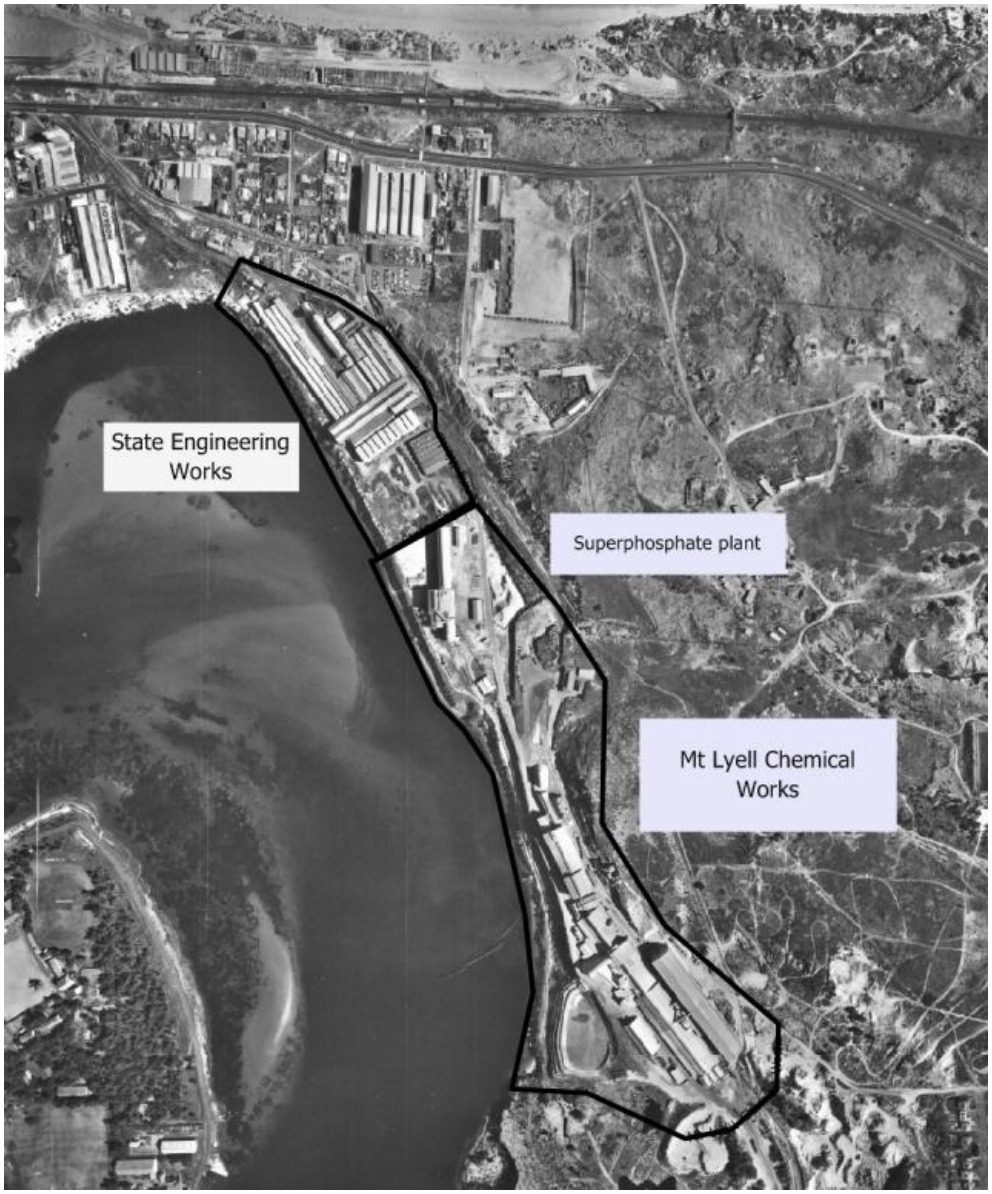

Figure 11: Rocky Bay denoting Mt Lyell Chemical Works and the SEW, 1959 (Source: WA 534 Z Metro Regional Run 26 (39-79) 3750 Jun 1959 Frame 26/77)

2.3.4 Post Industrial Phase

The mid-1980s was a defining period for North Fremantle. Industry around Rocky Bay ceased and the area was rezoned for residential use (DLUPM D.G.N7-1; DLUPM D.G.N9-1). The boats yards of Point Direction were replaced with multi-storey apartment buildings and the foreshore was landscaped, including the construction of a limestone sea wall complete with private jetties.

The former quarry sites of the SEW and Mt Lyell Chemical plants were not easily redeveloped. An unfortunate legacy of these operations was extensive chemical contamination of the soils across both sites. The Mt Lyell Chemicals site was contaminated with heavy metals and chemical by-products. The main contaminates were lead residues from lead sulphate scale, pyrite (iron sulphide) cinders from superphosphate production, and highly acidic liquor used in gas scrubbers to control harmful emissions, which over time became contaminated with mercury, all of which were dumped on-site (Boman Bishaw Gorham 1992:4). The soils of the SEW site were similarly contaminated. Chemical waste was found across the entire site and included "burnt coal wastes, clinker slag and pyritic cinders, and contains elevated levels of lead, arsenic, zinc, copper, iron, mercury and cadmium" (EPA 1989:1).

The contamination was not restricted to the soils as waste also leached into the waters of Rocky Bay. Heavy metal contamination was present on both the river foreshore and in local molluscs (Maunsell and Partners Pty Ltd cited in Bowman Bishaw Gorham 1992:8). A large-scale clean-up operation removed contaminated soils from both sites. The drainage systems that lead into the river were removed and a one metre layer of clean earth was placed across the site. Contaminants from the foreshore were also removed (EPA 1989:10).

These necessary steps potentially removed sub-surface cultural material from the former SEW and Mt Lyell Chemicals sites. Upon completion of the clean-up operation, the land was sold to developers for housing overlooking Rocky Bay with views of the suburb of East Fremantle on the other side of the river.

Chapter Three - Methodology

In this chapter the methodology for the collection of various data sets is described as well as how the data are used to generate the necessary information required to answer the research questions proposed in Chapter One. Limitations encountered during the project are outlined at the end of the chapter.

Historical research and onsite fieldwork will be undertaken to answer the proposed research questions including:

- Archival research
- Search of statutory databases
- Use of aerial imagery both past and present
- Terrestrial archaeological survey
- Underwater remote sensing
- Underwater archaeological survey
- Oral histories

3.1 Archival Search

3.1.1 Official Records, Maps and Plans

Archival records, government correspondence, historic maps and plans relating to Rocky Bay are reviewed in the State Records Office (SRO). In addition, general photography, aerial photography, and bathymetric data, also held in the SRO, are examined. Records from the Public Works Department (PWD) are of particular interest as this department was responsible for the construction of infrastructure projects such as the Port of Fremantle and the SEW.

Modern bathymetric data is used to compare how the river channel changed over the past 100 years. Therefore, the Department of Transport was approached for access to

recent bathymetric data collected in 2010 for comparison with bathymetric data collected in the 1890s.

3.1.2 Published Sources

A search of published sources was undertaken in the state library (Battye Library), the Fremantle Library, the Grove Library (Cottesloe), and the Western Australian Royal Historical Society. This focused on published histories and oral accounts of people who worked and lived in the North Fremantle area as it was anticipated that these would provide valuable historical context to the maps and photographs held within the SRO.

3.1.3 Newspaper Articles

The Australia TROVE database of historic newspapers was examined for articles relating to Rocky bay. In particular, articles concerning the various industries overlooking Rocky Bay are valuable for their content and dates. Keywords used in the search were: Rocky Bay, Swan River, and North Fremantle.

3.1.4 Statutory Databases

The databases of the Heritage Council of Western Australia (HCWA), City of Fremantle Municipal Inventory, Western Australian Department of Indigenous Affairs (DIA), Western Australian Maritime Museum (WAMM) and Maritime Archaeology Association of Western Australia (MAAWA) were examined to ascertain what heritage sites are within and surrounding the study area, and their legal and cultural status. The search of HCWA and City of Fremantle Municipal Inventory was made using the keywords Rocky Bay, North Fremantle and Swan River.

Sunken historic vessels are known within Rocky Bay. A search of the WAMM Maritime Archaeology Databases Search (MADS) was made using the keywords Rocky Bay, Swan River, Point Roe and Point Direction. A search MAAWA's Swan River paper files was also undertaken.

A search for Indigenous heritage sites was made using the DIA online Aboriginal Heritage Inquiry System (AHIS). This system allows a search to be undertaken for sites within user defined spatial polygon. Indigenous sites are protected under the *Aboriginal Heritage Act 1972-1980*, and it is an offense to disturb any site without prior approval from the Minister. In some instances it is culturally insensitive to visit particular sites, especially those relating to Dreamtime stories without permission of the Traditional Owners.

3.2 Aerial Imagery

Three sources of aerial imagery were used in this project – present day aerial photos from the Western Australian Department of Land Administration (DOLA), historical aerial photos, and web-based imagery through the programs Google Earth, Nearmap (www.nearmap.com.au) and the City Of Fremantle's online map viewer IntraMap. Nearmap has the advantage of providing high resolution, geo-referenced photography of the Perth metropolitan area indexed by date.

Historic photographs were examined for structural features or buildings that were present along the water's edge of Rocky Bay but do not exist today. The photographs were digitised and then geo-referenced using the GIS program Manifold (see below) so they could be overlaid and compared with each other, and with modern aerial images. The spatial locations of identified features were used in the terrestrial and intertidal zone surveys, and for the survey of any submerged features. The dates of the photographs used were verified either from the website from which they were obtained or, in the case of printed aerial photography, from the printed dates found along the margin of the photograph.

3.3 Terrestrial Survey

A terrestrial survey of Rocky Bay was undertaken to physically search and identify cultural remains on the shore and the intertidal zone, and record these and any other cultural remains. A 2009 MAAWA inspection of Rocky Bay conducted in 2009 found a small cave, a concrete platform and an associated tunnel above the high water mark, as well as material visible in the shallow waters.

The north-western part of the bay consists of water over 1m deep alongside vertical cliffs. This area was not be included in the terrestrial survey. The terrestrial survey of the south-western part was surveyed using opportunistic examination of shallow water where access can be obtained from the narrow track of land at the base of the limestone cliffs. Shallow water areas are separated by water over a metre deep.

A meandering pedestrian survey was conducted along the northern embankment at low tide between the northwest corner of the bay and Milo Beach. At this time approximately two metres of the shoreline is exposed. Cultural material may also be visible in the shallow water for another three metres before being totally obscured by the water. The maximum depth at this time is estimated to be half a metre.

A pedestrian survey of the area between Milo Beach and the Minim Cove Jetty was also undertaken at low tide, however at this time no dry land is present and water depth is reduced to approximately thirty centimetres.

Two types of mapping-grade, hand-held Geographical Positioning System (GPS) receivers were used during the fieldwork component of this project - the Garmin GPS76CSx for general point taking, and the Garmin Oregon 550 which contains an internal digital camera for geo-referenced photographs. These units have a recognised error of ± 5m. A single waypoint was taken for either a single artefact of for a cluster of several artefacts

in a single location. All information relating to individual waypoints is listed in an Excel spreadsheet for further analysis and for presentation within this thesis as Appendix F. Data fields include:

- ✓ Unique Identifier
- ✓ Easting and Northing
- ✓ Description
- ✓ Raw material type (metal, concrete, brick, limestone and wood),
- ✓ Associated site or feature if relevant, and
- ✓ Function (construction material for site, industrial by-product, industrial discard, or other).

3.4 Geographical Information System (GIS)

The GIS program Manifold (Ver. 8.0.26.0 Copyright © 1993-2011) is used for the storage of all electronic waypoint information, geo-referencing of digitised maps and plans, and for interpretation of information collected from the field.

Waypoint data was downloaded from the GPS units in Garmin format (.gdb). This file type was then converted into a shape file (.shp) via an intermediate program called Ozi-Explorer. The spatial distribution of all artefacts and features collected during fieldwork was plotted and viewed over a backdrop of geo-referenced historical map, photographs and modern aerial images.

The coordinate system used is UTM MGA Zone 50, using the GDA94 datum and Eastings (mE) and Northings (mN). This convention was chosen over Latitude/Longitude because it is the most appropriate format for this project as most of the waypoint data generated or collected will be terrestrial points. The program Mapwel 2011 (Ver 8.1 © BALARAD)

was used to upload generated datasets into the GPS units to aid in the search for potential archaeological features.

3.5 Underwater Remote Sensing

Owing to the potential for submerged archaeological material not accessible through terrestrial survey techniques, WAMM was approached for use of their side scan sonar. The aim of the side scan survey is to identify targets on the river bed that may be related to this study. The unit is a Marine Sonic Dual Frequency side scan (150/600Khz) model. Coverage of the area between the deep water channel and the shore between Point Direction and Milo Beach was achieved with two passes across the survey area. Survey results were uploaded into the GIS and scrutinised for any regular shapes or features which may represent a submerged contact, to be examined during the underwater survey.

3.6 Underwater Survey

The aim of the underwater survey was to investigate targets identified from archival research and side scan survey. All targets were either dived upon from a small boat, or if the targets were located near an accessible beach, then a shore dive was undertaken. A minimum of two divers was used on every dive. All diving was conducted under the auspices of the volunteer organisation MAWAA since permissions to dive under Flinders University's dive program were not sought. Because the author is a member of MAWAA, the diving portions of this research project are more easily facilitated through this membership.

All dives undertook a non-invasive examination of targets. Cultural material was not disturbed and no material was removed from site. Notes and descriptions of material located underwater was made during dives using 'Dive Rites' underwater notebooks and A3 slates covered with drawing film. If water visibility was of sufficient clarity,

photography and video was taken. The camera to be used for this was an Otek 6.1 Mega Pixel digital camera with a waterproof housing rated to 45m. Underwater images may have need to be manipulated for the purpose of producing a mosaic picture to better show the entirety of any large underwater object. This was done using Photoshop (Version 5.5).

3.7 Oral Histories

Oral histories held at the local history collection, City of Fremantle, or from MAAWA were utilised to provide valuable insight into the areas past. No Flinders Ethics application was completed, thus the only oral history utilised in this thesis will be that found in the above-mentioned repositories.

3.8 Limitations of Data

3.8.1 Historic Photographs

Most photographs used in this project are labelled with a date range for when they were taken. In the case of aerial photography, usually a date and time is present on the image. However, the year of the earliest aerial photograph used (1939) was estimated based on the level of development of the surrounding area. Historical research shows that the naval shore establishment HMAS Leeuwin was not built until 1940. Its absence from the ca.1939 photograph indicates the image was taken prior to 1940, so for the purposes of this study, the year of this image is indicated as ca.1939. Furthermore, the appearance of features and buildings within each aerial photograph utilised differed because of the time of day the image was taken, the approach heading of the aircraft and the presence of shadows and reflection of sunlight. -Photographs obtained from the collection held at the Battye Library are usually labelled with an estimated date or date range, which may not always be accurate.

3.8.2 Side Scan Survey

The side scan survey of Rocky Bay was carried out between Point Direction and Milo Beach by the WAMM. It was not until later that a target was identified further to the east and outside this area. For this reason no side scan images were obtained for this site. While it is unlikely that other structures were present between Milo Beach and Minim Cove, it is possible that some material may have been missed.

3.8.3 Terrestrial Survey

Access to portions of the survey area was constrained owing to safety issues. The limestone cliffs of Rocky Bay are unstable, evidenced by fallen limestone blocks that line the water's edge. During the project, two large limestone boulders fell approximately ten metres from the cliffs and destroyed previously identified foundations within the survey area (Figure 12). Each boulder was the size of a small car. As a result, for public safety, the City of Fremantle closed the water's edge along the western part of the bay. For this reason the area below the cliffs was not fully examined.

The face of the northern embankment is steep (approximately 60 degrees) and covered with loose sands and leaf litter. It is fenced off from the walk paths above to prevent falls but can be accessed from the water's edge below. Attempts to climb up the embankment to inspect possible targets were problematic as the surface tended to give way. Therefore, cultural material on the embankment slope could only be observed and not properly recorded.

The survey area is regularly influenced by the tides. The western part of the northern foreshore is regularly exposed at low tide, allowing easy examination while the eastern part, being edged with a limestone seawall, is always underwater. Therefore, examination of the eastern part is recognised as not being as complete as the western part. Likewise the western side of the bay is always underwater.

Figure 12: Rockfall onto pump house foundations

3.8.4 Diving

During late 2010, dredging operations conducted by the Port of Fremantle resulted in a large amount of sediment entering the water column that was taken upstream into the Rocky Bay area by tides. This reduced water visibility to zero metres, thus preventing any meaningful visual inspection of underwater targets. After several months water visibility was at best two metres and typically only one metre. In addition to the low visibility, a fast flowing current of up to 3.0 knots was common in the deep water channel. This made recording the underwater sites difficult as equipment such as tapes and slates, as well as divers, had a tendency to be taken by the current so underwater investigations were targeted to periods of slack water.

Chapter Four - Results

The combination of archival research and fieldwork found that substantial remains still exist in Rocky Bay, both in the intertidal zone and beneath the water. Each site relates to a particular part of Rocky Bay's industrial and recreational past, and is linked to both the early development of the Swan River Colony through the riverine transport trade, as well as to one of the major development projects in Western Australian history, namely the building of the Port of Fremantle.

4.1 Previously Recorded Indigenous Sites

An examination of the DIA AHIS database found twelve previously recorded Aboriginal heritage sites surrounding Rocky Bay in the suburbs of North Fremantle, East Fremantle and Mosman Park. These sites consist of five mythological sites (Sites #3536 – Swan River; #3596 – Rocky Bay; #3776 – Indian Ocean; #21253 – Mosman Park; #22463 Mosman Bay Pinnacles), two water sources (Sites #3650 – Blackwall Reach, Bicton; #3651 Blackwall Reach, Mosman Park), four artefact scatters associated with camping sites (Sites #3335 – Macarthur Street; #3336 – Victoria Street Station; #3339 – Minim Cove; #3569 – Colonial Sugar Refinery) and one campsite (Site #3588 – Freshwater Bay) (Appendix A). Only one site, #3339 – Minim Cove, has been excavated. Archaeological excavations conducted in the 1970s by the WA Museum in the vicinity of Minim Cove and the Colonial Sugar Refinery identified artefacts in association with charcoal that was dated to ca. 10,000 Before Present (BP) (Dortch 1975). These sites all provide tangible evidence of Indigenous occupation of the area surrounding Rocky Bay and of the utilisation of the Swan River by local *Nyungar* populations over a period of millennia.

4.2 Previously Recorded Underwater sites

An examination of MADS database found two previously identified sunken vessels - *City of Perth* (ca.1900) and *Mayfield* (1945) within the study area (Figure 13; Table 1). A

further five previously recorded sunken vessels are recorded near the study area – Pt. Roe Box Barge No. 1 and Pt. Roe Box Barge No. 2 near Point Roe, and two unidentified wrecks near Point Direction (Appendix B).

Figure 13: Sunken vessels surrounding the study area (Source: Google Earth).

	Vessel	Easting (mE)	Northing (mN)	Legal Status
1	*Pt. Roe Barge #1*	384129	6456050	Not Protected (State)
2	*Pt. Roe Barge #2*	384139	6456070	Not Protected (State)
3	*City of Perth*	382655	6455616	Protected (State)
4	*Mayfield*	382665	6455625	Not Protected (State)
5	*Unidentified Wreck No. 1*	382974	6455286	Not Protected (State)
6	*Eva*	382958	6455220	Not Protected (State)
7	*Unidentified Wreck No.2*	382975	6455220	Not Protected (State)

Table 1: Underwater sites located within the study area

The remains of *City of Perth* are located next to the cliffs on the western side of Rocky Bay, lying in approximately one metre of water. Approximately 15 metres away, in six metres of water, are remains of the vessel *Mayfield* (Figure 14).

The *City of Perth* was built as a side-wheel paddle steamer in 1872 by Lawrence and Sons. The vessel was of wooden construction, carvel design with a rounded stern. It was 26.5m long, 5m across the beam, and had a draught of 1.6m, and displaced 61.2 tons (Appendix C). The hull was covered with Muntz metal sheeting. The vessel was powered by two 20 horsepower engines installed and fitted out by G. Randell and Co. (Dickson 1998:108). When launched, the vessel was commanded by ""Eve" Hines, who was also the engineer, and T. Parkinson, and the deckhands were J. Bowman and B. Whitfield" (Murray 1949:59). This vessel was later converted into a lighter and registered with the Harbour and Lights Department in 1898 (Murray 2004:6) before being abandoned ca.1900 in Rocky Bay (Parsons 1980:13).

The *Mayfield* was originally an unpowered wooden barge approximately 22m long and 5m across the beam, with at least one mast. Registered in 1899 and operated by the Swan Brewery Company, *Mayfield* was towed by the paddle steamer *Kentish Lass* and was used to transport beer from the brewery to the port where it was exchanged for raw materials such as sugar, hops and malt that were returned to the brewery (Wellborn 1987:79). The barge was bought by a ferry operator named Tilly in 1934, who installed two engines on the deck so it could operate independently. Like many such vessels, its history is relatively unknown, with its only noted task being that it carried the 6 inch armour plating to Rottnest Island for the installation of the 9.2 inch naval guns at Oliver

Hill battery (Scrimshaw 1981:5). After it sank (for reasons unknown) in Rocky Bay in 1945, the location of the wreck was marked by its topmast which was visible above the water, until this broke away.

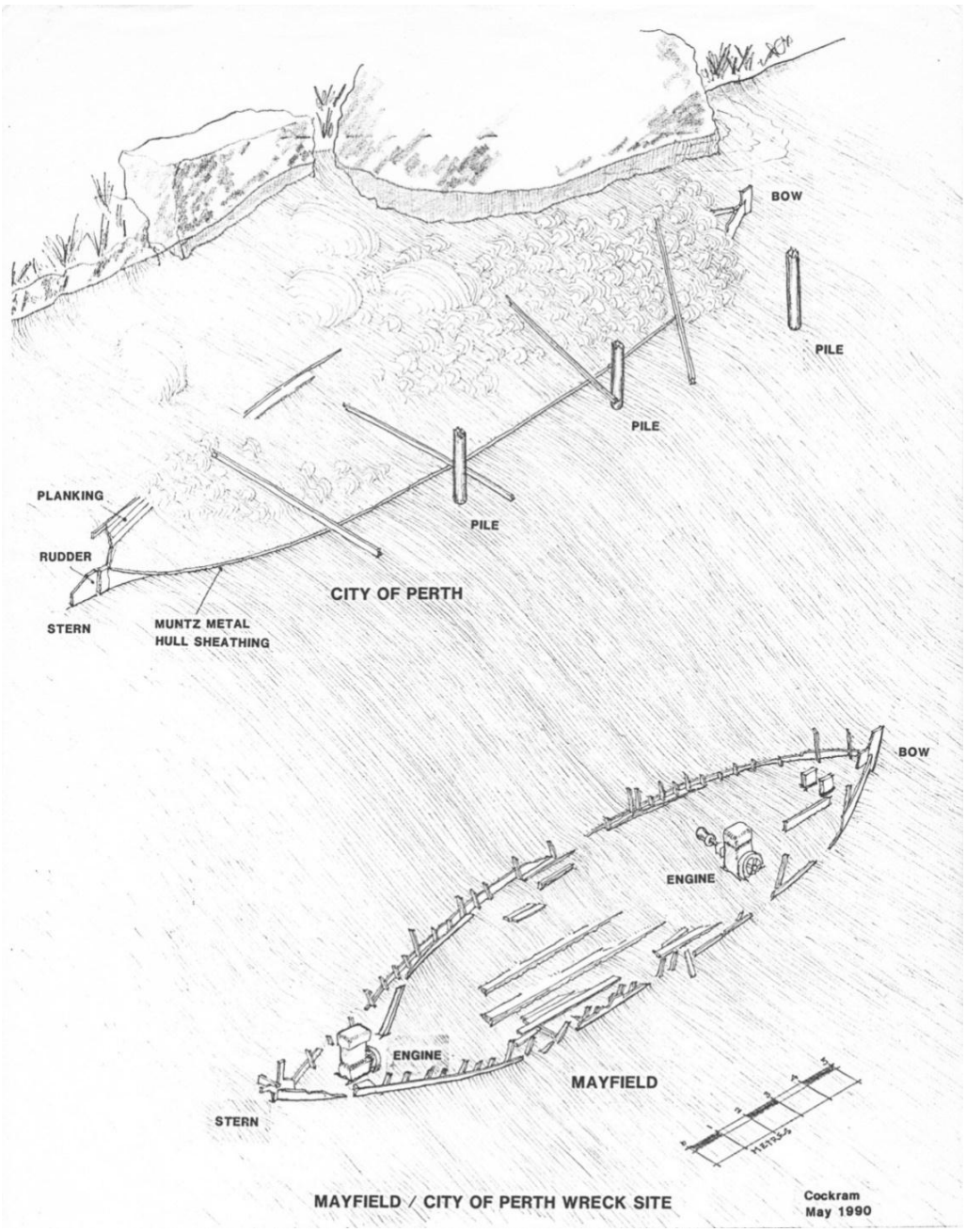

Figure 14: The remains of *City of Perth* and *Mayfield*, 1990 (Source: Cockram 1990)

The vessels were relocated in 1979 and recorded in 1980 by MAAWA divers and re-recorded by MAAWA in 1990 (Cockram 1990). In 1990, both vessels were covered with sand. *City of Perth* was also covered with limestone rubble presumably from the cliffs above. Some starboard side hull timbers were exposed, as were the stem post and the upper part of the rudder. Four segments of railway track were found lying across the vessel. *Mayfield* was found to have the tops of its frames and some hull timbers exposed. The bow and stern were identifiable, however, the rudder was missing. Some timber planks were observed lying fore and aft within the vessel. The two engines were clearly recognisable.

An inspection of these vessels in 2011 found that the appearance of both vessels had changed. The sand observed covering the wrecks in 1990 was mostly gone and a 1m wide trench was scoured around the hulls of both vessels exposing the starboard side of *City of Perth* and sides of *Mayfield*. The protective Muntz metal hull sheathing on *City of Perth* was more exposed and sections of the sheathing had started to separate from the hull. The limestone rubble across the top of the wreck was fully exposed. The rudder is clearly visible (Figure 15). Exposed sections of the hull were covered with marine growth making identification of various parts of the vessel difficult. Along the starboard side of the vessel are a number of tyres and a 200L drum, as well as a number of modern bottles across the site.

The remains of *City of Perth* are visible in modern aerial photography but only when the sun is at the correct angle and the water is clear. An examination of older black and white photography did not find any trace of this vessel. An image from Nearmap.com.au, dated 02 July 2009, shows the outline of the vessel clearly (Figure 16). *Mayfield*, located in the deeper water, is not visible.

Figure 15: Rudder of the *City of Perth*

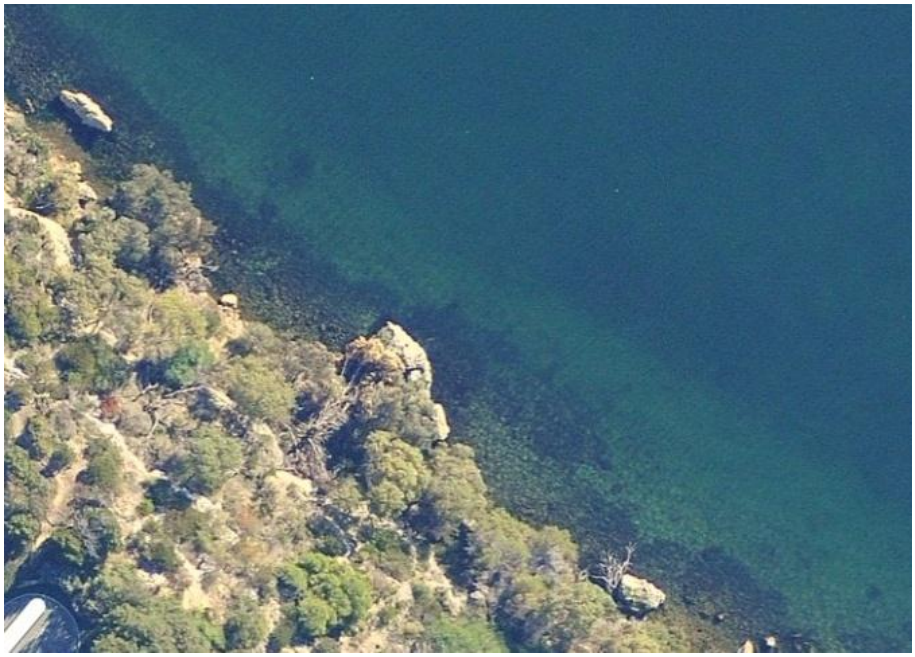

Figure 16: Remains of *City of Perth*, 02 July 2009 (Source: Nearmap)

The wooden hull and engines of *Mayfield* are covered with marine growth. The sand that once covered the vessel is gone exposing many of the deck timbers. The fore and aft timbers observed in 1990 are still in place and beams located beneath these are now visible. The timber decking on which the forward engine is mounted is also exposed and displays signs of damage by marine borers. The bow is now fully exposed, clearly highlighting the triangular configuration of the forward deck timbers (Figure 17).

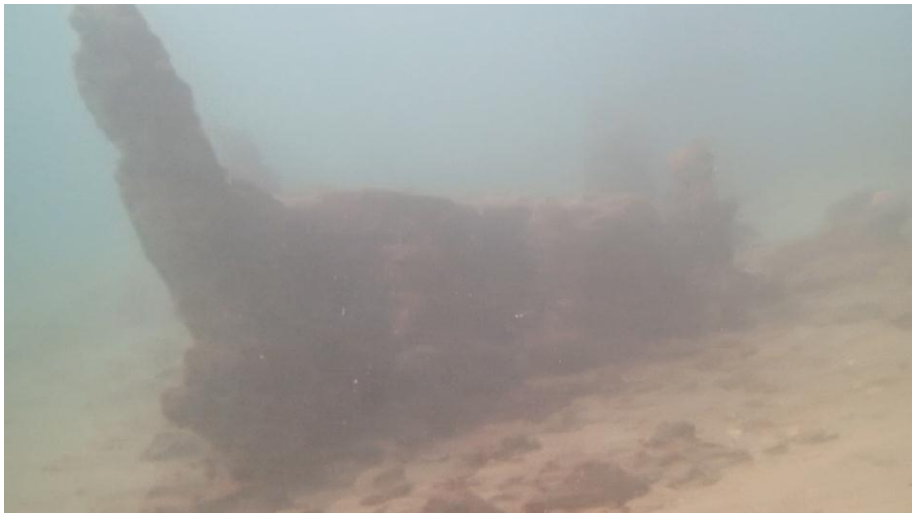

Figure 17: Port side of *Mayfield* bow

Immediately adjacent to *City of Perth* are the remains of two large Jarrah (*Eucalyptus marginate*) piles that once stood high out of the water but are now found below the surface. Originally two of four piles, these have been in place for at least 90 years (see Figure 2). In 1970 three of the piles were still upright, supported by lengths of rail track (Figure 18). A board leading into the water in Figure 18 suggests that one pile collapsed. In 2011 the piles are no longer visible above the water. Of the two piles located during the undewater inspection, one is relatively intact and stands approximately two metres above the riverbed (Figure 19). The other is severly degraded and stands only half a metre above the riverbed. The tracks shown in Figure 18 are presumably those now located across the *City of Perth* wreck.

Examination of the side scan imagery shows both vessels clearly (Figure 20). *City of Perth* is obscured, however the hard edge of the starboard side of the vessel is clear. The outline of *Mayfield* is quite clear. The two engines illustrated in Figure 14 can be seen, as can the stern of the vessel. The northern-most pile also illustrated in Figure 14 is clear, however, the others are not. The hard line near the port side of *City of Perth* is a large limestone boulder.

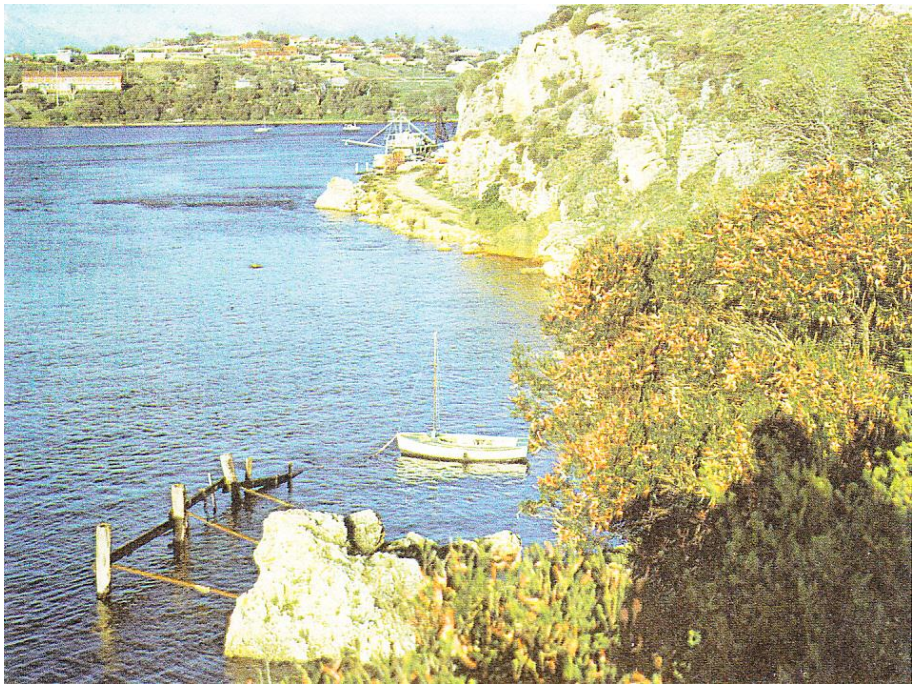

Figure 18: Piles in Rocky Bay, 1970 (Source: Seddon 1970:47)

Figure 19: Remains of pile adjacent *City of Perth*

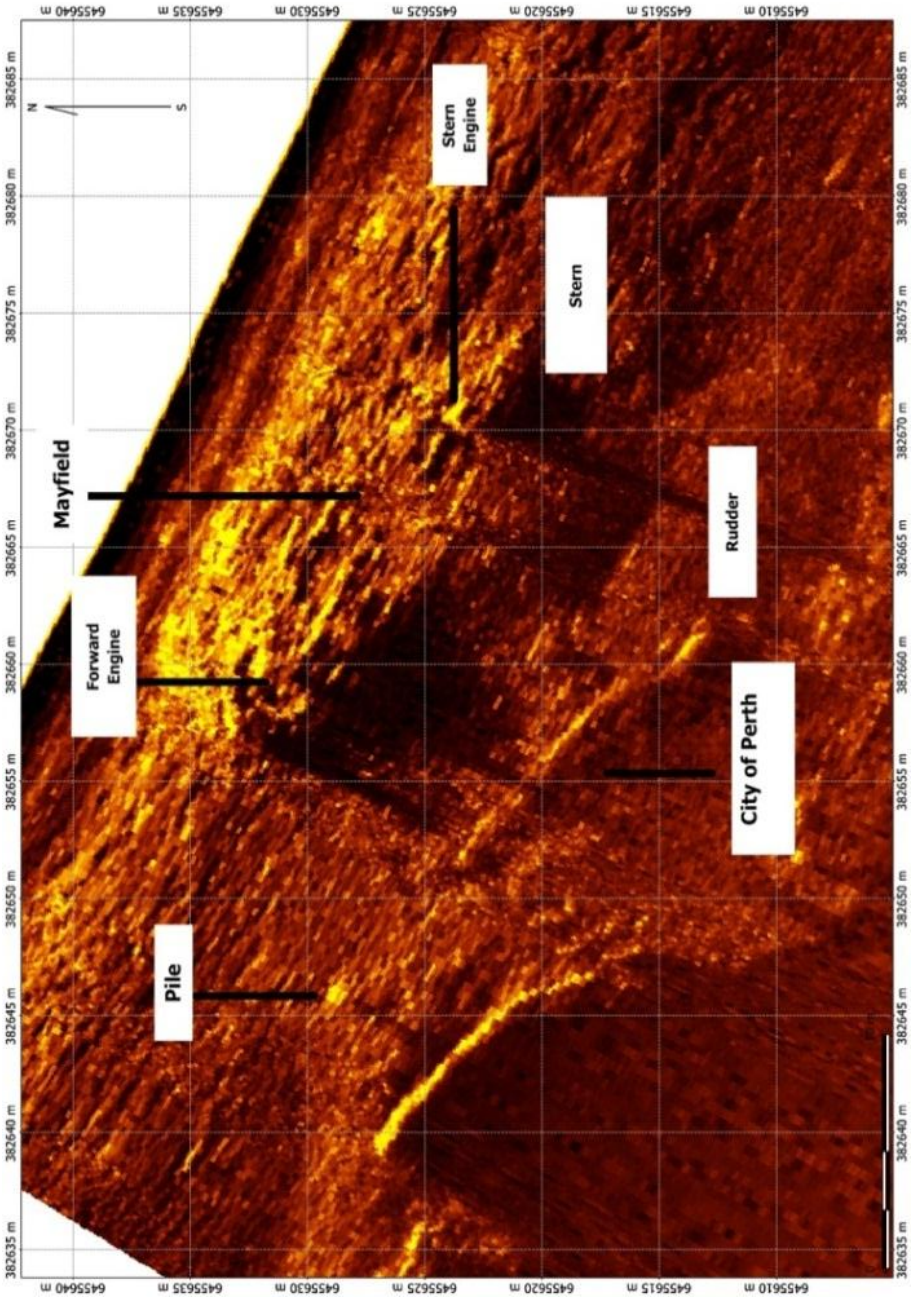

Figure 20: Side scan image of *City of Perth* and *Mayfield* (Source: WAMM)

4.3 Historic Maps and Plans

The search of archival records held at the SRO found several historic maps and PWD plans that featured Rocky Bay. These plans showed both proposed projects that were not carried out and projects that were undertaken and completed. These include:

- a proposed 1874 canal works for the construction of a deep water access point within Rocky Bay to the Swan River,
- 1890s development of the Rocky Bay Quarry,
- 1894 depth soundings of Rocky Bay,
- the rail network leading to the SEW and Mt Lyell Chemicals,
- a proposed water pumping station relating to the Mt Lyell Chemical Works dating to 1920, and
- 1917 stormwater drainage to the Swan River.

4.3.1 The Proposed Canal

PWD Plan 1426 (Figure 21) relates to an 1874 proposal for a canal through the limestone bedrock between Rocky Bay and the Indian Ocean that would have allowed deep water access to the Swan River. The plans indicate the intended orientation of the canal and the possible construction alternatives (cribwork, rubble stone or concrete blocks) for two protective breakwaters (Figure 22).

If this plan had been undertaken it would have dramatically changed the landscape of the area. North Fremantle would have become an island supporting a maritime port, and larger vessels would have had access to the deep water channel of the Swan River, by passing established traffic and pedestrian bridges, which could have led to the development of larger wharves and jetties closer to Perth.

4.3.2 The Rocky Bay Quarry and the Port of Fremantle

PWD plans relating to the construction of the Port of Fremantle provide valuable insight to the physical environment of Rocky Bay prior to and during to the 1890s. PWD Plan 2034 was produced in 1890, prior to the commencement of the harbour works (Figure 23). It is a topographic survey map of the Seven Sisters formation produced to ascertain

the quantities of limestone available at Rocky Bay for the construction of the port. PWD 2034 plan also shows the original shoreline of the bay (Figure 24).

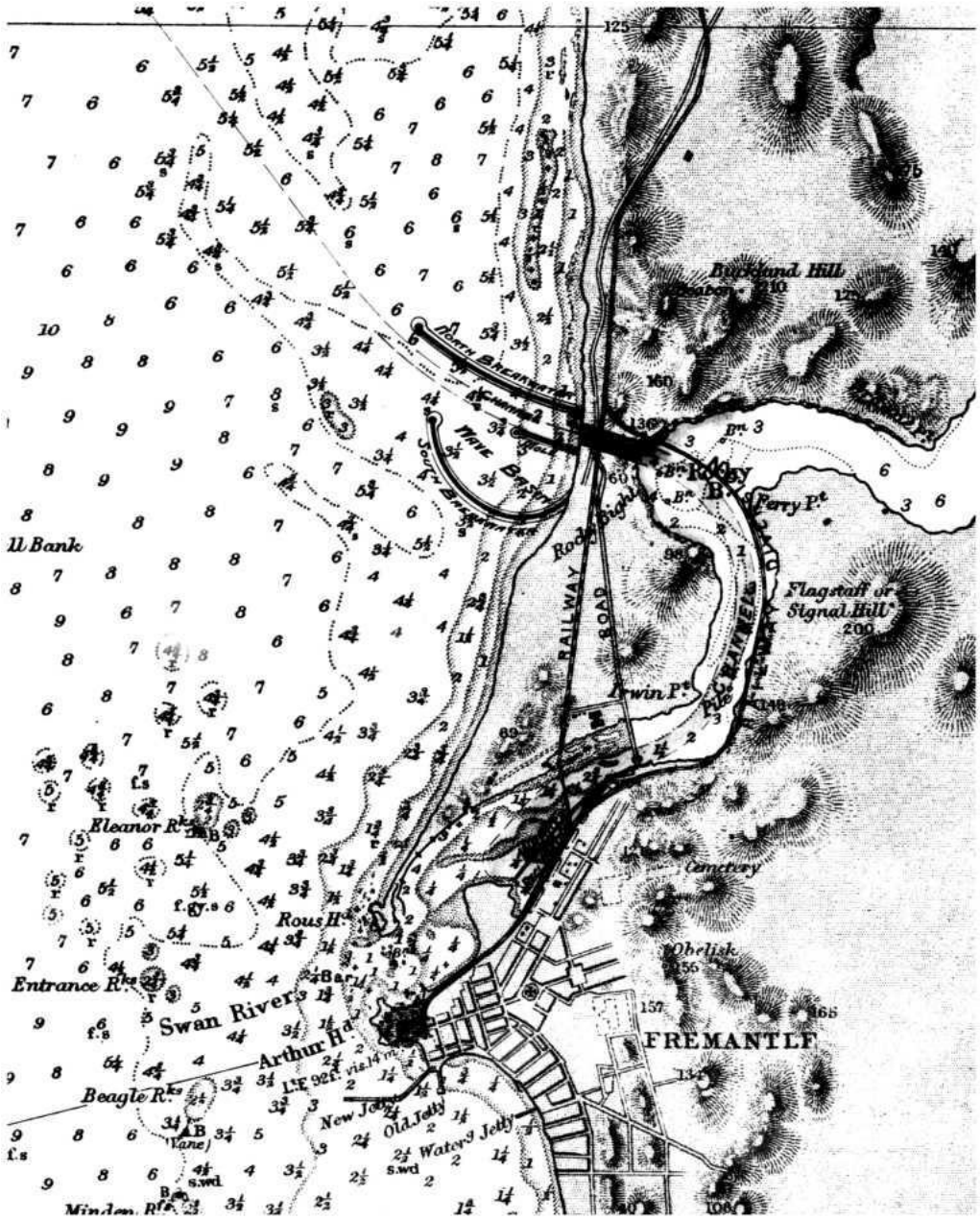

Figure 21: Close up of the proposed 1974 canal from the Indian Ocean to Rocky Bay (Source PWD 1426, State Records Office).

PWD Plan 3801 contains plans 3702, 3712, 3729. PWD Plan 3702 is a simple plan of Rocky Bay produced in 1895, three years after the commencement of quarrying, and was the base map for information given in PWD Plans 3712, 3729 and 3801. PWD Plan 3712

details depth soundings within Rocky Bay, and these soundings are represented as cross-sections of the river bed as detailed in PWD Plan 3729.

Quarrying at Rocky Bay commenced ca. 1893. From the outset, limestone detritus was pushed into the river. The emerging level platform against the river's edge became the foundations of the initial rail bed used to take the limestone out of the quarry (Figure 25). As quarrying continued limestone rubble was continually deposited into the river. In 1895, concerns were raised about the narrowing of the deep water channel in Rocky Bay as a direct result of the dumping of limestone detritus from the quarry (*WM*, 02 August 1895). A report was commissioned for the Legislative Assembly to discuss the rapid filling of the channel (Western Australian Parliament 1895).

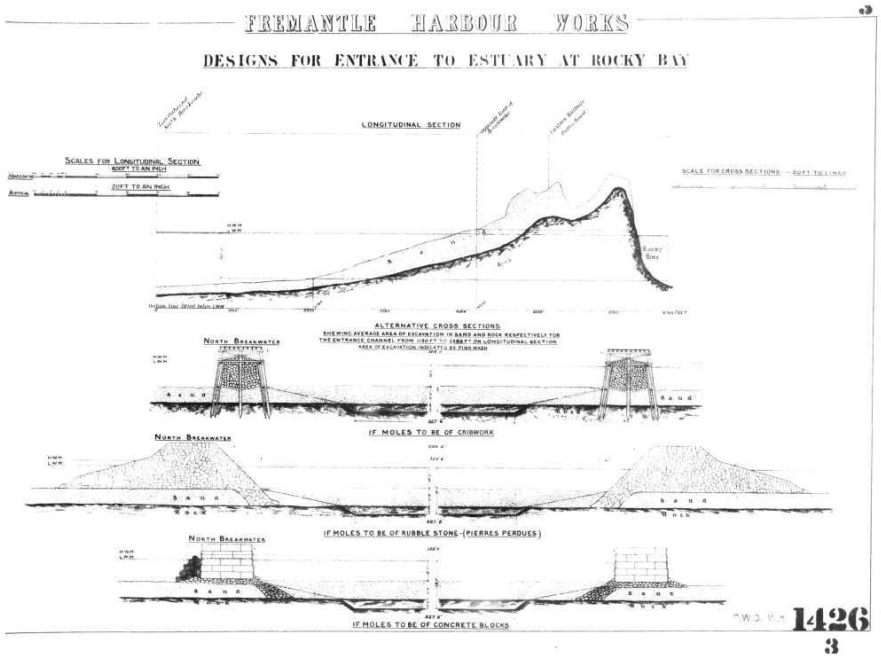

Figure 22: Proposed breakwater designs and cross-section from Indian Ocean to Rocky Bay (Source PWD plan 1426, State Records Office)

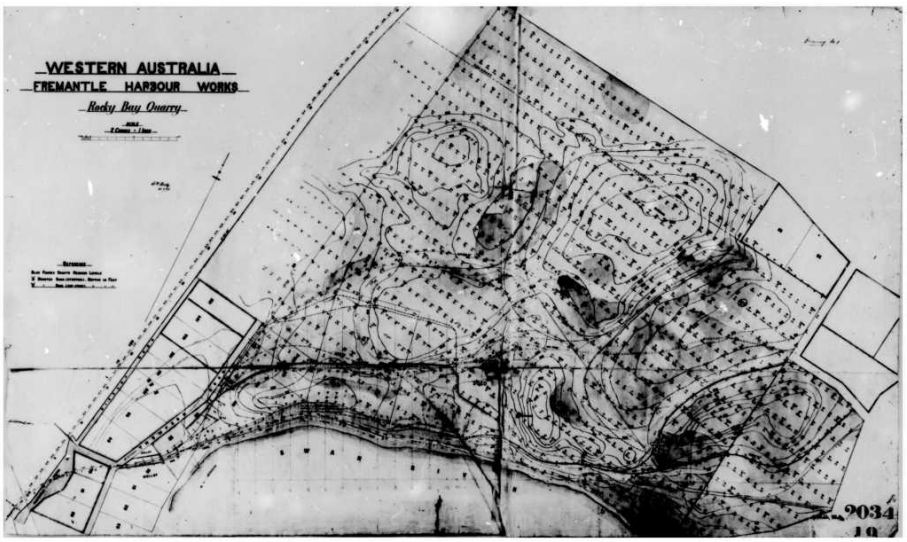

Figure 23: Topographic survey of Rocky Bay, 1892 (Source PWD 2034, State Records Office).

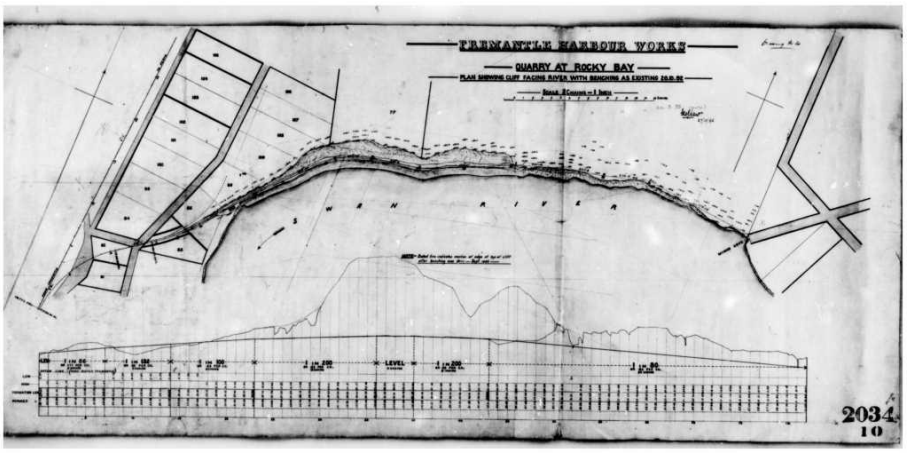

Figure 24: Original shoreline of Rocky Bay, 1892 (Source PWD 2034, State Records Office).

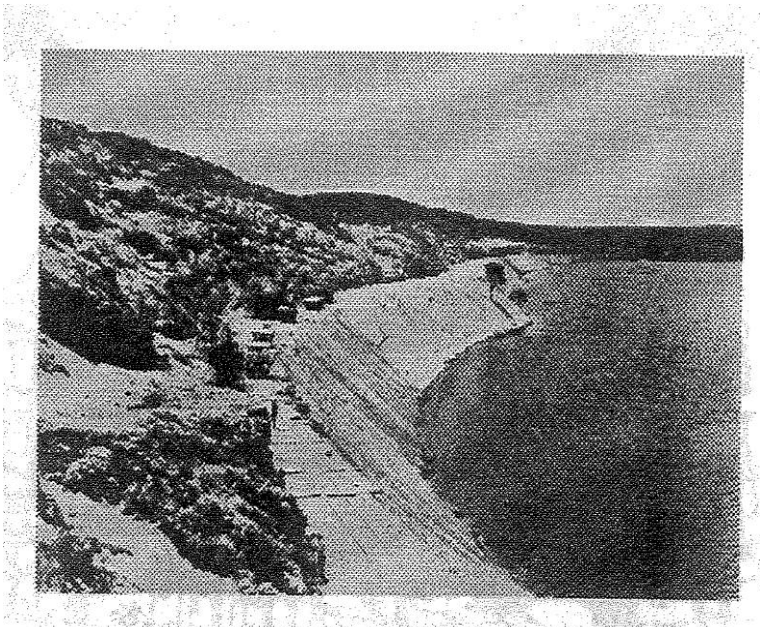

Figure 25: Commencement of the Rocky Bay Quarry ca.1892 looking east (Source NFCMCHP 1992)

The report found that the deep water channel was in danger of becoming too narrow for vessels to navigate safely and, from that time, the practice of dumping into the river ceased. A trace of the 1892 shoreline set over a modern day photograph of the bay demonstrates that the northern side of the channel was filled in by a distance of 70 metres (Figure 26). A survey of the river conducted by Commander L.S. Dawson RN between December 1895 and May 1896 found that since the commencement of the quarry works, the original "inward curve" of the bay no longer existed, and where the depth of the channel was originally "five fathoms" (9.1m) it was now only 18 feet (5.4m) against the new shoreline (*TWA* 02 April 1896). PWD Plan 3712, dated July 1895, illustrates through soundings and cross sections that the western part of the bay maintained its depth but the areas adjacent to the quarry are severely encroached upon. Comparison between the 1892 and modern shorelines indicates the shoreline in the eastern part of the bay was not affected.

Figure 26: Trace of 1892 shoreline, taken from PWD Plan 2034 and set against a modern photo of Rocky Bay (Source: DOLA).

The deep-water channel in Rocky Bay was dredged in the 1960s, increasing its depth to greater than eight metres. The spoil was used to reclaim land further downstream. The creation of a new channel through the shallows on the southern side of the river in the 1970s saw the deposition of spoil back into the channel, reducing the depth to 5m. Spoil was also deposited on the southern shore, creating a new area that became the location for recreational grounds and a yacht club (PWD 1978:9-10).

4.3.4 SEW/Mt Lyell Chemicals Rail Network

The SEW and Mt Lyell Chemicals factories inherited the advantage of an established rail network leading into the site. PWD Plan 14976, dated to 1913, outlines the position of SEW tracks as well as the track leading into Mt Lyell Chemicals (Figure 27). These plans indicate that originally four rail lines was utilised by the SEW.

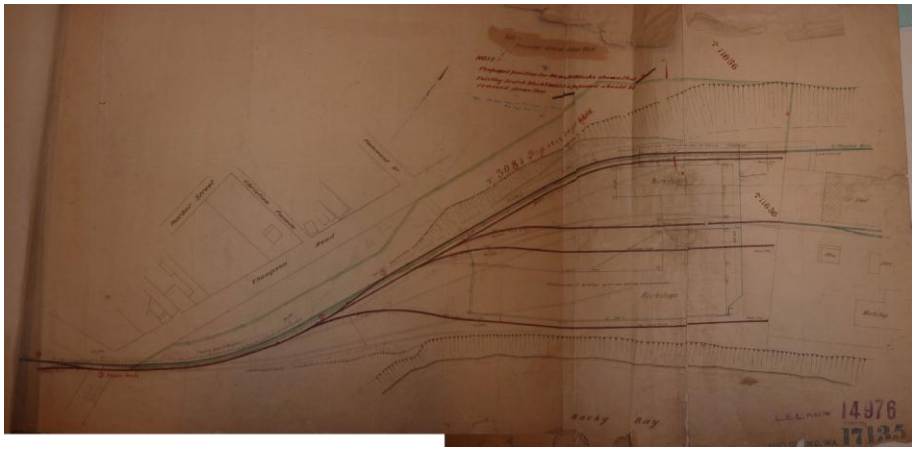

Figure 27: Route of SEW rail lines

PWD Plan 14584 indicates the course of the rail line through the Mt. Lyell Chemical property (Figure 28). Combined, these plans demonstrate the importance of the rail line to the operations of both factories for the movement of goods to and from the site.

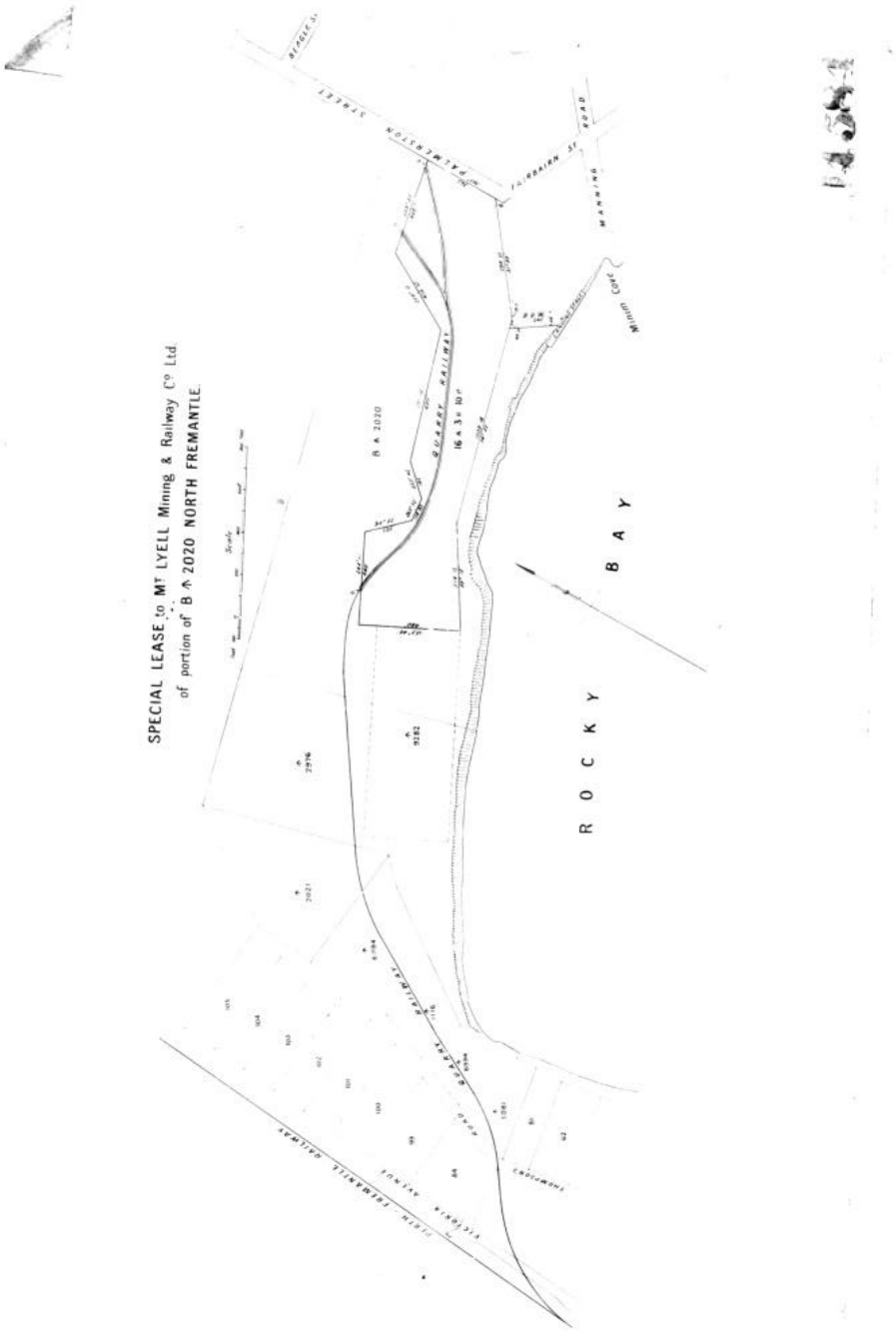

Figure 28: Route of Mt Lyell Chemicals rail lines

4.3.5 1920 Pumping Station

PWD Plan 14584 indicates a pumping station was proposed to be located on the shore of the Swan River below the Mt Lyell Chemical plant for the purpose of pumping water from the river to the plant. These plans (Figure 29 and Figure 30) show a building

approximately six metres high and four and half metres square with an angled roof, built upon a limestone base within the waters of the river. A jetty extends out of the building into the river. Intake pipes extend up from the water and onto the jetty, then into the pump house. The pipes then extend up the embankment to the factory. An arrangement of machinery is portrayed in the building. The fabric of the building is not indicated.

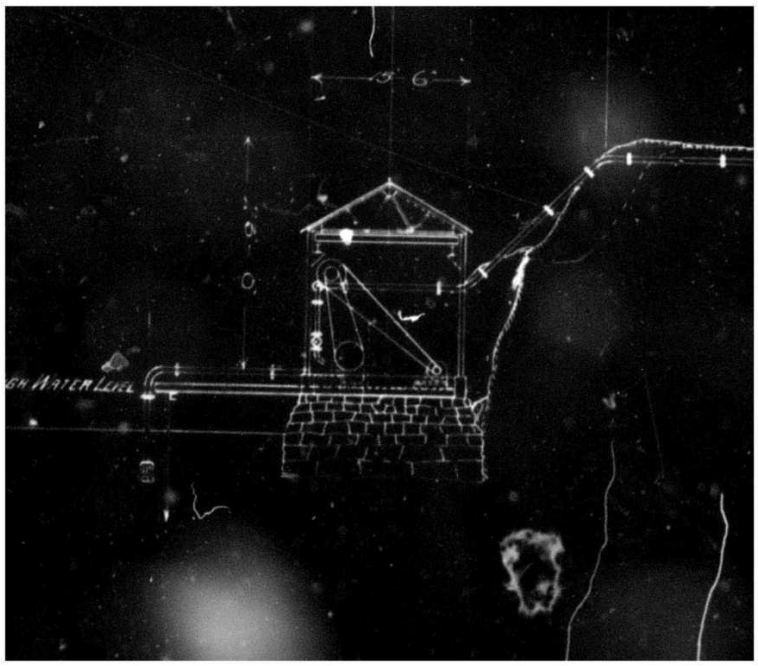

Figure 29: Side view of the proposed Mt Lyell Pumping Station, 1920 (Source PWD 14584).

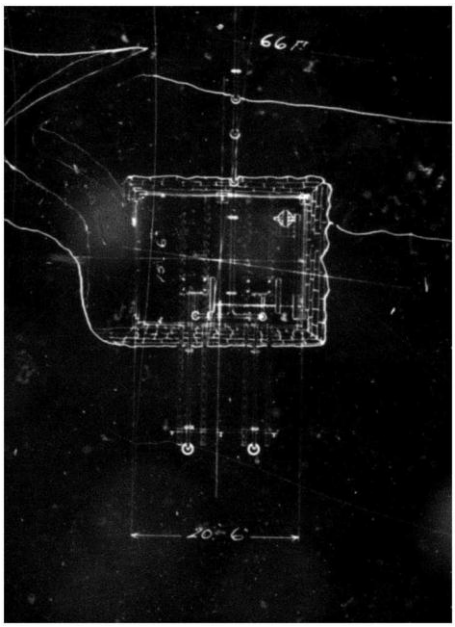

Figure 30: Top down view of the proposed Mt Lyell Pumping Station, 1920 (Source PWD 14584).

4.3.6 1917 Drainage Tunnel

On the western side of the bay a drainage tunnel was built from Thompson Street into the river. PWD Plan 16073 indicates the tunnel was designed to be three feet (0.9m) wide, five foot six inches (1.65m) high with an arched ceiling (Figure 31). The floor was made of poured concrete that dipped in the centre. The tunnel was to be four hundred and seven feet (123.3m) long with a fall of 1m in every 3.56m. The tunnel opened onto an open cut section of the cliff with a cement apron. A copy of the plans stating that the project was completed indicates the ceiling of the tunnel may have been squared and supported by a wooden frame.

Whether this tunnel still exists is unknown as it may have been filled during the remedial works on the SEW site. The author recalls seeing the outlet for this tunnel during the early 1980s. The outlet of the tunnel then was sealed with a metal door. Today the outlet apron has either been removed or buried as no sign of it is visible.

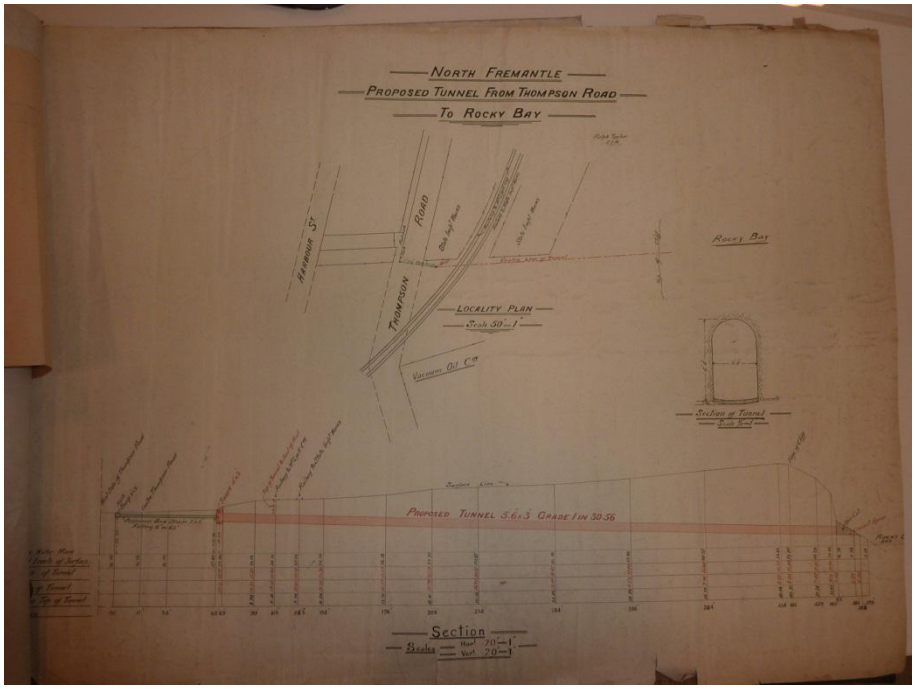

Figure 31: Plans of drainage tunnel leading from Thompson Road to Rocky bay. (Source: PWD plan 16703, State Records Office)

4.4 Photography and Aerial Imagery

An inspection of aerial photography from the past seventy years identified several structures of interest within the survey area. Aerial photographs used in this thesis date from the late 1930s to 2011.

Aerial imagery is enhanced when combined with other historical photographs taken during the same period. Photographs retrieved from the Battye Library, WAMM and published sources give valuable insight into the nature of some of the sites identified during this project. Each structure or 'site' identified from the aerial images was assigned an arbitrary site name (Table 2). The results of the aerial image research are presented below as part of specific site descriptions.

Rocky Bay Aerial Imagery Targets				
Site Name	**Description**	**Easting (mE)**	**Northing (mN)**	**Source**
Mt Lyell Pumping Station	Building on shoreline	383230	6456425	1949, 1959, 1963 image
Mt Lyell Jetty	Building on shoreline	382911	6456276	1949, 1959, 1963 image
Mt Lyell Stairs	Stairs	382848	6456253	1959
Slipway	Building & timbers	382688	6456177	1959, 1963 image
City of Perth	Submerged wreck	382660	6455616	Nearmap
Pt Direction Barges	Barges	382925	6455521	ca. 1939 Image
Pt Direction Slipways	Slipways in operation	382928	6455455	ca. 1939 Image
Pt Direction Slipways	Abandoned slipways	382928	6455455	Nearmap

Table 2: Sites identified from aerial photography

In addition to these potential sites, several small jetties or wooden platforms were seen along the western shore. These are believed to have been small, temporary, makeshift structures.

4.5 Side Scan Results

A side scan survey of Rocky Bay, between Point Direction (382880mE, 6455560mN) and Milo Beach (383050mE, 6456335mN), was undertaken by the WAMM in December 2010 (Figure 32). Fifteen distinct targets were identified for underwater inspection (Table 3). Some of these targets, such as the remains of *City of Perth* and *Mayfield*, were already known. Several attempts were made to identify each of the unknown targets. In some cases no physical feature or cultural features were located in the general position of the target. This could result from the target being a reflection off an unobserved passing vessel during the side scan run, or smaller targets may have been missed during the search phase due to poor visibility. The side scan images of the fifteen targets can be found in Appendix E.

Figure 32: Side scan coverage of Rocky Bay

No.	Description based on side scan image	Actual Identification
1	1m diameter object	Nil found
2	2.5 x 3.8m rectangular object	Nil found
3	2 x 5m objects in line on NW-SE axis	Limestone blocks
4	Sunken vessel *City of Perth*	Sunken vessel City of Perth
5	Sunken vessel *Mayfield*	Sunken vessel *Mayfield*
6	Circular object 33m east of *Mayfield*	Large tractor tyre
7	20m long shape	Limestone ledge
8	Object - gives off shadow on side scan	Nil found
9	Unknown shape maybe 6m in length	Nil found
10	Large object may be boat hull reflection off passing vessel	Nil found
11	4m barrel shape	Large limestone block from cliff face
12	Shadow near shore	Nil found
13	Regular tube shape object 10m long and bent	Overlapping sections of railway track
14	Small shape about 1m	Nil found
15	Clutter below hard straight contacts	Construction steel and general metal debris

Table 3: Results of search for targets generated from Side Scan survey.

4.6 Terrestrial Survey

The terrestrial survey consisted of pedestrian walks between Point Direction and the Minim Cove Jetty. The survey focused on targets identified from the aerial imagery search, the side scan results and historical background research. The most obvious feature within the bay is the artificial embankment that forms the northern shore and is the remains of the Rocky Bay Quarry. The embankment is made of compacted limestone rubble and sands. Efforts to stabilise the slope were evident through the placement of limestone boulders along the base and the planting of trees that now form thick foliage along the foreshore. In several places along the embankment, evidence of past

structures or discarded material can be seen in the form of concrete blocks, bricks, iron sheeting and iron rods protruding out of the bank. These rods may have been part of earlier attempts to stabilise the slope. Most are corroded and covered with vines or small shrubs (Figure 33).

Figure 33: Plant growth covering stabilising rods and building rubble.

The physical remains of the Mt Lyell Pumping Station, Mt Lyell Jetty, Mt Lyell Stairs, the 1942 Slipway and Side Scan Target 13 were located during the survey. In addition, a small cave was located in the northwest corner of the bay. The previously known site of the soap factory pumping house was also inspected. These sites are all discussed in more detail below.

The search of the intertidal zone found a variety of cultural material. A total of 118 waypoints were taken during the terrestrial search (Figure 34). The majority of artefacts located were either iron or steel. The most prominent iron artefacts were sections of

railway track (Figure 35). These were found against the base of the embankment, protruding out of the embankment, or lying in the shallows. The second main category of iron artefact was manufactured materials such as pipes, thick metal rings or hoops, drums (Figure 36), circular flat plates, cylinders, rectangular blocks, and amorphous pieces (Figure 37).

Many artefacts observed appeared to cluster in the vicinity of the slipway feature identified in the aerial imagery. The artefacts may be associated with the construction of the steel barges mentioned above suggesting that this is the SSY slipway. Alternatively the material may have originated from the SEW which occupied the land immediately above the slipway. This becomes more apparent when the waypoint data is seen against a backdrop of the factories (Figure 38).

Additional manufactured iron material found is described as miscellaneous fragments and fasteners. Many of the numerous iron pieces located were corroded and broken. Many could be identified as bolts, while others were fragments of hoops or bands (Figure 39). The majority, however, could only be described as rusted fragments. At eight locations, artefacts consisted of both iron and brick pieces and were assessed as remains of the building(s) that were once on the limestone platform above.

Figure 34: Waypoint data of terrestrial survey.

Figure 35: Railway track found at base of embankment (Waypoint 16 - 382803mE 6456233mN)

Figure 36: Drum in shallows

Figure 37: Miscellaneous metal objects

Figure 38: Waypoint data set against 1959 backdrop

The more readily identified artefacts were red bricks, found as rubble, isolated whole bricks or as part of a brick construction (Figure 40). These were easily seen against the yellow limestone sands.

Remaining artefacts are identified as concrete pieces, concrete combined with iron posts (presumably sign posts discarded from above), tyres, fibreboard (Figure 41), and dressed limestone blocks (Figure 42).

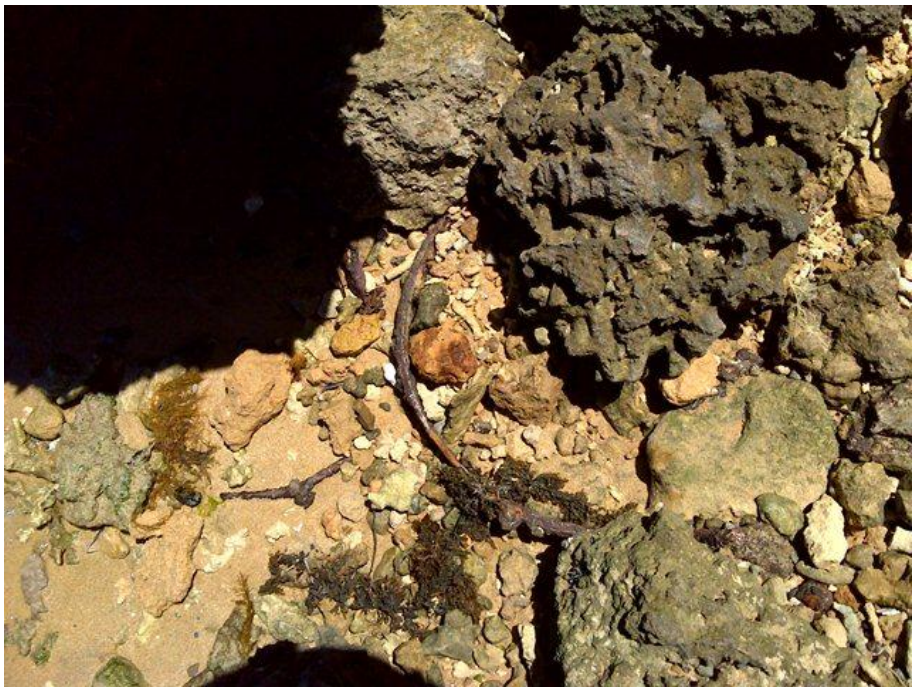

Figure 39: Rusted 'hoop' (382937mE 6456287mN)

Figure 40: Brick rubble (382844mE 6456247mN)

Figure 41: Fibreboard sheeting (382922mE 6456281mN)

Figure 42: Fragment of dressed limestone (383009mE 6456333mN)

4.8 Specific Sites

Ten specific sites were investigated during the terrestrial survey based on the use of archival data, historical photography and side scan data (Figure 43,Table 4). These are described below.

Figure 43: Location of Archaeological Sites in Rocky Bay (Source: DOLA)

Site ID	Site Name	Easting (mE)	Northing (mN)
1	Mt Lyell Pumping Station	383230	6456425
2	Mt Lyell Jetty	382911	6456276
3	Mt Lyell Stairs	382848	6456253
4	1942 SSY Slipway	382688	6456177
5	Meteor Cave	382454	6455726
6	Burford Pumping Station and Tunnel	382528	6455726
7	*City of Perth*	382660	6455616
8	*Mayfield*	382674	6455624
9	Ship Breaking Point	382766	6455582
10	Mt Direction Slipway and Barges	382934	6455462

Table 4: Positions of Rocky bay archaeological sites

4.8.1 Mt Lyell Pumping Station

Aerial photography shows this to have been a jetty and building at the base of the embankment. The building appears to be wider than the jetty, suggesting it could be the main structure from which the jetty extends rather than the building being built upon the jetty (Figure 44).

Figure 44: 1959 image of Mt Lyell Pumping Station (WA 534 Z Metro Regional Run 26 (39-79) 3750' 6" Jun 1959 26/77)

After geo-referencing the aerial images, the position of the structure was determined and inspected during the terrestrial survey. The area surrounding this location is fully landscaped and no obvious remnants of the structure are visible above the water. A sea wall has been created with rough limestone boulders to stabilise the embankment at the water's edge. In the shallows a number of limestone blocks were observed (Figure 45). These covered an area of 14 metres (E-W) by 4.5 metres (N-S) and are presumably the remains of the foundations. This is larger than the estimated five metres square base

shown in the plans, but may be evidence of how the building was demolished. Within the rubble, metal pipework, lengths of six inch angle iron and railway track were located.

Figure 45: Remnant limestone foundations of the Mt Lyell Pumping Station

Immediately adjacent the foundations the river deepens. An underwater inspection of the site found limestone and building debris which continued to the depth of five metres (Figure 46). Building materials observed included red bricks, structural iron and railway track (Figure 47), metal pipework (Figure 48), a rail cart axle and wheels (Figure 49), tyres and green bottles. The site appears to be undisturbed. Marine growth was present on all artefacts across the site but did not obscure basic identification of objects.

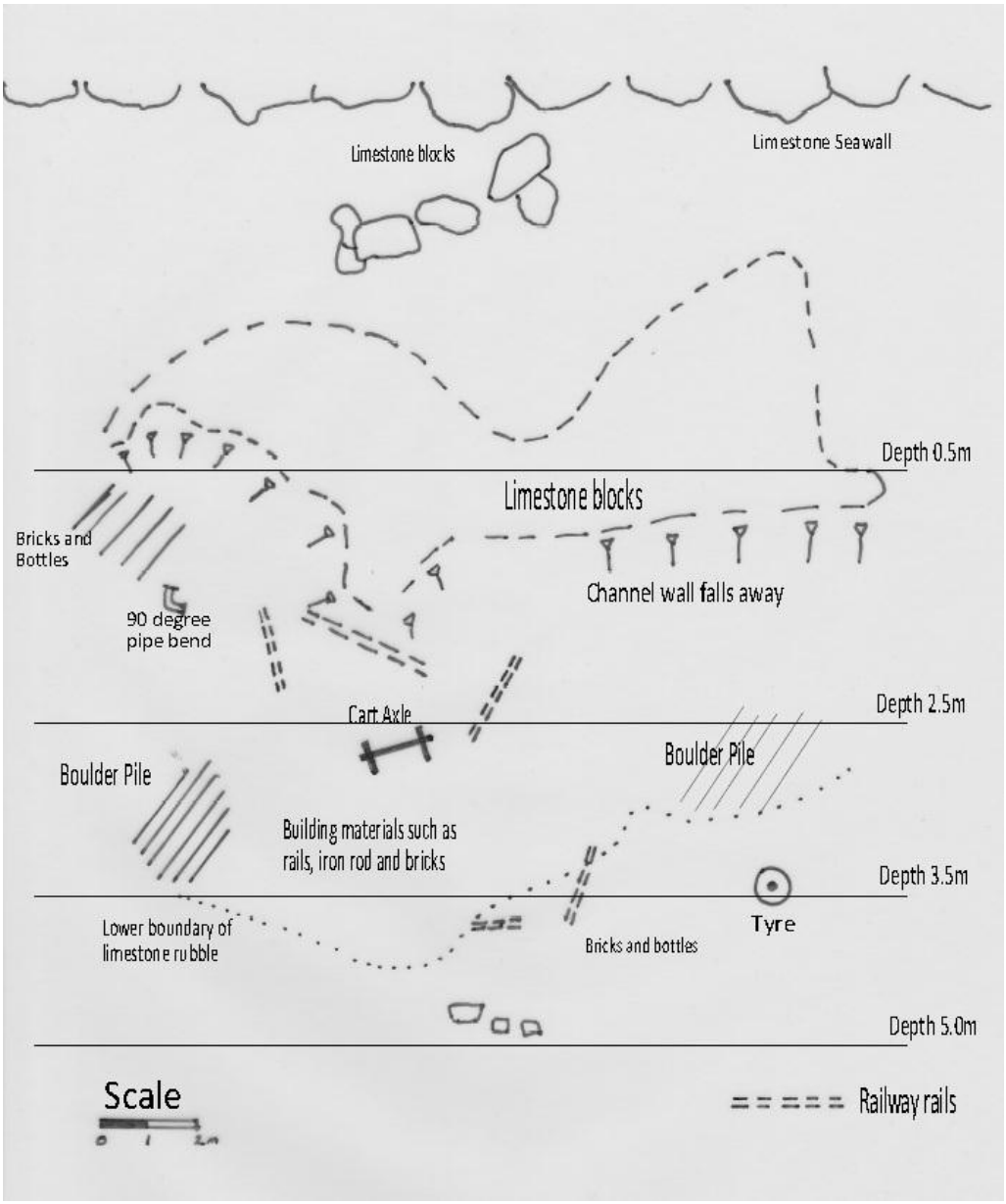

Figure 46: Site plan of Mt Lyell Pumping Station

Figure 47: Example of structural iron present on site

Figure 48: 90 Degree pipe angle with intact flanges

Figure 49: Railway cart axle

4.8.2 Mt Lyell Jetty

Historic imagery (Figure 50) shows a building similar to the Mt Lyell Pumping Station adjacent to the embankment. This building may have had a similar function of supplying water to the superphosphate plant above it. No plans were found for this site. Without a clear indication for its purpose this structure was simply called Mt Lyell Jetty.

Figure 50: Mt Lyell Jetty (WA 534 Z Metro Regional Run 26 (39-79) 3750’ 6” Jun 1959 26/77)

A terrestrial inspection of this location found the remnants of a limestone retaining wall (Figure 51). Erosion of the soil behind the wall revealed two concrete filled, 200L drums set one atop the other supporting the wall. In front of the wall are the foundations of a separate related structure (Figure 52). Two types of concrete formwork are present. Within the formwork are the stumps of rail tracks that were cut off at ground level.

An investigation of the shallows at this location found two large pipes (≈50cm diameter) extending out from the side of the channel wall (Figure 53). The pipes are set on converging angles and concrete formwork was observed on the channel wall. These do not appear to be for water transport but may have had a structural function, perhaps as legs for the jetty. Some small iron rods were also located in this area. The maximum depth at this location was six metres, and visibility was generally poor, being less than one metre.

Figure 51: Limestone wall of Mt Lyell Jetty

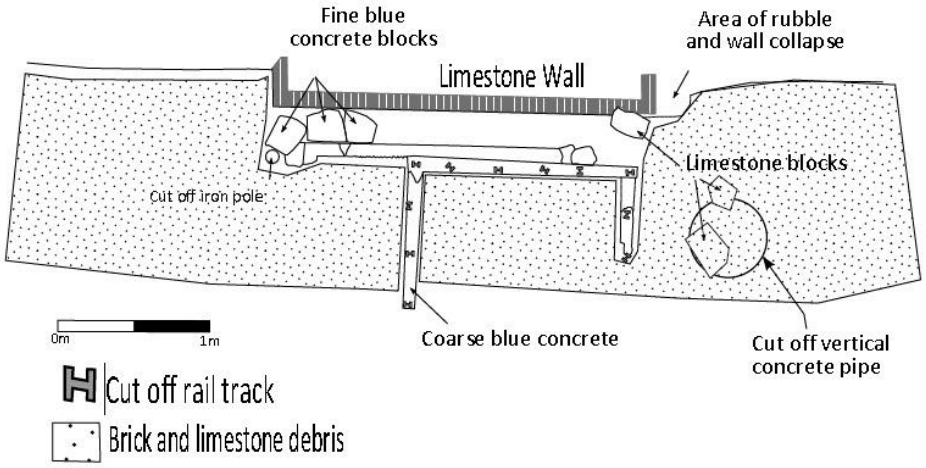

Figure 52: Plan of the Mt Lyell Jetty site

Figure 53: Structural pipes at Mt Lyell Jetty

To the west of Mt Lyell Jetty is a disused drainpipe constructed of glazed brown clay and 25cm steel reinforced concrete (Figure 54). The drainpipe once provided drainage from the above factory. It leads down the slope terminating on a concrete base. The pipe is broken at this point, with the broken angled bend alongside the base. The pipe is supported either side by a frame made from pieces of railway track. Wooden formwork was observed around the concrete base.

Figure 54: Drain west of Mt Lyell Jetty

4.8.3 Mt Lyell Stairs

A set of stairs appears to be present leading down the embankment, approximately 200m west of Mt Lyell Jetty (Figure 55). During the terrestrial survey, the remains of a metal and wooden structure were found in the general location of this feature. Several overlapping 20cm wide jarrah boards, each over four metres in length, and a vertical post were found protruding out of the limestone embankment (Figure 56). In the shallows below is a metal 'step' made from a section of railway track (Figure 57). A second step, made of concrete and sections of track, is located behind the first. Surrounding these features is a large amount of limestone rubble and red bricks which continue into the water.

Figure 55: Mt Lyell Stairs (1959) west of Mt Lyell Jetty (WA 534 Z Metro Regional Run 26 (39-79) 3750' 6" Jun 1959 26/77))

On the embankment above bricks and concrete pieces were visible at the top of slope under vegetation. These are possibly the remains of a building once situated at the top of the embankment. The limestone rubble is probably associated with the embankment and is not associated to any building.

Figure 56: Timber planking of Mt Lyell Stairs

Figure 57: Railway track step at Mt Lyell Stairs

4.8.4 SSY Slipway

Approximately 240 metres to the west of the Mt. Lyell Jetty, is a timber beam structure. Aerial photography indicates the structure consisted of three rows of large rails or poles that extended into the water, with the possibility of a small building in the centre (Figure 58). This configuration of beams or rails, adjacent the former SEW site, suggests this is the original site of the SSY as seen in Figure 6 and Figure 7. The structure appears in the 1958, 1959 and 1968 photographs, but no evidence of it is seen in earlier images.

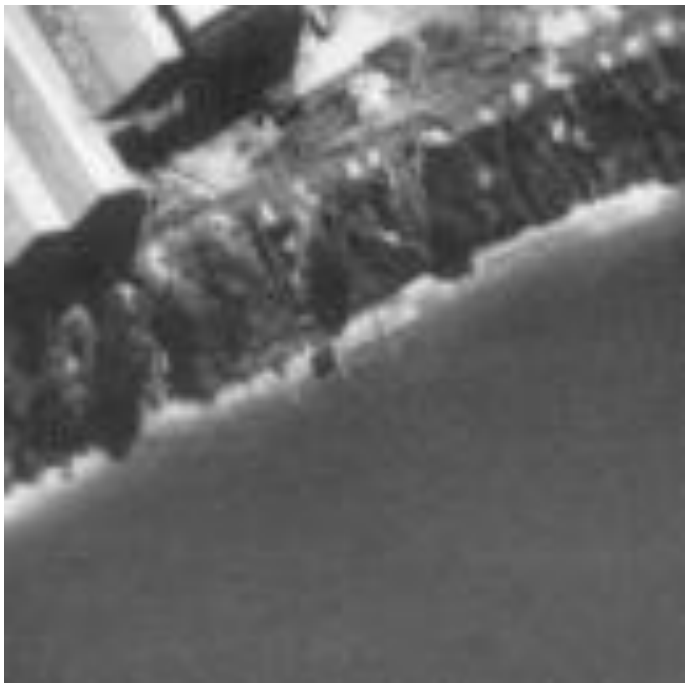

Figure 58: 1942 SSY slipway as seen in 1958 (WA 457 Metro regional Run 27 (34-74), 3750' 6" Aug 1958 27/21)

The terrestrial survey found the remains of three rows of timber beams (Figure 59). These are believed to be made of jarrah, the most common construction timber of the time. Each row consists of a double row of timbers approximately 25m long (Figure 60). The timber beams were approximately 39cm wide and 6.5cm thick. They were joined by two iron plates 46cm long, 24cm wide and 2.5cm thick, secured with six square-headed bolts, approximately 2cm diameter and 40cm long (Figure 61). The timbers were bolted to wooden poles, set lower than the beams, and placed at regular 5m intervals.

The timbers at the site are in poor condition. The second row of timbers is regularly exposed with the tides and is heavily degraded with sections of timber rotted away leaving only metal faceplates and bolts *in situ*. The deeper, third row appears to be present with much of this row covered with sands and marine growth.

Figure 59: Remains of slipway in 2011, with metal faceplate and bolt arrangement in foreground

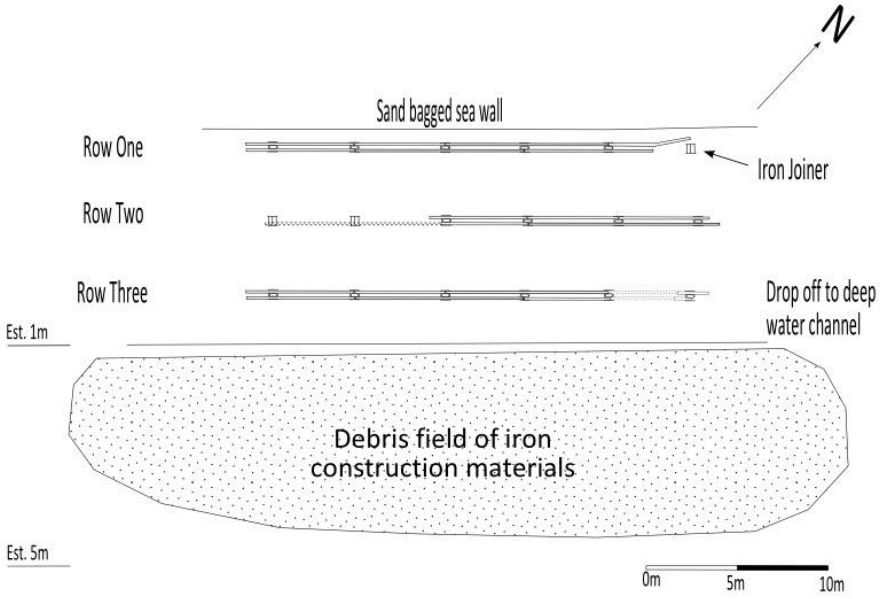

Figure 60: Site plan of SSY slipway.

Figure 61: Fastening plate typical of all timber joins in the slipway

The side scan results of this part of the bay show two hard lines at the top centre of the frame and a large disturbed area on the face of the channel wall (Figure 62). These hard lines represent the two rows of timbers that are predominantly in the water.

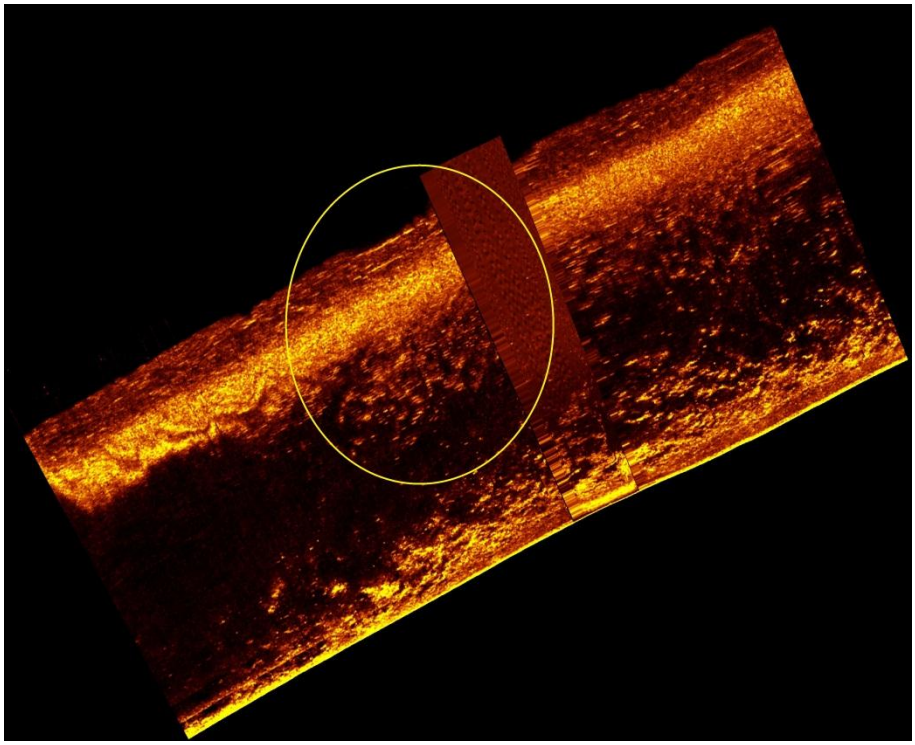

Figure 62: Side Scan image of 1942 State Shipyard slipway

In the shallows surrounding the site are numerous metallic objects such as drums, pipes, hoops, rods, small sections of pipe and miscellaneous pieces of metal (Figure 63). These are most likely either discarded material from when the slip was in operation or were introduced into the site by the SEW. This material continued into deeper water approaching the deep-water channel.

Figure 63: Material located in the shallows surrounding the slipway, 2011

An underwater examination of the site in the deep water channel located a large amount of metal debris on the channel wall. Larger objects such as beams and flanged piping, flexible steel wire rope and railway track were located. While most were lying flat against the side of the channel, the most distinctive feature on the site was a group of heavily concreted metal 'posts' or 'pipes' jutting vertically out of the embankment towards the surface (Figure 64). These objects were several metres long, possibly forming some type of frame, with several pieces found overlapping one another. Other large pieces of structural steel were also resting on and against this singular feature. Much of the debris

was covered with marine growth and conglomerate, making identification impossible beyond the simplest classification such as ‘pipe’, ‘rail’, ‘structural steel’, or ‘bottle’.

Figure 64: Photomosaic of large, heavily concreted steel pipes and beams

In addition to the larger structural objects, the site contained a large number of domestic items, predominantly bottles. Most bottles were consistent with 750ml amber beer bottles typical of the local breweries. Condiment jars and clear bottles believed to be carbonated drink bottles were also observed. Vehicle tyres were also found and may

have been used either as fenders or supports. These findings correlate with photographic evidence of the site in operation (Figure 65).

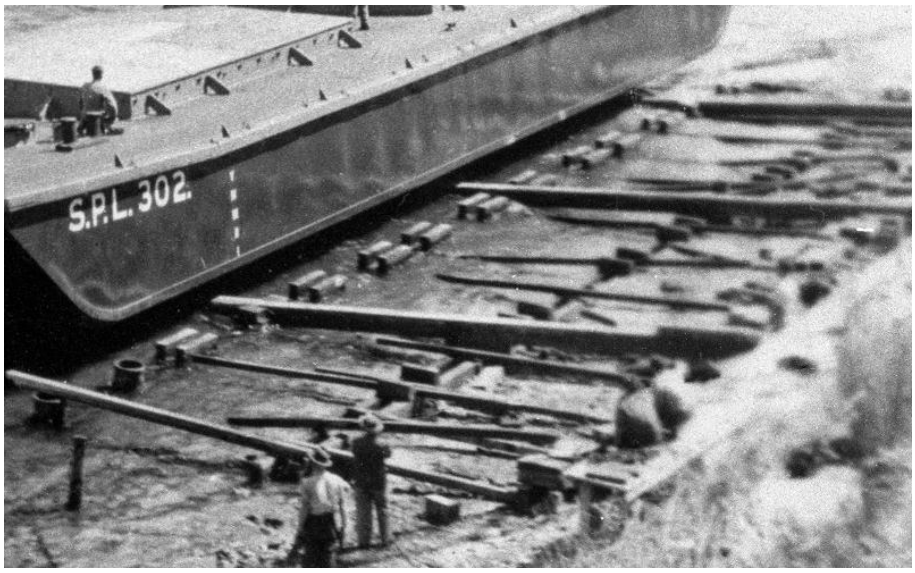

Figure 65: Close up view of the slipway in operation in 1942 (Source WAMM: MHA / 4577 / 23)

4.8.5 Meteor Cave

A small cave is located in the northwest corner of the bay (Figure 66). The cave is approximately 3m wide, 4m deep and 2m high at its entrance, increasing to approximately 2.5m inside. Two pieces of timber are affixed along the roof and on the right side of the entrance to the cave. The timbers are 8cm wide and 5cm thick and appear to be jarrah. The upper timber is approximately 1.96m long and the vertical beam is approximately 2m long. Two iron hinges on the vertical timber indicate a swinging door was once present. A wooden stump in the ground on the left side of the cave indicates a missing vertical post. To make the cave secure, the left side of the cave was sealed between the limestone wall and the missing post.

Figure 66: The entrance to Meteor Cave

An examination of the shallows immediately in front of the cave found various bottles, large amber beer bottles, a painted ceramic cup, a tyre, a piece of marine plywood and a set of parallel railway track (Figure 67). The rails are welded with cross bars (also of rail track) to maintain a set distance between the rails. Across the rails are two axles suggesting the presence of a low trolley or possibly a cradle.

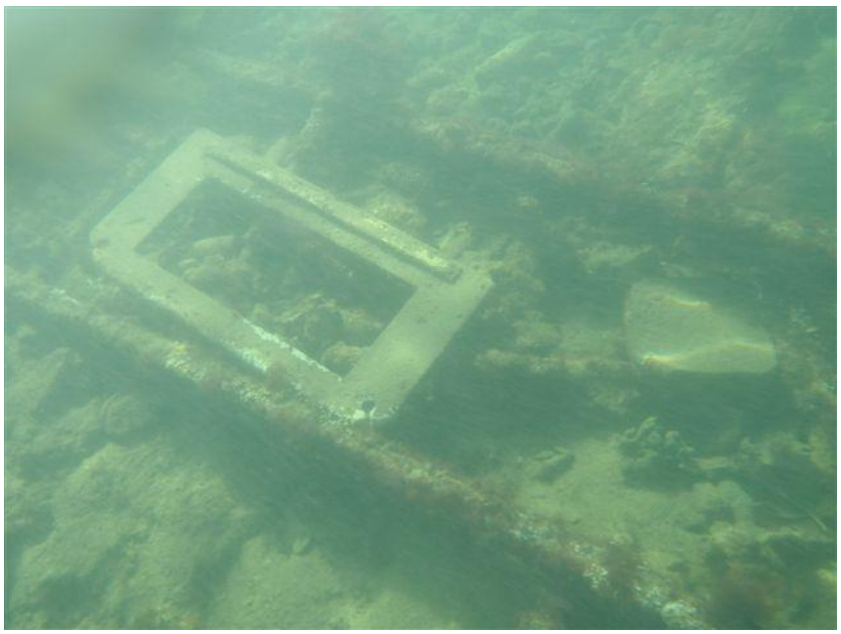

Figure 67: Parallel rails and trolley axles

An account of this cave by Mr Ken Miller (84 years old), a long-time resident of North Fremantle, recalls that approximately 70 years ago, a family friend, Mr James (Jim) Watkins, had a homemade speed boat which he stored in the cave in Rocky Bay – the boat was called *Meteor*. Watkins enlarged the cave and installed doors supported on a timber frame to secure the craft. The boat was moved into and out of the water on a small trolley that was fashioned to run along a set of rails made from railway track taken from the local area. For this reason, and for the purposes of this study, the cave is called Meteor Cave.

4.8.6 Soap Factory Pump House

The initial inspection of the survey area found concrete and red brick foundations located adjacent a large limestone boulder immediately beneath the western limestone cliffs (Figure 68). Access to the foundations is via a narrow beach on the western side of the bay below *Garungup* Cave. The foundations are approximately 3.4m by 3.6m in size, and made of concrete with five courses of brickwork still in place. The bricks have a characteristic English bond patterning, with the bricks of the third course placed end on. The bricks appear to have been rendered with a thin layer of cement. In the centre of the foundations is a raised concrete footing approximately 40cm high. On the north side of the foundations the bricks are laid back from the edge providing a narrow walkway into the building.

Figure 69 shows the building as it appeared in 1970. It was a small building with a door on the northern side, but with no obvious windows. At this time it appears to have a four-sided, triangular pitched roof made of corrugated iron. The walls were an off-white colour which may indicate cement render.

Figure 68: Concrete platform associated with the soap factory pump house, June 2009

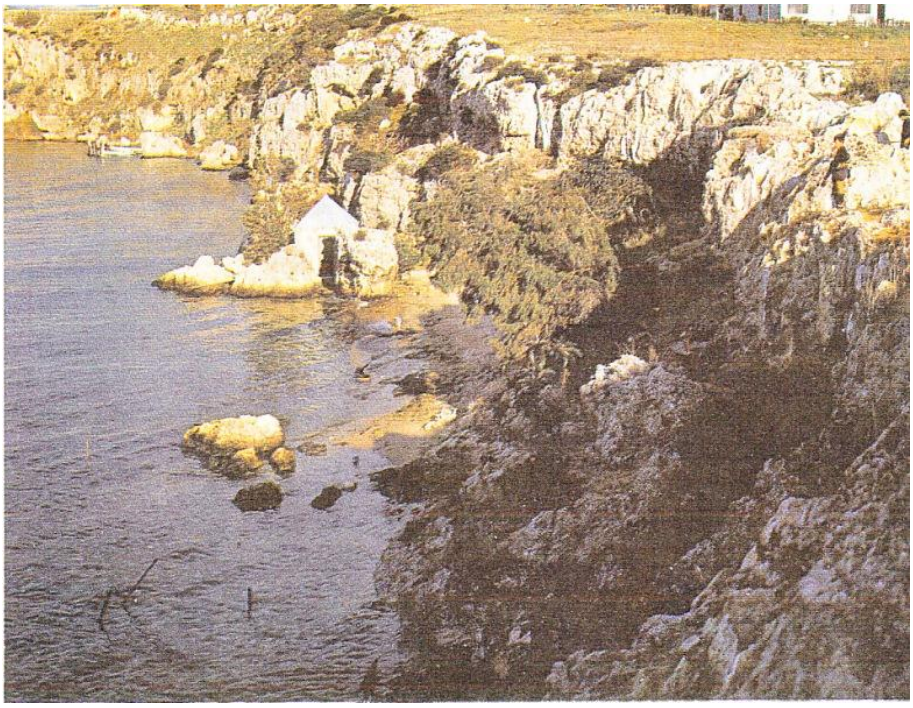

Figure 69: View of pump house looking south along Rocky Bay, 1970. (Source: Seddon 1970:47)

The side scan image of this particular site identified a single large target approximately 4.8m x 2.7m in size (Figure 70). An underwater inspection found this to be a large limestone block that fell from the cliffs above. On the underwater slope adjacent the

foundations, is a field of building debris including bricks, cement blocks, and steel rod cascading down the slope (Figure 71). Pipes up to four metres long and an eight metre long steel beam were also present. In addition to construction debris a variety of modern materials are also present. This includes many amber glass beer bottles, a portable traffic signal and tyres.

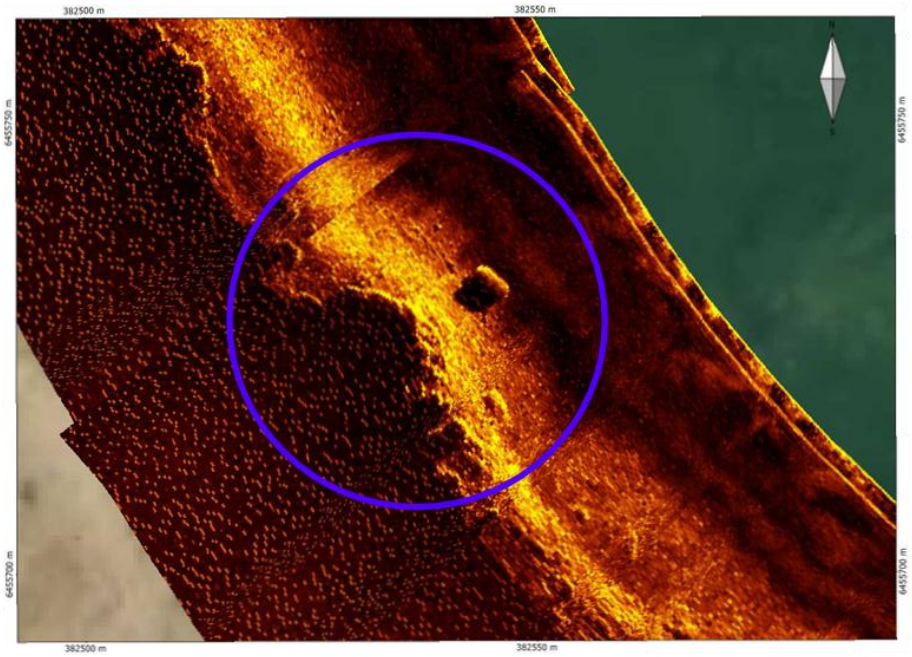

Figure 70: Side scan in vicinity of soap factory foundations

Figure 71: Bricks and bottles located adjacent the Burford Pump Station

Jutting out from the brick debris is a metal wheel which may have been a flywheel from a pump (Figure 72). The appearance of the wheel, embedded into the bricks, suggests that there is some depth to the brick debris. The field of construction debris extends 10m both sides of the foundations and down to a depth of approximately five metres. It appears that the debris descended to a natural stopping point (Figure 73).

Figure 72: Flywheel embedded in brick debris (Scale equals 10cm)

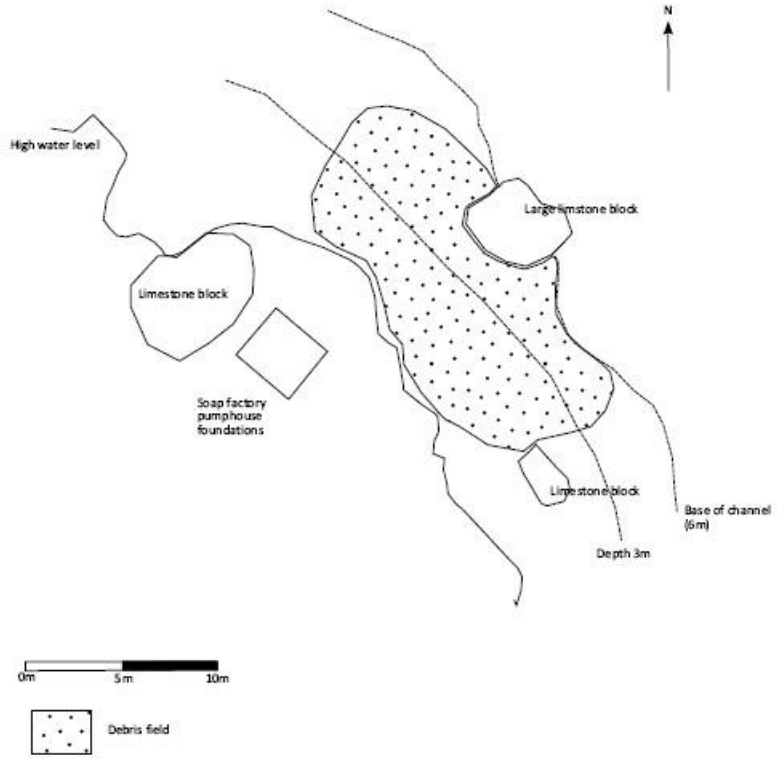

Figure 73: Site plan of underwater distribution of construction debris

Mr Robert Lindsay, a former employee at the soap factory in the 1950s, indicates that this building was a pump house used to pump water from the river up to the factory above and the concrete footing within the building was for the engine (Lindsay Pers. Comm.). What type of engine or pump used in this building is unknown.

4.8.7 Soap Factory Tunnel

Immediately behind the soap factory foundations is a tunnel leading into the cliff (Figure 74). The tunnel is approximately 96 metres long, 1.8 metres high and 1.4 metres wide, while the walls are vertical and, for half its length, the roof is unsupported. A carved indentation in the limestone indicates a lintel was once fitted at the entrance, probably in association with an earlier gate. On the ground is a series of single wooden planks,

38cm wide and 9.75m long laid end to end. Adjacent the planks a corroded, five centimetre diameter metal pipe extends into the tunnel.

The tunnel was found to have several distinctive features (Table 5). The tunnel has two vertical trunks that lead to storm drains on the street above. The first trunk is located at the only bend in the tunnel. It is a dry wall construction and capped with angle iron, tin sheeting and cement. The second trunk is lined in modern concrete with hand holds leading to the surface. After the bend, jarrah shoring appears with several planks forming a protective ceiling (Figure 75). The necessity for the shoring is evident by a roof collapse partway along tunnel. Approximately 94.5 metres from the entrance a storage cavity was excavated which contains several lengths of five centimetre diameter pipe and wooden battens.

The metal pipes on the floor of the tunnel and in the storage area were used to transport water pumped from the river to below the factory, where it was directed up the vertical trunk to the factory and then to the cooling tanks or to be heated into steam. At the same time effluent from the factory drained into the tunnel and out into the Swan River where the wash from passing boats agitated the suds causing them to foam.

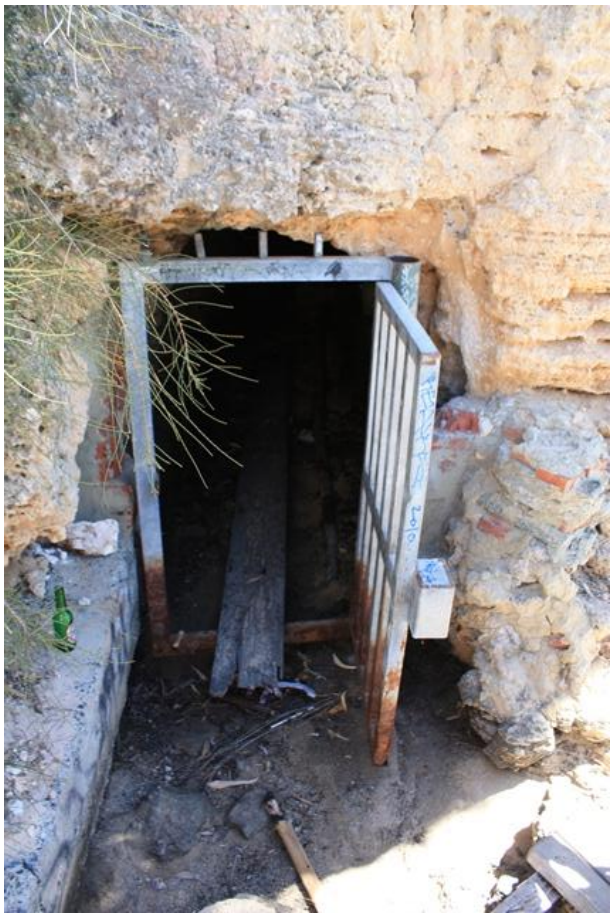

Figure 74: Entrance to the soap factory tunnel.

Figure 75: Wooden shoring within the soap factory tunnel

Distance from entrance	Bearing	Comment
0m - 51.7m	240°	
28m		Single plank to three plank arrangment
51.7m - 96.3m	215°	
51.7m		Vertical trunk 1.5m x 1.5m
53m		Wooden shoring
69.7m		Location of roof collapse
94.5m		Storage cavity
95m		Modern concrete pipe
96.3m		Modern concrete vertical trunk

Table 5: Features of the soap factory tunnel

Examination of the length and angle of the tunnel indicates the tunnel terminates just below the southern side of the soap factory (Figure 76). The soap factory consisted of several buildings in addition to the red brick building (Figure 77) and tunnel is believed to have terminated in the vicinity of the glycerine sheds.

Figure 76: Route of tunnel

Figure 77: Soap factory as seen in 1963 (Source: Lake Clifton Run 22 (5179-5198) 7000' 6" 13-10-63 Frame 5180)

4.8.8 Location of ship breaking and salvage

Side scan results indicate the presence of a regular shaped object approximately 10m long at coordinates 382689mE 6455593mN (Figure 78), north of Point Direction. A search of this location found several lengths of railway track in the shallows. In addition to the rails, metal rods and numerous bottles were located. An inspection of the shore immediately adjacent found concrete foundations set with a metal ring and the base of a metal post (Figure 79).

The remains of a former road surface were discovered leading from the end of Harvest Road to the concrete foundation (Figure 80). The road was made from two distinct limestone and shell grit layers. Photos from the 1960s show a road on a wide, level surface devoid of trees leading to this location (Figure 81, see also Figure 18). This evidence suggests this is the ship breaking area mentioned by Murray (2004:24).

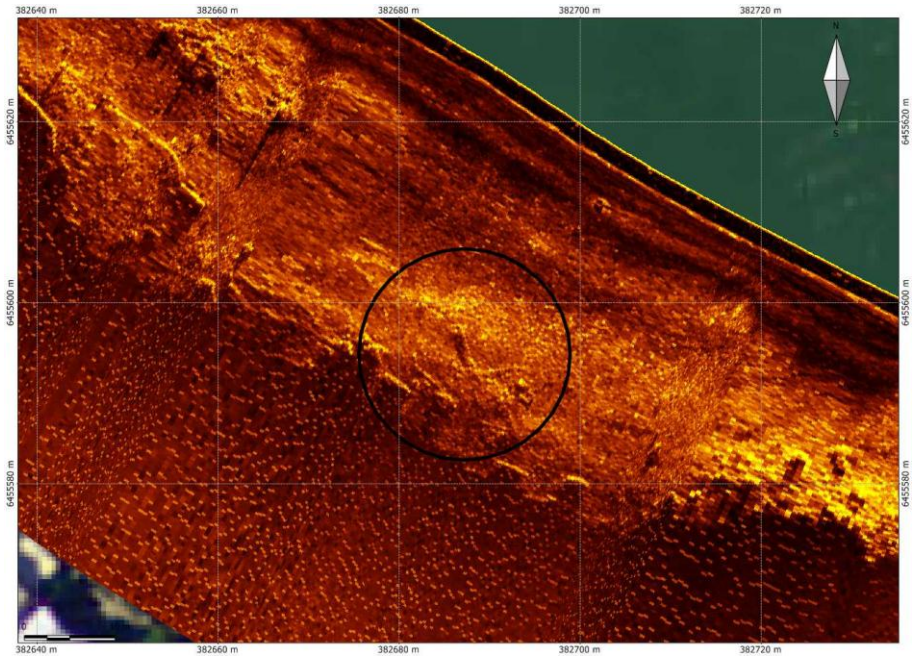

Figure 78: Side scan image of Target 13 showing a long bent tube-like feature

Figure 79: Concrete foundation set with metal ring and pipe base. Note the dry stone wall built on top of the foundation.

Figure 80: Old road surface, Pt. Direction.

Figure 81: Service road to ship breaking area, bottom right of picture, 1960s (Source: Lake Clifton Run 22 (5179-5198) 7000' 6" 13-10-63 Frame 5180)

Photographs held by the WAMM show the vessel *SS Gascoyne*, a former whaling vessel, being broken up at Rocky Bay (Figure 82 and Figure 83). The location of the vessel in relation to the cliffs in the background supports the conclusion the remains located in the vicinity of the side scan Target 13 are associated with the ship breaking activities in the bay.

Figure 82: Whale chaser *SS Gascoyne* on slipway in 1962 (Source: WAMM D7/430b)

Figure 83: *SS Gascoyne* being broken up in Rocky Bay, 1970 (Source: WAMM D7/431b)

4.8.9 Point Direction Slipways and Barges

Historical research shows that Point Direction was the location of several boat yards from the 1890s through to the 1980s. An inspection of Point Direction found the area has been totally redeveloped. The area is currently occupied by the Western Australian Water Police and residential apartments. Several private jetties extend from a sea wall into the Swan River.

Historic accounts demonstrate that barges moored here in the early twentieth century were in poor condition and many sank. These accounts are substantiated by the 1943 account (see p.24-25) of two barges discovered buried in the shallows during construction of the new slipyard. Early aerial photography shows the types of barges present at the site (Figure 84).

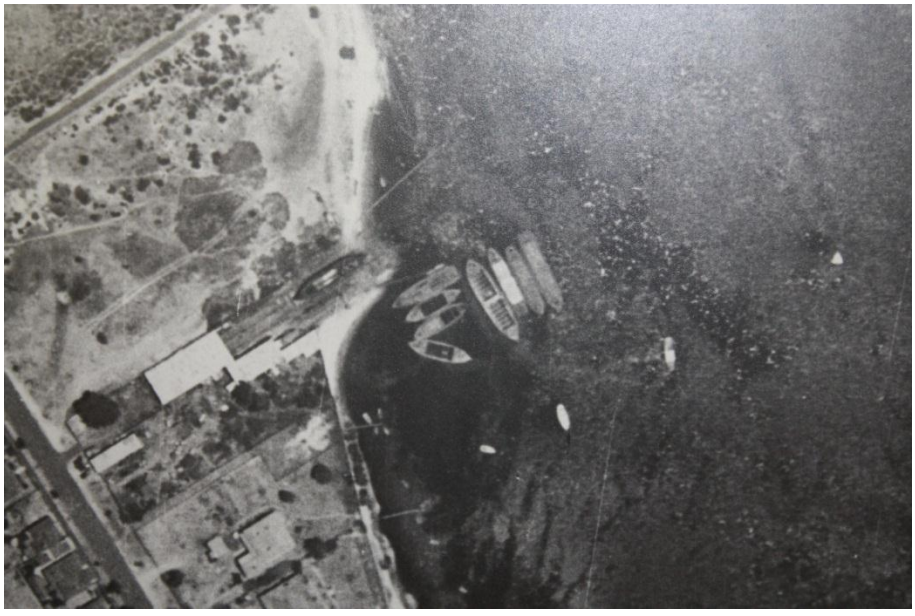

Figure 84: Barges tied up alongside boatyards at Point Direction (ca. 1939). (Source APACE)

An examination of an enlarged portion of a 1968 aerial photograph of Point Direction clearly shows the slipways extending from the boat ramps into the river (Figure 85). In the centre of the picture is the outline of a sunken vessel between the slipways. The accounts of sunken vessels, supported by photographic evidence from 1943 and 1968, demonstrates the potential for further sunken craft to exist in this area. If this is so, then

any such vessel will be completely buried as is the case of the two vessels located in 1943.

An image of Point Direction from 2009 shows the apartments fronting the river and the private jetties. Between the three jetties, two sets of rails from the old slipways are seen clearly *in situ* in the water (Figure 86). The position of the central jetty is placed exactly over the position of the sunken vessel shown in Figure 85, suggesting that if the vessel was not removed during construction of the jetty then it is in place beneath it.

Figure 85: Outline of sunken barge between slipways, 1963 (Source: Department of Land Administration WA 838 Wanneroo- Lake Clifton Run 22 (5179-5198) 7000' 6" 13-10-63 Frame 5180)

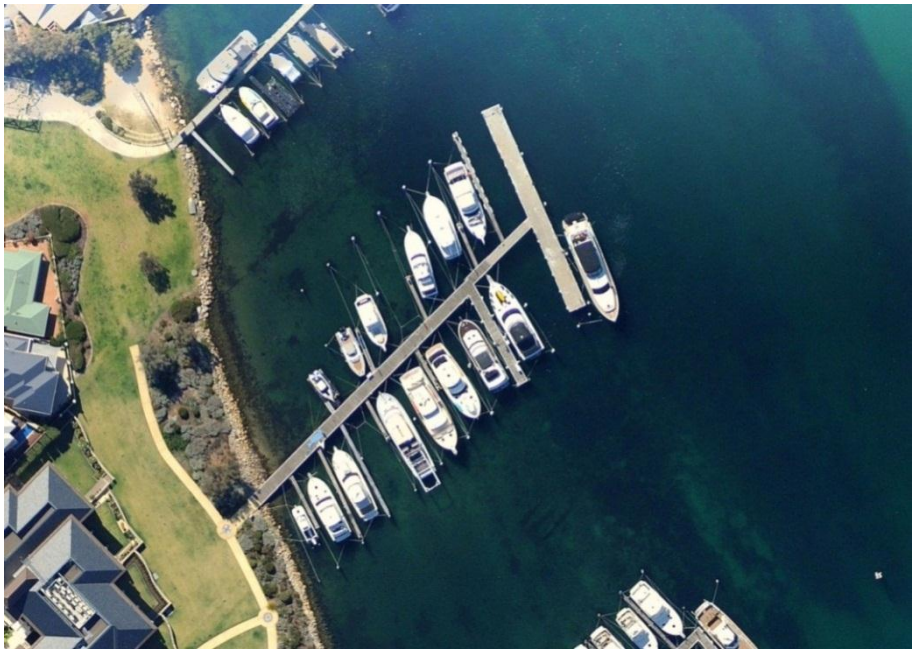

Figure 86: The remains of slipways between new jetties, May 2009 (Source: www. nearmap.com.au)

Chapter Five – Addressing Research Questions

The aim of this project is to identify and investigate archaeological sites within Rocky Bay. The results of this research project show several archaeological sites are present within Rocky Bay that reflect its industrial past and that have not been previously identified as being of archaeological interest.

5.1 Archaeological Sites Versus a Maritime Cultural Landscape Approach

In Chapter Two, the nature of riverine sites within Rocky bay is defined – either as part of a maritime cultural landscape or simply as sites within an archaeological landscape. For the purposes of this study sites should be assessed based on their primary function. That is, the overriding, general activity that occurred on the site.

The sites of the former Rocky Bay Quarry, SSY slipway, Meteor Cave, *City of Perth*, *Mayfield*, the Rocky Bay wrecking point and the Pt. Direction slipways all have primary functions which are inherently of a maritime nature (see Table 6 below). These sites are assessed, based on their primary function, as being part of a maritime cultural landscape. However, this assessment may become blurred when secondary functions and activities are taken into consideration.

The remaining sites of the Mt Lyell pumping station, the Mt Lyell Jetty and Stairs, and the Burford Soap Factory pumping station and tunnel are interpreted as archaeological sites of an industrial nature and are not considered to be part of a maritime cultural landscape. This is because the primary function of these sites is not related to the maritime world. In effect, these sites could all have operated in exactly the same way at other locations away from a riverine setting as long as a suitable water supply was available.

Therefore, while rivers may be seen as part of a maritime cultural landscape, it becomes apparent that not all sites within or adjacent to rivers can assumed to be or should be included within that type of landscape.

5.2 Research Questions

Three research questions are proposed for this project to characterise the archaeological signature of Rocky Bay. These questions are addressed below.

Question 1: What can the archaeological and historical investigation of Rocky Bay's riverine and underwater landscape reveal about the area's industrial past?

Archaeological and historical research identified that the development of industry within North Fremantle was the main catalyst for site formation in Rocky Bay. With the exception of Meteor Cave, each site represents a particular aspect of the bay's industrial past. The Swan River was the main avenue for moving people and goods inland from the sea. In the 1850s sailing craft began to be replaced by steam powered vessels. The remains of the *City of Perth* and *Mayfield* are examples of both steam and non-powered craft. Both vessels are known to have undergone modification to extend their useful work life as part of this riverine trade. The presence of the slipways demonstrates the activities of ship building and repair occurred within the colony. Boat building and repair were part of North Fremantle industrial character since the 1890s, and was the workplace of the State's most prolific boat builder, Mr A.E. Brown.

The presence of abandoned barges (two removed in 1943, and the remains seen in the 1963 aerial photo), plus the number of laid up barges seen in early photography, suggests that Point Direction was a holding point for older or retired vessels. This may have been a consequence of a fall in the demand for river transport resulting from the introduction of the Perth - Fremantle rail line in 1888 and from improved road networks.

Personal accounts of sunken barges in the shallows at Point Direction show that the vessels were there long enough to either sink at their moorings from neglect or to be deliberately scuttled. Historical documents indicate that ship breaking occurred in Rocky Bay, and the archaeological survey has confirmed the presence of material remains in the suspected location of that activity on the northern side of Point Direction.

Archaeological evidence shows that, from the earliest days of the Rocky Bay Quarry until the present day, industries in Rocky Bay had a casual attitude to the disposal of waste materials. The quarrying of limestone for port construction produced a large amount of rubble. The dumping of limestone detritus into the river was a convenient method of disposal, with the added effect of extending the limestone platform created by the quarry into the river resulting in a narrowing of the deep water channel. The limestone embankment along the northern shore of the river is the legacy of this process. Similarly, the draining of effluent from the Burford soap factory directly into the river was common practice. EPA documentation indicates the dumping of chemical wastes and pyrite cinders by the SEW and Mt Lyell Chemical was common practice, necessitating the need for large quantities of contaminated soil to be removed from these sites in later years before the land could be reused.

This trend of purposeful disposal into the river is also demonstrated at the site of the SSY slipway. The slipway was built at the base of the SEW to allow for easy access to steel materials for the construction of barges. The terrestrial survey noted a large quantity of steel materials in the shallows surrounding the site. These pipes, plates and rods are unlikely to be associated with the construction of the slipway and are more likely discards from the constructions of the barges. The underwater inspection found a greater amount of larger pipes, plates and steels beams below the location of the

slipway. The presence of beer bottles and condiment jars as artefacts associated with employees of the sites indicates a similar personal attitude towards disposal.

As part of the 1980s remedial clean-up operation developers were required to clean up the foreshore along the northern bank. While the EPA documentation does not indicate how this occurred, the archaeological evidence suggests that whatever parts of industrial structures not removed to landfill were dumped into the river. The presence of bricks and other construction materials on the slope of the embankment and the shore, not related to any shoreline structure, appears to confirm this. The archaeological evidence demonstrates the river has long been used as a convenient dumping ground for waste materials for the various industries fronting the river.

In contrast, evidence for the reuse of materials, particularly railway tracks, is present throughout the sites. Sections of track located during the survey were initially part of the rail network from the Rocky Bay Quarry/SEW/Mt Lyell sites. The archaeological evidence shows that rail track was reused in sites around the bay for purposes not related to the rail network. For example, track was found to have been used in the construction of the Mt Lyell Jetty site. The cut-off ends of rails within the concrete footings of the jetty structure indicate their use as vertical metal posts. At the drain location immediately adjacent this site, track was used as part of the structural framework for the drain pipe. At the site of the *City of Perth*, tracks were used to stabilise and strengthen the piles at that location. Rails were also found in the shallows at the ship breaking location. Even at the Meteor Cave site, track was reused to make a slip and trolley for a small boat. No other artefacts found in the terrestrial and underwater surveys were reused, other than rail track, thereby indicating its importance not only for its primary use but also its suitability as a construction material for a variety of secondary uses.

Not only was the Swan River a convenient dumping ground, it was also directly utilised as a resource for industrial processes. The two pumping stations constructed in Rocky Bay show the factories required water for both the production of chemicals and for the production of soap and candles. The presence of the Swan River, an endless supply of free water, was an attractive drawcard to Rocky Bay along with the added benefit of easy waste disposal.

The above practices of discard, use of resources and reuse of materials assisted in making each industry more cost effective. These factories, like all businesses, were driven by the economy and the ability to supply goods for a competitive price. Commercial entities aim to be profitable by taking advantage of the surrounding resources to reduce costs was pursued whenever possible.

The port construction was a major government undertaking, and the availability of a nearby source of building material was seen as advantageous. The establishment of a rail network to transport materials to site reduced costs through increased efficiency, and the ability to clear the quarry site of debris by simply dumping it into the river negated the need to stockpile spoil quarry at another location for future disposal. The Mt Lyell Chemical plant provided the local agriculture sector with fertilizers to supplement the native soil. In addition, local farmers required modern machinery to work the land. The SEW was originally set up by the Western Australian Government to develop an industry of locally produced agricultural machinery for Western Australian farmers, thereby reducing the need for expensive imports for the Eastern States or overseas. The utilisation of an existing level platform as the location of each of these factories minimised construction costs. The presence of an established rail network leading to the port meant minimal transportation costs, and the presence of an unlimited source of water adjacent the site reduced the dependence on other sources of water. The

establishment of the 1942 slipway below the SEW, the source of its raw materials, allowed barges to be built quickly and efficiently with reduced transportation costs.

At the same time as the port was being constructed. the gold rush in Kalgoorlie and Coolgardie moved from the collection of surface gold towards underground mining. Without the benefits of electricity to light the tunnels, light was provided by candles. The large volume of candles required was supplied by in part by the Burford factory. The ability to draw the large amounts of water essential for production free from the river assisted in lowering costs.

The archaeological and historical investigation of Rocky Bay's riverine and underwater landscape demonstrated that:

- Rocky Bay was a plentiful and close source of limestone suitable for the port construction.
- Quarrying modified the natural landscape on a massive scale.
- The area surrounding Rocky Bay was an attractive location for industries in the early twentieth century.
- The water from the Swan River was a free and plentiful resource essential for local industry.
- The river was readily used as dumping ground for unwanted material, commercial and domestic. This trend continued from the 1890s until the 1980s.
- The land surface of the SEW and Mt Lyell Chemical sites were likewise used as an easy dumping ground for chemical and contaminated waste products.
- Some reuse of materials did occur across all the sites.

Questions 2: How does the archaeological signature reflect changes over time with regards to the community of North Fremantle?

The archaeological sites in Rocky Bay are representative of the different types of activities that occurred in Rocky Bay dating from the nineteenth century until the 1980s (Table 6). In that time the demographic of North Fremantle changed from a working class suburb to a high value residential suburb and the archaeology of the area reflects this evolution.

The quarrying of limestone for port construction was a short term project, spanning only five years between 1892 and 1897. At this time, North Fremantle consisted of a few small communities of Irish and Chelsea pensioner guards centred on the area known as Brucetown located near Point Direction (*TWA* 13/09/1935). Makeshift camps began to appear which were home to itinerant quarry workers and their families. One such place, called "The Camp" was described as:

> a number of temporary dwellings occupied by men who worked in the quarries; wooden houses, tin houses, canvas houses, hessian houses and bits-and-pieces houses. Fowls and goats wondered at will about the camp. However, when the north mole was complete and the quarries ceased operation they sought employment elsewhere and the camp gradually faded away (Anon. 1906).

Even after the quarry works ceased operation the shanties did not disappear immediately due to the acute accommodation shortage in the area brought about by the gold rush of the 1890s (*TWA* 13/09/1935).

Site	Purpose	Related Industry	Period
Rocky Bay Quarry	Raw materials	Port construction	1892-1897
Mt Lyell Pumping Station	Provision of water to plant	Chemical manufacture	1920-1959
Mt Lyell Jetty	Unknown	Chemical manufacture	1920-1959
Mt Lyell Stairs	Access to intertidal area	Chemical manufacture	1920-1959
SSY slipway	Steel barge construction	Boat building	1942
Meteor Cave	Boat storage	Recreation	ca.1940s
Burford Soap Factory pumping station	Provision of water to plant	Goods manufacture	1895 - 1959
Burford Soap Factory tunnel	Path for water pumping; effluent drainage	Goods manufacture	1895 - 1959
City of Perth	Initially passenger transport; goods transport	River transportation	1872 - ca. 1900
Mayfield	Goods transport	River transportation	ca. 1900 - 1946
Point Direction barges	Goods transport	River transportation	19th - 20th Century
Rocky Bay ship breaking point	Salvage and breaking up of vessels	Boat salvage	ca. 1960s
Point Direction slipways	Boat building and repairs	Boat building	ca. 1890 - ca. 1980s

Table 6: Rocky Bay archaeological sites and their related industries

In 1895, one of the aims of the new city council was to develop the infrastructure of North Fremantle which at the time consisted of a few streets, limestone tracks and the native landscape. Being financially poor the council sought assistance from the government to develop infrastructure and sanitation, which also attracted industry to the area. The establishment of long term industry, such as the SEW, Mt Lyell Chemical, boat building yards, and the soap and candle works, saw a change in the local demographic from a transient to a sedentary population. These factories formed part of the industrial fabric that characterised North Fremantle in the twentieth century. The population of North Fremantle became more established with workers living near their places of work.

The closing of these factories in the latter part of the twentieth century coincided with the residential redevelopment within the area. Many of the earlier industrial sites were demolished and rezoned, and new residential housing and apartments soon began to

appear. The loss of these industries, both in Rocky Bay and across North Fremantle, reduced employment opportunities and, like in the earlier part of the century, many people sought work elsewhere, once again changing the demographic of the area from working class to residential in a short number of years.

This long-term residential pattern is reflected in the longevity of the remains found within the area. Like the short term nature of the Rocky Bay Quarry, the transient camps of its workers disappeared in the years after its close. The SEW, Mt Lyell Chemicals, the boat yards, and the soap and candle works were all long term industries in the area and this was reflected in the established nature of the residential housing in the area.

The decline of these industries and the demolition of the buildings left few superficial reminders of this period overlooking Rocky Bay. Other than the Burford factory, now used as residential housing, these industries are now represented by the riverine sites discussed in the previous chapter.

Question 3: What can the study of Rocky Bay's riverine and underwater landscapes contribute to a broader understanding of the use of this inland waterway and the development of the state of Western Australia?

The results of this project confirm historical accounts of the use of Rocky Bay as a resource (limestone, water), as part of an important transportation route in the early years of the colony (river traffic), and as a convenient dumping ground for commercial and domestic rubbish. The northern embankment, remains of pumping stations, slipways and the sunken vessels provide a tangible link with the area's industrial past, and therefore also those industries relationship with the development of Western Australia. For example,

- Without limestone from Rocky Bay, construction of the Port of Fremantle may not have been undertaken in its current form.

- The boat yards at Point Direction were the workplace of the Swan River's most prolific boat builder, Mr A.E. Brown, who constructed many of the iconic watercraft that operated in the Swan River.
- The candles manufactured by the Burford Soap factory provided lighting for underground mining operations in the Western Australian Goldfields, thus assisting that industry to develop.
- The SEW and Mt Lyell Chemical sites provided essential support to the development of the State's agricultural sector, and
- The establishment of the small slipway beneath the SEW provides insight into the manufacturing support that North Fremantle provided during World War II, and illustrates the connection with the War in northern Australia and the Pacific.

Whether these associations are typical of riverine environments or if Rocky Bay is a unique or uncommon situation is unclear and warrants further investigation and comparison with other industrial riverine landscapes. A systematic investigation of the river was not undertaken; the length of the survey area was approximately two kilometres representing a minor component of the Swan River. Therefore comparisons between parts of the Swan River to other waterways in similar situations in Australia (e.g. Kenderdine 1993; Nutley 2003) has not been possible. Nevertheless, the study demonstrates that a lack of information exists regarding sites within the Swan River and the river's underwater archaeological signature.

5.3 Further Research

A number of research questions are suggested to promote a better understanding of the broader patterns of utilisation of the Swan River. These are:

- Are similar industrial sites (manufacturing/boatbuilding) still present along the Swan River?
- Are these sites consistent with the timeframe identified in Rocky Bay?
- What resources were desirable at these sites, and did these influence the geographical location of the sites in question?
- Is a similar demographic pattern versus time versus development recognisable at these locations?
- What information of specific industries can be gleaned from more in-depth investigations of these sites?, and
- What comparisons can be made between the development of industry fronting the Swan River and industrial sites in similar riverine environments?

Obviously, the parameters of research questions depends on the sites concerned, but it is clear that more research is needed in the investigation of archaeological sites within the Swan River.

Chapter Six: Conclusion

The archaeological survey of riverine and underwater landscapes of Rocky Bay provided insight into the area's industrial past, how its natural resources were used and the purposeful discard of material into the surrounding environment. While the sites are situated in a riverine environment, they are predominantly industrial in nature. In Chapter Two the concept of the maritime cultural landscape was discussed and, while it could be argued that these sites form part of such a landscape, the definition of the maritime cultural landscape is recognised to be ambiguous and that sites may be better assessed on their primary function before being associated within any particular landscape type. The sites of the vessels *City of Perth* and *Mayfield*, slipways, ship breaking point and the potential for sunken barges at Point Direction could be viewed as being part of a maritime cultural landscape; however, sites relating to Mt Lyell Chemicals and the Burford Soap Factory are not as they are distinctly industrial without any particular relationship to a maritime landscape other than their physical proximity to the river. These industrial sites could be moved away from the river to another location whilst maintaining their industrial nature, however, to do so with the slipways or the sunken vessels would take them from their maritime context. An alternative to the cultural landscape approach would be to interpret these sites (the slipways, factories and their associated infrastructure) as part of the archaeological landscape of Rocky Bay area, and separating them into a single or multiple cultural landscape types is neither useful or relevant.

The study shows that the suburb of North Fremantle evolved through many stages since the 1890s, from a small community to a working-class industrial suburb, before finally transforming into a popular inner-city residential area. The archaeology of Rocky Bay

reflects these changes and, today, the archaeological sites located during this survey are physical reminders of those changes.

Meteor Cave is a tangible reminder of the recreational use of the river. The river is still used for commercial and recreational purposes, but recreational use of the river has increased greatly, coinciding with private boat ownership. Today, numerous boats can be found anchoring in the lee of the limestone cliffs on the weekends (Figure 87).

Finally, this investigation demonstrated the potential for archaeological sites to exist beneath the waters of the Swan River. While this may seem to be an obvious statement, it serves as a reminder to heritage management agencies that not all important heritage sites exist above the water and that, in some cases, as demonstrated in Rocky Bay, underwater sites and sites located in the intertidal zone may constitute some of the few remains of past activities, industrial or otherwise, within the Swan River.

Figure 87: Boats anchored in Rocky Bay, Australia Day 2011.

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Appendix A: Results of Searches of AHIS.

Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System

Aboriginal Sites Database

Search Criteria

12 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6454791	381486
6457706	385021

Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System

Aboriginal Sites Database

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status

L - Lodged		IA - Information Assessed		ACMC Decision Made
Information lodged, awaiting assessment	→	Information Awaiting ACMC Decision Assessment Only	→	**R - Registered Site** **I - Insufficient information** **S - Stored Data**

***Explanation of Assessment**

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not the final assessment.

Final assessment and decisions will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. "5000000:250" means Easting=5000000, Zone=50.

Sites Shown on Maps

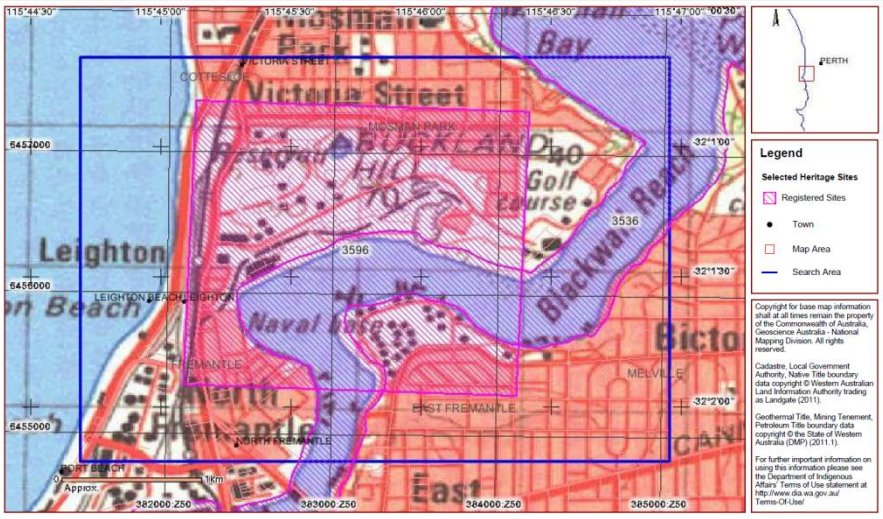
Site boundaries may not appear on maps at low zoom levels

List of 2 Registered Aboriginal Sites with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
3536	R	O	N	Swan River	Mythological		*Registered Informant names available from DIA.	443400mE 6461957mN Zone 50 [Reliable]	S02548
3596	R	C	N	Rocky Bay	Mythological		*Registered Informant names available from DIA.	Not available for closed sites	S02422

Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System
Aboriginal Sites Database



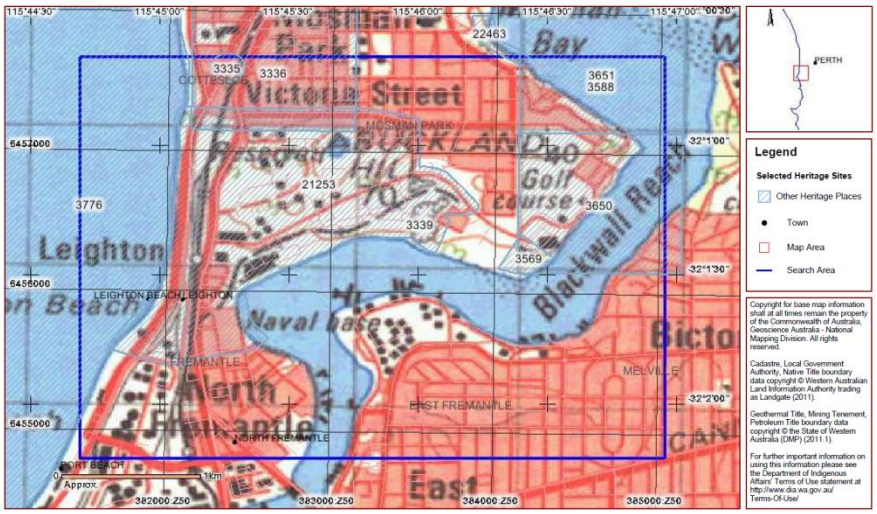
List of 10 Other Heritage Places with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
3335	S	O	N	Macarthur Street	Artefacts / Scatter			382359mE 6457599mN Zone 50 [Reliable]	S00179
3336	S	O	N	Victoria Street Station.	Artefacts / Scatter	Camp		382639mE 6457649mN Zone 50 [Unreliable]	S00180
3339	S	O	N	Minim Cove.	Artefacts / Scatter	Camp		383544mE 6456495mN Zone 50 [Unreliable]	S00183
3569	S	O	N	Colonial Sugar Refinery.	Artefacts / Scatter	Camp		384192mE 6456275mN Zone 50 [Unreliable]	S02492
3588	S	O	N	Freshwater Bay.		Camp		384639mE 6457649mN Zone 50 [Unreliable]	S02414
3650	S	O	N	Blackwall Reach, Bicton.		Water Source		384639mE 6456649mN Zone 50 [Unreliable]	S02264
3651	S	O	N	Blackwall Reach, Mosman Pk.		Water Source		384639mE 6457649mN Zone 50 [Unreliable]	S02265
3776	S	O	N	Indian Ocean	Mythological		*Registered Informant names available from DIA.	372624mE 6445362mN Zone 50 [Reliable]	S02169
21253	S	O	N	Mosman Park	Ceremonial, Mythological, Artefacts / Scatter, Historical, Grinding patches / grooves	Water Source	*Registered Informant names available from DIA.	382770mE 6456397mN Zone 50 [Reliable]	

Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System
Aboriginal Sites Database

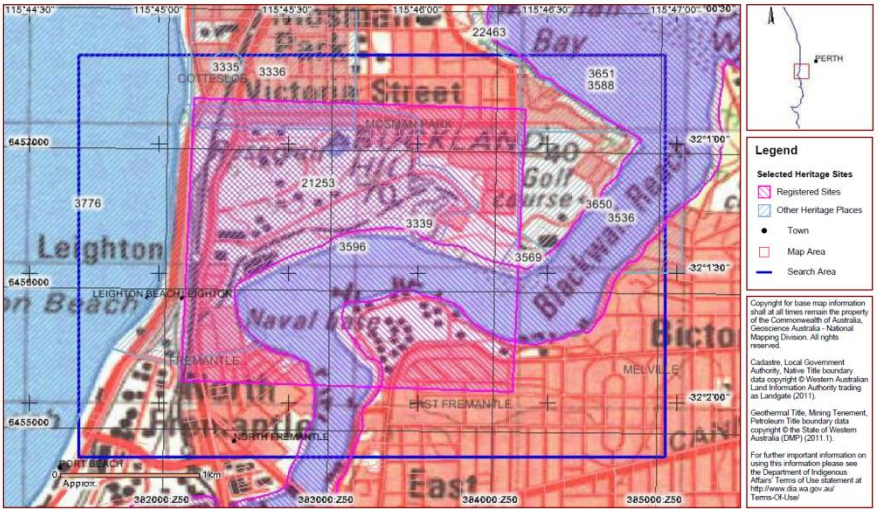
Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
22463	L	O	N	Mosman Bay Pinnacles	Mythological	Natural Feature	*Registered Informant names available from DIA.	383992mE 6457813mN Zone 50 [Reliable]	



Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System
Aboriginal Sites Database

Map Showing Registered Aboriginal Sites and Other Heritage Places



Appendix B: Results of Searches of MADS.

Maritime Archaeology Databases Search Results: Point Roe

Point Roe Box Barge 1

Museum Reference

wreck	Protected	Found	Inspected	File Number	Confidential
Point Roe Box Barge 1	Not protected State	Y	Y	376/77/3	NO

Artefact information

Full information about the Point Roe Box Barge 1

wreck	Point Roe Box Barge 1
When Lost	Unknown
Protected	Not protected State
Found	Y
Inspected	Y
Where Lost	Roe Point, Swan River
Latitude Max	-32.025783
Longitude Max	115.77301
Position Information	SkyView2004
Engine	N
Length	12.20
Beam	6.10
File Number	376/77/3
Sources	Colin Scrimshaw, Swan & Canning River Wrecks, Maritime Archaeology Association of Western Australia
Confidential	NO
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/point-roe-box-barge-1

Point Roe Box Barge 2

Museum Reference

wreck	Protected	Found	Inspected	File Number	Confidential
Point Roe Box Barge 2	Not protected State	Y	Y	376/77/3	NO

Artefact information

Full information about the Point Roe Box Barge 2

wreck	Point Roe Box Barge 2
When Lost	Unknown
Protected	Not protected State
Found	Y
Inspected	Y
Where Lost	Roe Point, Swan River
Latitude Max	-32.025477
Longitude Max	115.773317
Position Information	SkyView2004
Engine	N
Length	12.20
Beam	6.10
File Number	376/77/3
Sources	Colin Scrimshaw, Swan & Canning River Wrecks, Maritime Archaeology Association of Western Australia
Confidential	NO
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/point-roe-box-barge-2

Maritime Archaeology Databases Search Results: Rocky Bay

City of Perth

Museum Reference

wreck	Protected	Found	Inspected	File Number	Chart Number	Confidential
City of Perth	Protected State	Y	N	376/77/3	112,	NO

Artefact information

Full information about the City of Perth

wreck	City of Perth
When Lost	1890
Protected	Protected State
Found	Y
Inspected	N
Where Lost	Rocky Bay, Swan River
Latitude Max	-32.029517
Longitude Max	115.7573
Position Information	GPS2004
Engine	N
Country Built	Unknown
When Built	1872
Length	26.40
Sinking	Untraced
Builder	Lawrence and Randell
File Number	376/77/3
Chart Number	112,
Confidential	NO
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/city-perth

Mayfield

Museum Reference

wreck	Protected	Found	Inspected	File Number	Confidential
Mayfield	Not protected State	Y	Y	376/77/3	NO

Artefact information

Full information about the Mayfield

wreck	Mayfield
When Lost	1945
Protected	Not protected State
Found	Y
Inspected	Y
Where Lost	Rocky Bay, Swan River
Latitude Max	-32.029461
Longitude Max	115.757407
Position Information	GPS2004
Engine	2 engines
Length	22.00
Beam	5.00
File Number	376/77/3
Comments	Was used to take the shields for the 6" guns over to Rottnest in WW II.
Sources	Colin Scrimshaw, Swan & Canning River Wrecks, Maritime Archaeology Association of Western Australia
Confidential	NO
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/mayfield

Maritime Archaeology Databases Search Results: Point Direction

Unidentified wreck No. 1 Swan River

Museum Reference

wreck	Protected	Found	Confidential
Unidentified wreck No. 1 Swan River	Not protected State	Y	N

Artefact information

Full information about the Unidentified wreck No. 1 Swan River

wreck	Unidentified wreck No. 1 Swan River
Protected	Not protected State
Found	Y
Where Lost	Point Direction, Pier 21 area
Latitude Max	-32.032535
Longitude Max	115.760657
Position Information	Aerial GIS
Comments	Noted on Landgate Metro Mosaic 1965
Confidential	N
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/unidentified-wreck-no-1-swan-river

Unidentified wreck No. 2 Swan River

Museum Reference

wreck	Protected	Found	Confidential
Unidentified wreck No. 2 Swan River	Not protected State	Y	N

Artefact information

Full information about the Unidentified wreck No. 2 Swan River

wreck	Unidentified wreck No. 2 Swan River
Protected	Not protected State
Found	Y
Where Lost	Point Direction, Pier 21 area
Latitude Max	-32.03314
Longitude Max	115.760653
Position Information	Aerial GIS
Comments	Noted on Landgate Metro Mosaic 1965
Confidential	N
URL	http://www.museum.wa.gov.au/maritime-archaeology-db/wrecks/unidentified-wreck-no-2-swan-river

Eva

Museum Reference

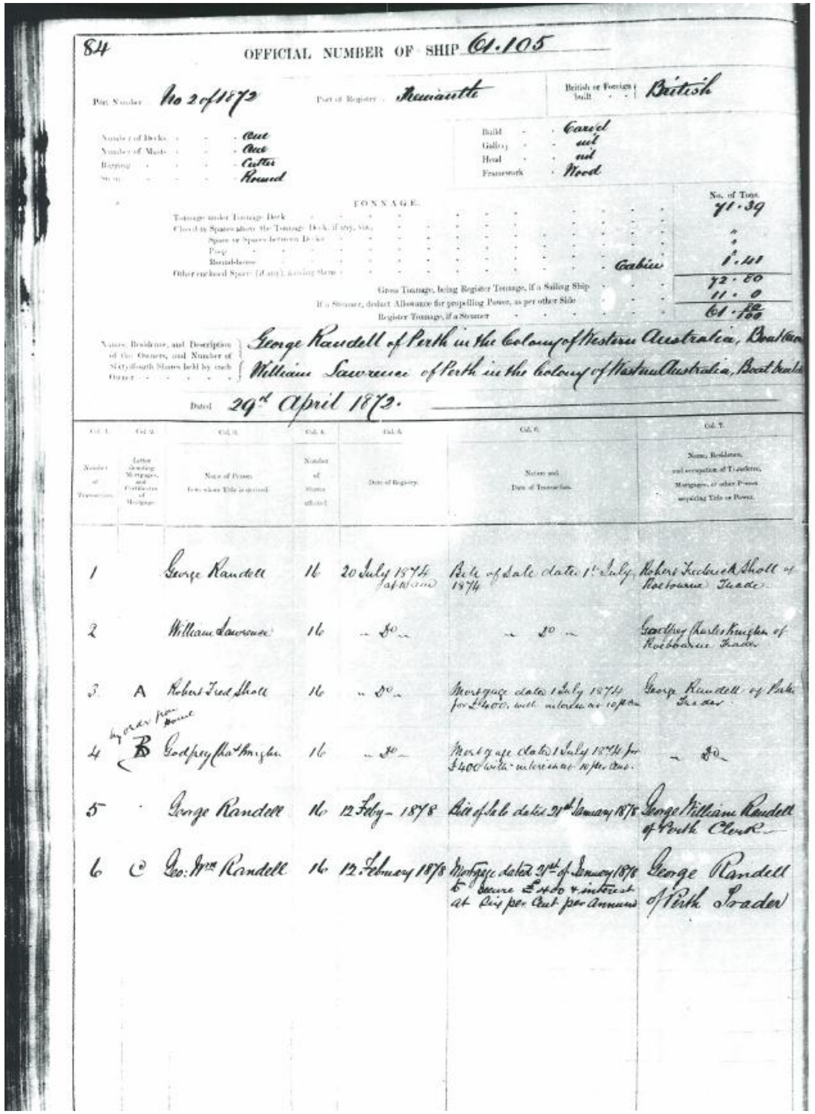
wreck	Protected	Found	Inspected	Official Number	Registration Number	File Number	Confidential
Eva	Not protected State	Y	N	120032	8/1907	376/77/3	NO

Artefact information

Full information about the Eva

wreck	Eva
Protected	Not protected State
Found	Y
Inspected	N
Where Lost	Jetty at Point Direction
Latitude Max	-32.033133
Longitude Max	115.760476
Position Information	Chart
Engine	N
TONA	50.84
TONB	40.24
Country Built	WA
Port Built	Perth
When Built	1897
Port Registered	Fremantle
Official Number	120032
Registration Number	8/1907
Length	29.20
Beam	7.60
Draft	2.50
Owner	McIlwraith & McEacharn Co.Ltd, Melbourne
Builder	W. & S. Lawrence
File Number	376/77/3
Sources	Colin Scrimshaw, Swan & Canning River Wrecks, Maritime Archaeology Association of Western Australia
Confidential	NO
URL	http://museum.wa.gov.au/maritime-archaeology-db/wrecks/eva-1-2

Appendix C: Ships Papers: *City of Perth*



84 OFFICIAL NUMBER OF SHIP 61.105

Port Number: No 2 of 1872 | Port of Registry: Fremantle | British or Foreign built: British

Number of Decks: One | Number of Masts: One | Rigging: Cutter | Stern: Round

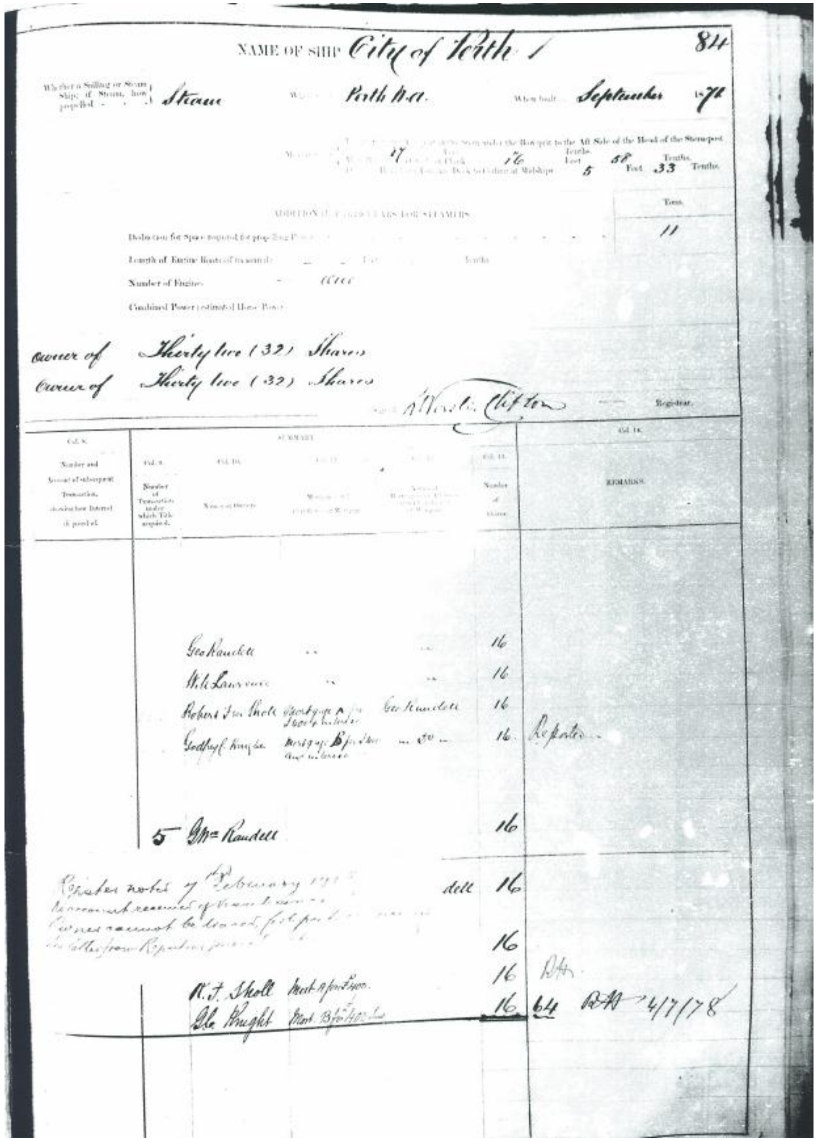
Build: Carvel | Galleries: nil | Head: nil | Framework: Wood

TONNAGE		No. of Tons
Tonnage under Tonnage Deck		71·39
Closed-in Spaces above the Tonnage Deck, if any, viz.:		
Space or Spaces between Decks		"
Poop		"
Roundhouse		
Other enclosed Space (if any), naming them	Cabin	1·41
Gross Tonnage, being Register Tonnage, if a Sailing Ship		72·80
If a Steamer, deduct Allowance for propelling Power, as per other Side		11·0
Register Tonnage, if a Steamer		61·80/100

Names, Residence, and Description of the Owners, and Number of Sixty-fourth Shares held by each Owner: George Randell of Perth in the Colony of Western Australia, Boatbuilder; William Lawrence of Perth in the Colony of Western Australia, Boatbuilder

Dated 29th April 1872.

Col. 1 Number of Transaction	Col. 2 Letter denoting Mortgages, and Certificates of Mortgage	Col. 3 Name of Person from whom Title is derived	Col. 4 Number of Shares affected	Col. 5 Date of Registry	Col. 6 Nature and Date of Transaction	Col. 7 Name, Residence, and occupation of Transferee, Mortgagee, or other Person acquiring Title or Power
1		George Randell	16	20 July 1874 at [illegible]	Bill of Sale dated 1st July 1874	Robert Frederick Sholl of Roebourne Trader
2		William Lawrence	16	do	do	Godfrey Charles Knight of Roebourne Trader
3	A	Robert Fred Sholl	16	do	Mortgage dated 1 July 1874 for £400, with interest at 10 p.c.	George Randell of Perth Trader
4	B (by order from home)	Godfrey Chas Knight	16	do	Mortgage dated 1 July 1874 for £400 with interest 10 per cent.	do
5		George Randell	16	12 Feby 1878	Bill of Sale dated 21st January 1878	George William Randell of Perth Clerk
6	C	Geo: Wm Randell	16	12 February 1878	Mortgage dated 21st of January 1878 to secure £400 + interest at six per Cent per Annum	George Randell of Perth Trader



NAME OF SHIP City of Perth 84

Whether a Sailing or Steam Ship; if Steam, how propelled: Steam | Where built: Perth W.A. | When built: September 1871

Tons: 11

Number of Engines: One

Owner of Thirty two (32) Shares
Owner of Thirty two (32) Shares

[illegible] Clifton, Registrar.

Col. 8 Number and Account of subsequent Transaction	Col. 9 Number of Transaction under which Title acquired	Col. 10 Name of Owners	Col. 11 Number of Shares	Col. 14 REMARKS
		Geo Randell	16	
		Wm Lawrence	16	
		Robert Fred Sholl — Mortgage A for £400 interest — Geo Randell	16	
		Godfrey C Knight — Mortgage B for £400 interest — do	16	Repaid
	5	Geo Wm Randell	16	
Register noted 7th February 1878 [illegible]		ditto	16	
			16	
			16	BH
		R.F. Sholl — Mort. A for £400. / G.C. Knight — Mort. B for £400	16 / 64	BH 4/7/78

Official Number.	Name of Ship.	Tonnage.	Whether Steam or Sailing Ship.	Port of Registry.	Date of Registry.	Occasion of Appropriation.	Date of Appropriation.
61090	Two Sons	11.6	Sailing	Newcastle	14 Dumby	First Registry	14 Dumby 69
61091	Two Ladies	24.11	"	"	"	"	"
61092	Premier	51.63	"	"	14 Sept 69	-50-	14 Sept 69.
61093	Adur	26.23	"	"	7 April 70	-60-	7 April 70
61094	Dawn	63.14	"	"	7 Apl 70	60	7 April 70
61095	Gipsey	27.25	"	"	14 Apl 70	60	14 April 70
61096	Neptune	21.98	"	"	25 Apl 70	-60-	25 April 70
61097	Governor Weld	18.12	"	"	25 August 70	50	25 aug 70
61098	Annie	6.91	"	"	2 Sept 70	-50-	2 Sept 70
61099	Ethel	14 —	"	"	10 Decr 1870	-60-	10 Decr 1870
61100	Surprise	28 16/100	—	"	31 Dec 1870	50	31 Dec 71
61101	Bannagara	16 49/100	—	—	27 Feb 71	50	3 Feb 71
61102	Amy	32 66/100	"	"	28 Feby 71	60	28 Feby 71
61103	Azelia	85 14/100	"	"	3 May 1871	60	3 May 71
61104	Clarice	15.7/100	"	"	17 Nov 71	-50-	17 Nov 71
61105	City of Perth	72.21/100	P Steamer	—	29 April 72	-50-	29 April 72
61106	Olga Jane	31.30	Sailing	—	17 Jany 73	-50-	17 Jany 73
61107	Moonlight	21.45	-50-	"	16 April 73	-50-	16 April 73

Appendix D: Historic Aerial Photography

Rocky Bay Ca. 1939 (Source APACE)

Rocky Bay June 1949 (Source: Department of Land Administration WA SVY570 Navy Store Preston Point Fremantle No. 2 10 Jun 1949 5000')

Rocky Bay August 1958 (Source: Department of Land Administration WA 457 Metro regional Run 27 (34-74), 3750’ 6” Aug 1958 27/21)

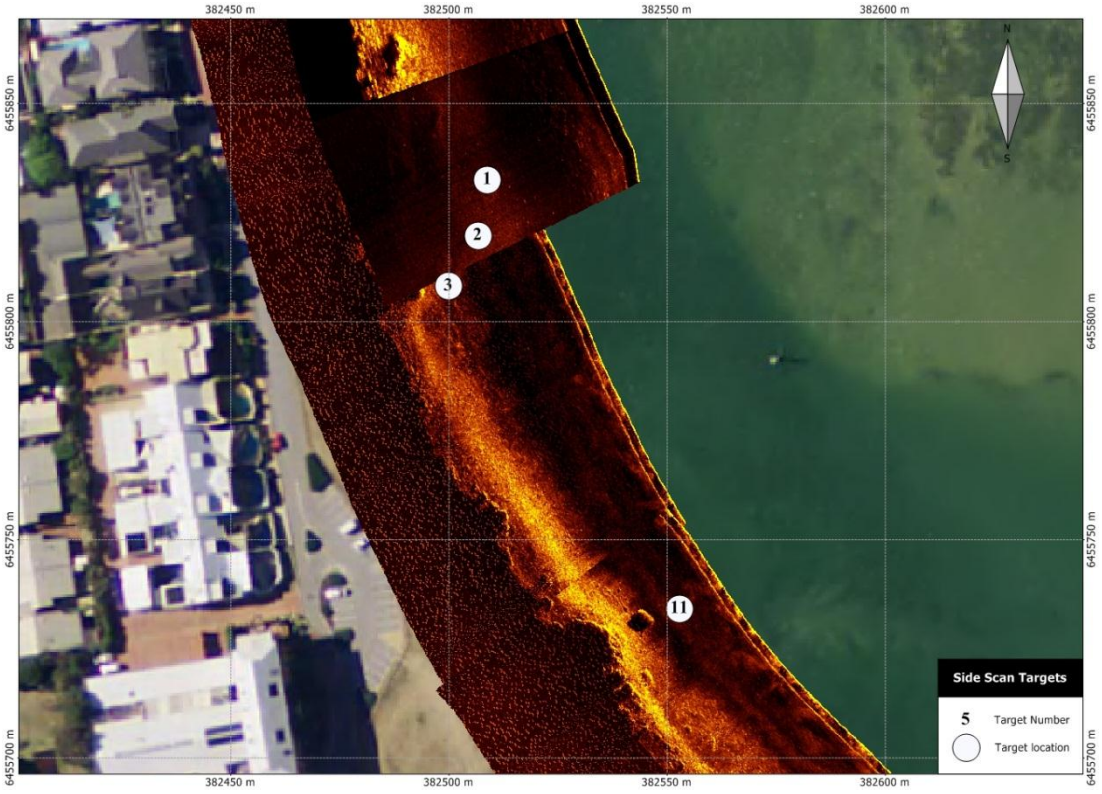
Rocky Bay June 1959 (Source: Department of Land Administration WA 534 Z Metro Regional Run 26 (39-79) 3750’ 6” Jun 1959 26/77)

Rocky Bay 1963 (Source: Department of Land Administration WA 838 Wanneroo- Lake Clifton Run 22 (5179-5198) 7000’ 6” 13-10-63 Frame 5180)

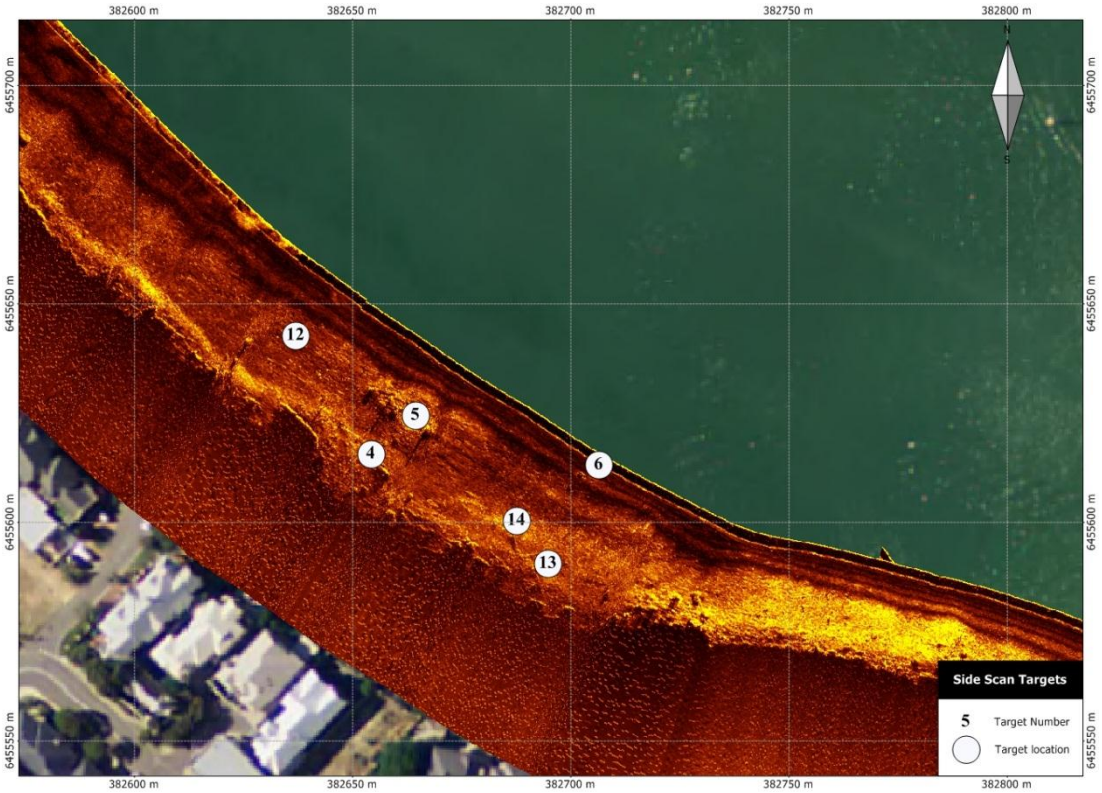
Appendix E: Side Scan Imagery

Side Scan Targets identified during project

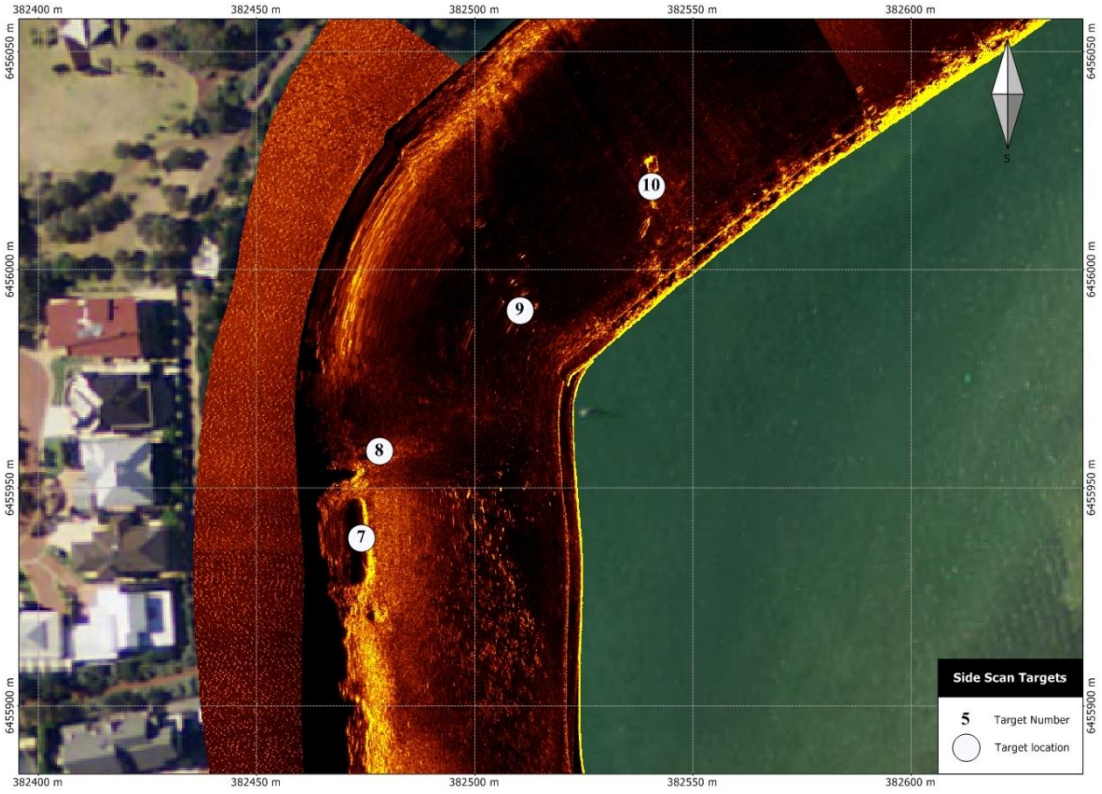
No.	Easting mE	Northing mN	Description based on side scan image	Result
1	382509	6455832	1m diameter object	Nil found
2	382507	6455820	2.5 x 3.8m rectangular object	Nil found
3	382500	6455808	2 x 5m objects in line on NW-SE axis	Limestone blocks
4	382654	6455616	*City of Perth*	Sunken vessel *City of Perth*
5	382664	6455625	*Mayfield*	Sunken vessel *Mayfield*
6	382706	6455613	Circular object 33m East of Mayfield	Large tractor tyre
7	382474	6455939	20m long shape which gives off shadow on side scan	Limestone ledge
8	382478	6455958	Object - gives off shadow on side scan	Nil found
9	382510	6455991	Unknown shape maybe 6m in length	Nil found
10	382540	6456019	Large object may be boat hull reflection off passing vessel	Nil found
11	382552	6455734	4m barrel shape	Large limestone block from cliff face
12	382636	6455642	Shadow near shore	Nil found
13	382694	6455590	Regular tube shape object 10m long and bent	Overlapping sections of railway track
14	382688	6455600	Small shape about 1m	Nil found
15	382679	6456128	Clutter below hard straight contacts	Construction steel and general metal debris



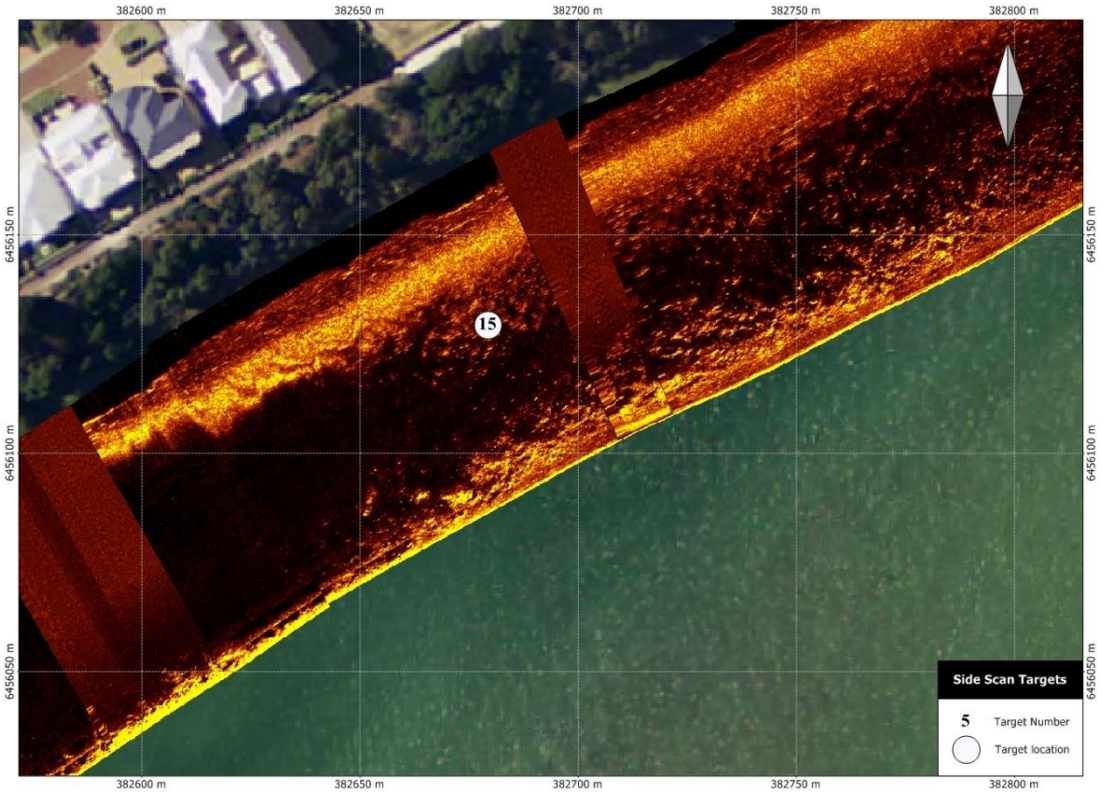
Side scan targets 1, 2, 3, and 11.



Side scan targets 4-6, 12-14.



Side scan targets 7-10.



Side scan target 15.

Appendix F: Waypoint Data from Terrestrial Survey

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
1	382989	6456307	Erosion of limestone detritus edge. Bricks observed at base (rubble overburden). 382 989mE 6456305mN +/- 7m. Bank now 10m Top to water at angle of 60 degrees	Bricks	Northern Embankment	Construction
2	382929	6456280	Bricks	Bricks	Northern Embankment	Construction
3	382927	6456280	Bricks	Bricks	Northern Embankment	Construction
4	382925	6456274	Bricks	Bricks	Northern Embankment	Construction
5	382926	6456273	2m long pipe fitting approx. 30cm dia. Flat metal plates at each end.	Iron	Northern Embankment	Construction
6	382907	6456273	Mt Lyell Jetty	Target	Northern Embankment	Jetty?
7	382915	6456275	Tyre	Other	Northern Embankment	
8	382895	6456269	Drum; 25cm diameter concrete steel reinforced drainpipe with brown glazed clay angle joint. This leads onto a concrete base supported on either side by re-used railway track, now used as posts. There is a lot of railway track that has been reused but is now corroded.	Feature	Northern Embankment	Drain
9	382870	6456250	Limestone blocks and metal blocks; metal "bucket" with scale, curved hollow metal	Iron / Limestone	Northern Embankment	Industrial by-product/discard
10	382850	6456247	Feature; red Brick and rail rubble at base of embankment; bricks continue into the water but most are on the water's edge. There is a wooden plank feature coming out of the embankment. Made several overlapping longboards jarrah over 4 metres long; 200mm wide and 30mm think. Bricks have "Curdup" impressed on one side. Bricks continue down from above. Once again rail reused as structural supports. Building rubble across a 20m wide area across base of embankment.	Bricks	Northern Embankment	Construction

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
11	382844	6456247	Stairs noted in this location from aerial photos in this location - concrete / blue metal and rail used as structural steel. More brick debris and corrugated iron sheeting observed on embankment but well covered by vegetation. Limestone with mortar also observed on embankment above 'stairs'. Parts of embankment eroded here - previous features may be an effective embankment stabilizer.	Feature	Mt Lyell Chemicals	Stairs
12	382838	6456242	Circular metal post corroded near end of brick rubble area of waypoints 15 and 16.	Iron	Northern Embankment	Industrial by-product/discard
13	382815	6456229	Large metal 'hoop' or 'ring' in water in shallows. Approximately 1.05m diameter and metal is 2cm thick. This is located just on the edge of the drop off into deep water channel.	Iron		Industrial by-product/discard
14	382814	6456234	Adjacent waypoint 18 miscellaneous metal angle iron and bricks.	Iron & Bricks		Industrial by-product/discard
15	382813	6456236	Adjacent Waypoint 19, bent metal rod with machined hole in the end. More evidence of corroded metal pieces and rust staining on limestone rubble at this location.	Iron		Industrial by-product/discard
16	382803	6456233	3.7m long rail track (with concrete on it) at base of the embankment	Iron		Industrial by-product/discard
17	382801	6456223	Pile of limestone and brick debris in shallows.	Bricks	1942 Slipway	Construction
18	382790	6456222		Other	1942 Slipway	
19	382690	6456170	Row 1; Pile 1	Target	1942 Slipway	Slipway
20	382692	6456167	Row 2; Pile 1	Target	1942 Slipway	Slipway
21	382694	6456163	Row 3; Pile 1	Target	1942 Slipway	Slipway
22	382689	6456161	Row 3; Pile 2	Target	1942 Slipway	Slipway
23	382687	6456165	Row 2; Pile 2	Target	1942 Slipway	Slipway
24	382683	6456169	Row 1; Pile 2	Target	1942 Slipway	Slipway
25	382678	6456168	Row 1; Pile 3	Target	1942 Slipway	Slipway
26	382681	6456164	Row 2; Pile 3	Target	1942 Slipway	Slipway
27	382684	6456160	Row 3; Pile 3	Target	1942 Slipway	Slipway
28	382679	6456159	Row 3; Pile 3	Target	1942 Slipway	Slipway
29	382677	6456162	Row 2; Pile 3	Target	1942 Slipway	Slipway

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
30	382675	6456166	Row 1; Pile 3	Target	1942 Slipway	Slipway
31	382671	6456163	Row 1; Pile 4	Target	1942 Slipway	Slipway
32	382673	6456159	Row 2; Pile 4	Target	1942 Slipway	Slipway
33	382676	6456156	Row 3; Pile 4	Target	1942 Slipway	Slipway
34	382672	6456154	Row 3; Pile 5	Target	1942 Slipway	Slipway
35	382670	6456157	Row 2; Pile 5	Target	1942 Slipway	Slipway
36	382668	6456162	Row 1; Pile 5	Target	1942 Slipway	Slipway
37	382665	6456157	Row 1; Pile 6	Target	1942 Slipway	Slipway
38	382668	6456153	Row 3; Pile 6	Target	1942 Slipway	Slipway
39	382663	6456157	Metal Ring	Iron	1942 Slipway	Industrial by-product/discard
40	382664	6456152	Metal ring	Iron	1942 Slipway	Industrial by-product/discard
41	382667	6456156	Small metal ring adjacent bricks	Iron & Bricks	1942 Slipway	Industrial by-product/discard
42	382668	6456151	Tyre	Other	1942 Slipway	
43	382669	6456152	Metal rod extending into drop off	Iron	1942 Slipway	Industrial by-product/discard
44	382670	6456153	"U" shape metal ladder rung	Iron	1942 Slipway	Industrial by-product/discard
45	382698	6456170	Metal rail, round metal plate	Iron	1942 Slipway	Industrial by-product/discard
46	382701	6456168	Metal cylinder	Iron	1942 Slipway	Industrial by-product/discard
47	382697	6456174	Metal cylinder	Iron	1942 Slipway	Industrial by-product/discard
48	382700	6456176	Metal ring	Iron	1942 Slipway	Industrial by-product/discard
49	382701	6456173	Metal ring	Iron	1942 Slipway	Industrial by-product/discard
50	382706	6456181	Round metal feature about 75cm in diameter - Possible flange seals or hatch covers.	Iron	1942 Slipway	Industrial by-product/discard
51	382710	6456180	Round metal feature about 75cm in diameter - Possible flange seals or hatch covers.	Iron	1942 Slipway	Industrial by-product/discard

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
52	382711	6456180	Metal drum	Iron	1942 Slipway	Industrial by-product/discard
53	382708	6456180	Metal collar	Iron	1942 Slipway	Industrial by-product/discard
54	382707	6456181	Round metal feature, same but smaller than waypoint 55 & 56	Iron	1942 Slipway	Industrial by-product/discard
55	382712	6456181	Round metal feature, same but smaller than waypoint 55 & 56, but with hole in centre and adjacent to concrete block. Adjacent to these is a metal (??) block.	Iron	1942 Slipway	Industrial by-product/discard
56	382716	6456183	2 metal buckets; 1 metal ring; 2 x rectangular metal blocks; 2 x metal rods; 1 metal disc.	Iron	1942 Slipway	Industrial by-product/discard
57	382721	6456189	Collection of rods; some brickwork and angle iron, metal bolts.	Iron & Bricks		Construction
58	382724	6456188	Circular metal feature with brick inside	Iron & Bricks		Industrial by-product/discard
59	382730	6456188	Metal rod	Iron		Industrial by-product/discard
60	382733	6456193	Metal collar approximately 50cm diameter	Iron		Industrial by-product/discard
61	382740	6456196	Metal hoop 75-100cm in diameter with rail adjacent	Iron		Industrial by-product/discard
62	382744	6456198	Metal rail	Iron		Industrial by-product/discard
63	382752	6456202	Metal rail	Iron		Industrial by-product/discard
64	382764	6456206	Metal hoop 75cm in diameter	Iron		Industrial by-product/discard
65	382770	6456211	50cm rail piece	Iron		Industrial by-product/discard
66	382713	6456184	Round metal feature about 75cm in diameter - Possible flange seals or hatch covers.	Iron		Industrial by-product/discard
67	382629	6456139	Metal rod and angle iron; 5 small metal collars of 20cm diameter; metal rail; metal ring 50cm diameter	Iron		Industrial by-product/discard
68	382637	6456140	Metal cylinder	Iron		Industrial by-product/discard

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
69	382638	6456141	2 metal rods; 1 metal ring; square metal sheet 50cm x 50cm	Iron		Industrial by-product/discard
70	382641	6456143	Cast metal cam	Iron		Industrial by-product/discard
71	382653	6456144	Circular metal piece - may be a 44 gallon drum looking top down	Iron		Industrial by-product/discard
72	382654	6456151	Circular metal piece with riveted edge half buried at angle.	Iron		Industrial by-product/discard
73	382658	6456149	square limestone block	Other		Construction
74	382659	6456149	Metal ring; 2m long metal pipe with conglomerate at one end - most likely a post with concrete base.	Iron		Industrial by-product/discard
75	382633	6456138	Metal rod	Iron		Industrial by-product/discard
76	382612	6456127	3m diameter pile of brick and construction rubble; metal rods	Iron & Bricks		Construction
77	382593	6456119	Metal post and concrete base on its side underwater	Iron		
78	382582	6456112	Metal post and concrete base	Iron		Post
79	382530	6456083	2.25m pipe with riveting flanges at either end	Iron		Industrial by-product/discard
80	382495	6456056	End of limestone block stabilisation	Feature		Bank stabilisation
81	382485	6456049	Rail embedded vertically in intertidal zone	Iron		
82	382451	6456000	Meteor Cave	Feature	Meteor Cave	Former Boat House
83	382449	6455989	Concreted metal piece that has been hammered into limestone platform	Iron		
84	382454	6455973	Metal rail (50cm long) on a limestone rock.	Iron		Industrial by-product/discard
85	382467	6456025	Vertical metal post in water - not a rail	Iron		
86	382993	6456313	Red Brick Rubble	Bricks	Northern Embankment	Construction
87	382991	6456313	Red Brick Rubble; rusting metal	Iron & Bricks	Northern Embankment	Construction
88	382991	6456313	Red Brick Rubble, corroding metal pipes, concrete	Iron & Bricks	Northern Embankment	Construction
89	382989	6456312	Concrete within rusting drum	Iron	Northern Embankment	
90	382990	6456313	Red bricks and concrete high on slope	Bricks	Northern Embankment	Construction
91	382986	6456311	Rusting Iron fasteners; red brick with "COOMER" imprinted	Iron & Bricks	Northern Embankment	Construction
92	382937	6456288	Rusting metal hoop fragment	Iron		Industrial by-

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
						product/discard
93	382929	6456284	Concrete iron fasteners, metal rods fragments; concrete	Iron		Fasteners
94	382928	6456283	Large piece of concrete	Other		
95	382923	6456282	Fibre board piece	Other		
96	382865	6456256	Upturned Red brickwork on slope	Bricks	Northern Embankment	Construction
97	383009	6456333	Roughly hewn limestone block	Other	Mt Lyell pumping station	
98	383219	6456426	Embankment at Mt Lyell Pumping Station	Feature	Mt Lyell pumping station	
99	383227	6456421	Limestone blocks in water at Mt Lyell Pumping Station	Target	Mt Lyell pumping station	
100	383260	6456426	Drain	Feature	Drain	Drain
101	383277	6456429	Rusting hoop fragment	Iron		Industrial by-product/discard
102	383286	6456429	Section of dislodged red brickwork	Bricks		Construction
103	383290	6456429	Concrete cylindrical object (roller??) with iron axle through centre	Other		
104	383339	6456431	Rusting iron rod in shallows	Iron		Construction
105	383341	6456431	Brickwork in water	Bricks		Construction
106	383349	6456431	Concrete in shallows	Other		Construction
107	383460	6456419	Iron hoop in shallows	Iron		Industrial by-product/discard
108	383491	6456419	Limestone block wall	Feature		
109	383491	6456419	Minim Cove jetty	Feature	Jetty	Jetty
110	382759	6455576	Concrete formwork on river edge	Feature	Ship Breaking Point	
111	382761	6455579	Long piece of rail	Iron	Ship Breaking Point	
112	382765	6455577	Long piece of rail	Iron	Ship Breaking Point	
113	382845	6455523	Old road surface leading around base of cliff to wrecking point.	Feature	Ship Breaking Point	Access Road
114	382672	6456153	Metal rods, Pile of corroded metal angle iron.	Iron		Industrial by-product/discard
115	382673	6456152	Large metal drum, approx. 1m diameter	Iron		Industrial by-product/discard
116	382685	6456459	Metal rod leading into drop off	Iron		Industrial by-product/discard
117	382685	6456156	Circular metal plate	Iron		Industrial by-product/discard

Waypoint Number	Easting (mE)	Northing (mN)	Description	Raw Material Type	Associated Feature	Function
118	382680	6456157	Angel iron adjacent end of Row 3 East, Long rod and metal sheet 200mm wide	Iron		Industrial by-product/discard