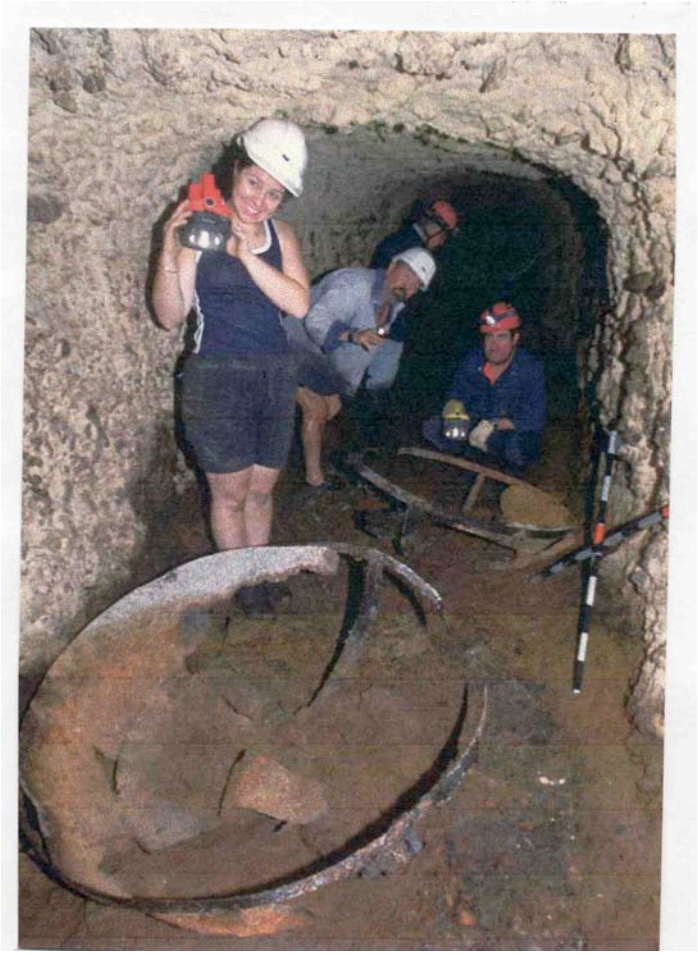
Watercraft
In
The old Fremantle Prison Tunnels

Maritime Heritage Site Inspection Report



B. Coley, M. McCarthy, V. Richards
With assistance from P. Baker, K. Holsgrove and G. Gammie
2004

Report - Dept. of Maritime Archaeology
WA Maritime Museum, No 191.

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Acknowledgments

This inspection was initiated and supported by staff of the Fremantle Prison Heritage Unit, notably Mr Graeme Gammie, CEO, Mr Beresford Coley, Precinct Manager and Mr Rob Besford Cataloguer.

Introduction

The purpose of this site inspection was to make a preliminary assessment of the extent and status of formerly submerged remains of what appear to be 'watercraft' in the tunnels at the Fremantle Prison and to produce a photographic record of the sites and any associated materials.

Background

Excerpts: From the records of the Fremantle Prison

Site Name: Prison Tunnels watercraft

File Name: Fremantle Prison Tunnels **File No**: MA 503/01

According to records supplied for the purposes of this study, the first wells dug at the Fremantle Prison in 1852 served solely to supply the needs of the Convict Establishment. The town of Fremantle also supplied its own needs by sinking wells, with the 'Water House Well' at South Beach used to fill casks for ships.

In 1874 'Water House Well' was damaged by a storm, forcing ship's suppliers to look elsewhere for water. Soon they turned to the Prison as an alternative source and a holding tank was constructed in the yards at the rear of the Main Cell Block. Pumps, manned by prisoners, were used to fill the tank with water, which was then gravity-fed by pipes, down through Fremantle, to the Jetties where ships berthed. At that time both the South Jetty and nearby Ocean Jetty were in operation.

The Prison Records also show that increased shipping produced a requirement for more water and in 1876 a reservoir was constructed, using Prison labour, on the South Knoll of the Prison. Prisoners manning pumps filled the tank at the rear of the Main Cell Block from this. Water from the tank was then gravity-fed by pipes to the Ocean Jetty, which by then had been extended to form the Long Jetty—then the main port-related structure at Fremantle.

In 1888 three new wells were commenced connecting with shafts, drives & tunnels driven underground in the north east of the Prison yard. This stage was completed in 1894. Water from this complex was delivered by a steam-driven 'beam engine' capable of raising 15,000 gallons per hour, to a new storage facility at the Prison, called the East Reservoir. In 1896 a town reservoir was constructed in Swanbourne Street, Fremantle, using Prison labour and this was filled with water pumped from the Prison. By 1897, when the entire facility had been completed, a triple expansion steam-driven pump capable of lifting more than 1 million gallons per day from the tunnels was in operation.

The focus of the convict labourers then shifted to cutting firewood and stoking boilers that fed the pumps.
The Pumping Station, located at the northern end of the East Workshop area, was excised from Prison control in 1901 such that the water authority, then the Metropolitan Sewerage & Water Supply, could operate independently of the Prison. It reverted back to Prison control in 1910 when both it and the town were connected to the Metropolitan water scheme, which was supplied from dams in the Darling Ranges.
Little appears known about activities in the tunnels after that time, though a plan dated 5 August 1921 headed *M.W.S.S & B.U. 'Plan showing Drives and Shafts at Pumping Station Fremantle'* reflects the Metropolitan Sewerage & Water Supply Department's continued interest in the facility, possibly as a reserve supply. The Prison continued to use ground water for its own garden needs up until 1989 when it became polluted by an oil leakage from nearby tanks. This 1921 plan was located when the present-day Department of Housing and Works took over the entire prison facility, including the tunnels in 1991/92. Using bioremediation, it took until 1996 to clear the pollution from the water in the tunnels.
The remains of the water supply facilities and the tunnels themselves have been, in recent times, the subjects of on-going study by heritage interests, partly as a result of plans to facilitate public access to the area. It was during this familiarization process that a visit conducted in late 2003, whilst water-levels were recorded at their lowest. What are believed to be 'water-craft' were seen along with other cultural deposits, some apparently dating back to the 'convict-era'. This discovery led to the February 2004 site inspection below.

Technical Data:

Date of Inspection: 20 February 2004

Personnel:

Fremantle Prison Staff

Mr. Beres Coley: Precinct Manager, Fremantle Prison
Mr.Graeme Gammie: Executive Manager, Fremantle Prison

WA Maritime Museum personnel

Mr Patrick Baker: Photographer, Department of Maritime Archaeology,
Ms Katie Holsgrove: Volunteer .
Dr. Michael McCarthy: Curator of Maritime Archaeology.
Ms Vicki Richards: Conservation Scientist: Department of Conservation, WA Museum.

The Inspection

At about 10 am on 20 February 2004 a site Inspection Team comprising a photographer, conservation scientist, volunteer and maritime archaeologist/historian joined the CEO, Precinct Manager and other Fremantle Prison staff entering the tunnel complex at the old Fremantle Prison, now a heritage precinct. The tunnels, with a total length of about 1 km, are located about 20 metres below the surface in limestone rock. The principal purpose of the inspection was to view recently located objects, possibly submerged 'watercraft', that were considered by Prison staff to be of maritime archaeological interest. These had not been seen on previous visits when water levels in the tunnel complex were about 30 to 50 cm higher.

This second inspection was doubly warranted given the desire of the Department of Housing and Works to open the southern area of the tunnels for heritage tours, with a projected start during 2004. Clearly, all cultural deposits and site works found in the facility needed to be accounted for before that time. This would require a set of suitable strategies being established for the purposes of better management and interpretation of the place, the structures and artefacts within.

Following an orientation briefing, the group entered the tunnel system via shaft S1, a complex of laddered, plank-covered platforms interspersed with heavy girders, piping and the accoutrements of earlier decades. Evocative of past engineering activity, it also included the remains of modern equipment designed to combat the effects of the 1990s pollution and to ensure that a safe air supply was available. Descending about 20 m to the floor and then proceeding south towards Shaft S7, the group inspected fixtures located in and at the base of the shaft. Extending up to the surface, this is expected to become the main entry for future tours. Being replete with evidence of past engineering activity, again its potential as an industrial archaeological site was clearly apparent. From there the group proceeded into the inundated regions.

GENERAL ENVIRONMENT

While some of the tunnels were dry others contained varying levels of fresh water. The atmosphere was damp and the relative humidity was considered to be very high. The substrate into which the tunnels were driven appears to be strong, well aggregated porous limestone, which is easily damaged. The water level in the tunnels was relatively low during the inspection period allowing access to some features and cultural materials that are usually difficult to inspect when the water levels are higher. Through-water visibility was surprisingly good allowing objects in the water column to be clearly seen.

Figure 1. Two of the inspection team travelling in the tunnels. (WA Newspapers)

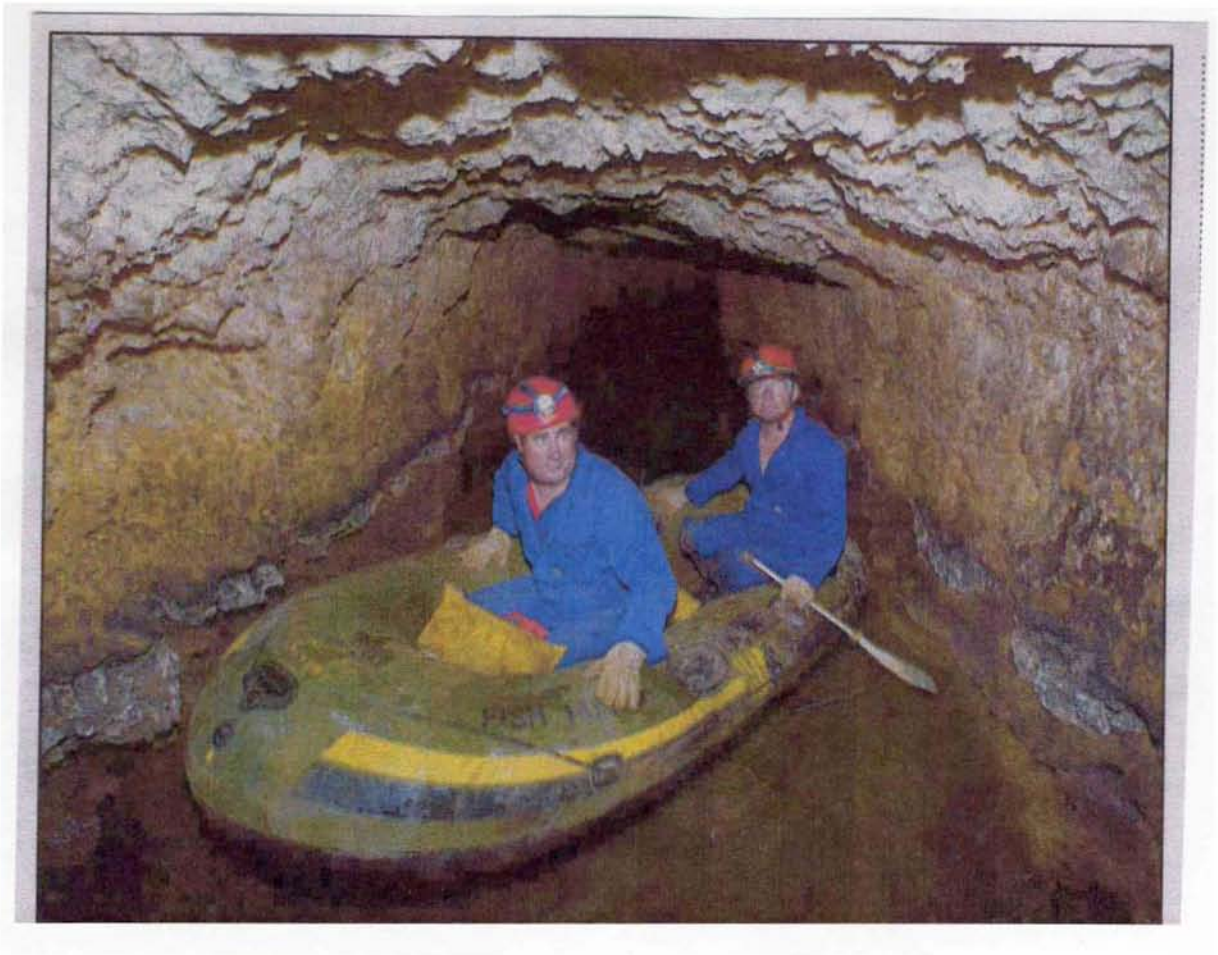
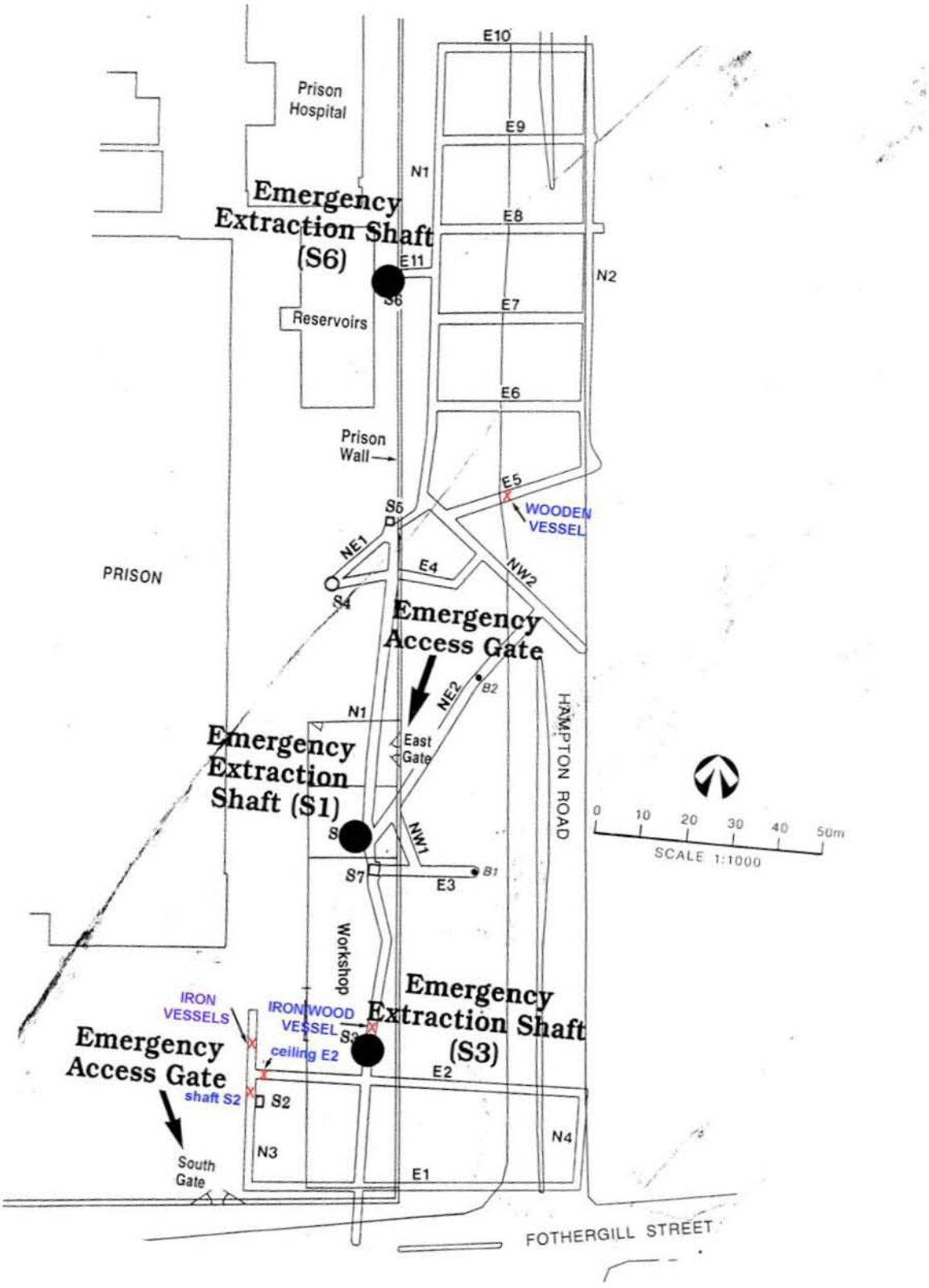


Figure 2. The Dames and Moore plan showing the progress of the inspection team as described below.



The sediment in the inundated tunnels consists of very fine particulate material, which produced zero through-water visibility when disturbed. It is anaerobic, indicating an essentially 'reducing' environment. Hydrogen sulphide and other polysulphides, formed by sulphate reducing bacteria present in the sediment, are released when the sediment is disturbed, and it is easily detected nasally. In addition, and despite the implementation of a rigorous clean-up process lasting a number of years following the diesel oil spill outlined above, there has been a lasting contamination of the catchment. Petroleum hydrocarbons have been physically adsorbed onto the fine sediment particles and they are released on physical disturbance of the sediment.

Nonetheless, due to the combination of the fresh water with these anaerobic sediments, organic material and to a lesser extent, metal objects are expected to be quite well preserved if buried in the sediment and/or totally immersed in the water column.

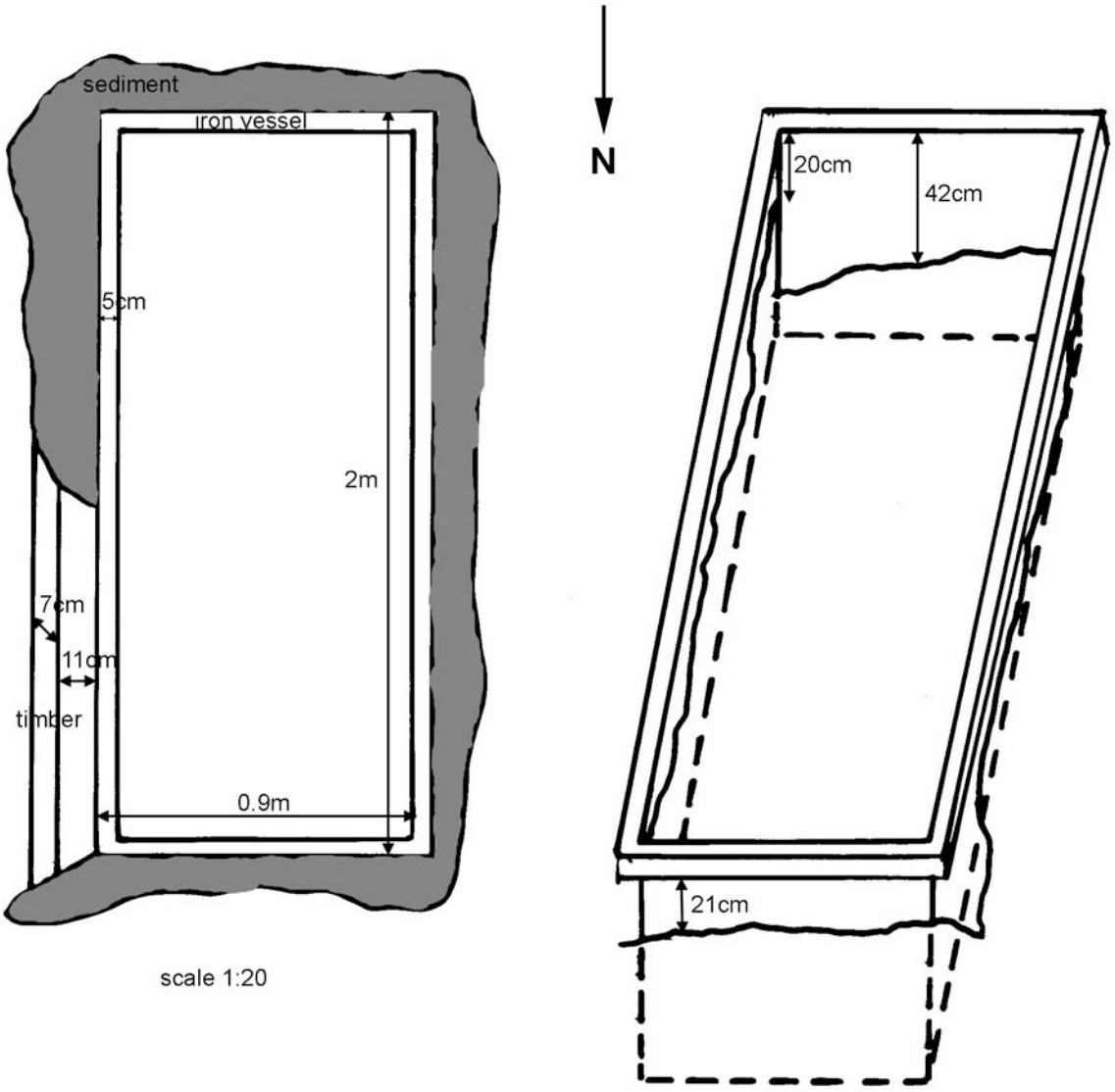
Where recently exposed by the drop in water levels, the surface of the sediment, however, had oxidised forming a thin red/brown encrusting surface layer overlying the typical black, anaerobic sediment. Hence, the exposure of any metals or organics to the atmosphere in the tunnels would cause accelerated degradation of these materials. Nonetheless, the extent of this degradation is expected to be far less than that experienced in most other underwater archaeological environments (e.g. the sea).

An iron or steel tank or 'vessel'

Following the inspection of Shafts S1 and S7, the group boarded inflatable rafts and proceeded over water through Tunnel N1 to an area about 3 metres to the north of extraction shaft S3 about 40m south of S1, the Emergency Extraction Shaft, where a fully submerged metallic vessel was recently located.

In remarkably clear underwater conditions, a number of photographs were taken from an inflatable and the remains were examined and measured manually. The 'vessel,' which lay on a soft 'muddy' deposit over a hard rough floor partially buried in the sediment, was an open rectangular metallic structure (considered to be probably iron, or its derivative steel) 2m in length and 0.9m wide with enclosed ends and 5cm x 5cm safe edges surrounding the periphery of the vessel (Figure 2). The skin was not concreted and the metal was in excellent condition, however there were some signs of active aerobic corrosion. The depth to sediment from the top of the frame on the southern side was about 42cm, on the eastern side 20cm and on the north-eastern edge 21cm. On the eastern side, a large piece of timber (11cm x 7cm) was located lying directly adjacent to the vessel some 9cm from the top of the frame, partially buried in parts. The timber was in an excellent state of preservation. It was not ascertained whether this timber was directly attached to the iron vessel. A small piece of loose timber (N1.1) was collected from the northern end of the vessel. Due to the extremely poor in-water visibility, a more extensive inspection was not performed and therefore, further structural features were not noted and recorded.

Figure3. Sketch of iron/steel vessel located in tunnel N1 [Vicki Richards].



The ‘tank’ or ‘vessel’ was surrounded by debris, some of it visible and the remainder palpable through the mud. Samples of materials from and near the vessel were taken, even though on preliminary indications (metric scantlings, corrosion-products etc., as outlined above) it was evident that it was of contemporary construction and that it could have been used to transport materials during the 1990s cleanup.

As the sediment (sometimes knee-deep) was disturbed during the inspection and as bubbles broke on the surface, the smell of sulphurous gas became evident to all. While this is common where sediments collect in archaeological and other deposits, as indicated above, the oil fumes and greasy slick that accompanied it and covered all limbs, bodies and recording objects that entered the water were clearly a product of the 1990s oil pollution and could prove a problem in the future.

From this area the group proceeded by boat via Tunnel E2 to its junction with Tunnel N3 where raised dry ground was encountered. Apparently noted as fully inundated in earlier visits by Prison Staff, this short tunnel currently comprises both a flooded section to the east of the landing point just past a plaque set in the wall and a dry section in the remainder finishing in the west at a wall exhibiting drill holes. These were probably in preparation for further blasting works during the 19th Century.

The 'prison coracles'

At the northern end of N3 were found two heavily-corroded and very fragile 'vessels' that resembled coracles—a form of skin or hide boat stretched over a wicker or similar frame that has been used in places like Wales and on the Tigris from time immemorial. They were normally quite small, with just enough space and freeboard for one person and were commonly found propelled by a single 'paddle' (e.g. Hornell, 1982). The 'prison coracles' had a metal 'skin' possibly of wrought iron over a part-riveted frame of iron. Photos were taken of both and they were also sketched and measured.

From their form, mode of construction and much-corroded state, it was considered that they were old, most likely dating back to the early 20th Century at least. Further while it was evident that while they could support the weight of one person needing to keep their feet dry (e.g. a guard) they were equally and perhaps most likely used to ferry tools, food and the like as the prisoners and their guards waded through the water in the complex. In that respect the term 'coracle' could prove problematic, providing the potentially false impression that they were used to transport people rather than goods or equally possibly detritus from the tunnelling itself. At present the term best provides an indication of their form.

Both vessels were very similar, each approximately 1m in diameter. Two iron sheets had been riveted together with half inch (1.27 cm) diameter rivets to form the 'bowl', which was then riveted to a circular rim one and a half inches (3.8 cm) wide. There were two curved supporting straps 3.8cm wide running under the base of the 'bowl', connected to opposite sides of the rim providing added strength to the structure.

The conservator's analysis indicates that they are lightly concreted, as is typical of fresh water anaerobic iron concretions. Being totally exposed to the atmosphere the vessels were exhibiting extensive aerobic corrosion and there were significant quantities of aerobic iron corrosion products (rust) on the surface of each. This corrosion process was causing the exfoliation of the previously corroded surface layers and concretion. Both vessels were extensively corroded, fragile and easily damaged.

In addition, there was a length of degraded rubber lying proud of the sediment, directly adjacent to the more northern vessel. There were also a few pieces of wood lying on the sediment near these vessels. One piece of wood had a carved indentation on one side. The wooden pieces were encrusted with damp sediment and in good condition. This sediment layer would decrease the drying rate of the wood and possibly prevent cracking, warping and checking.

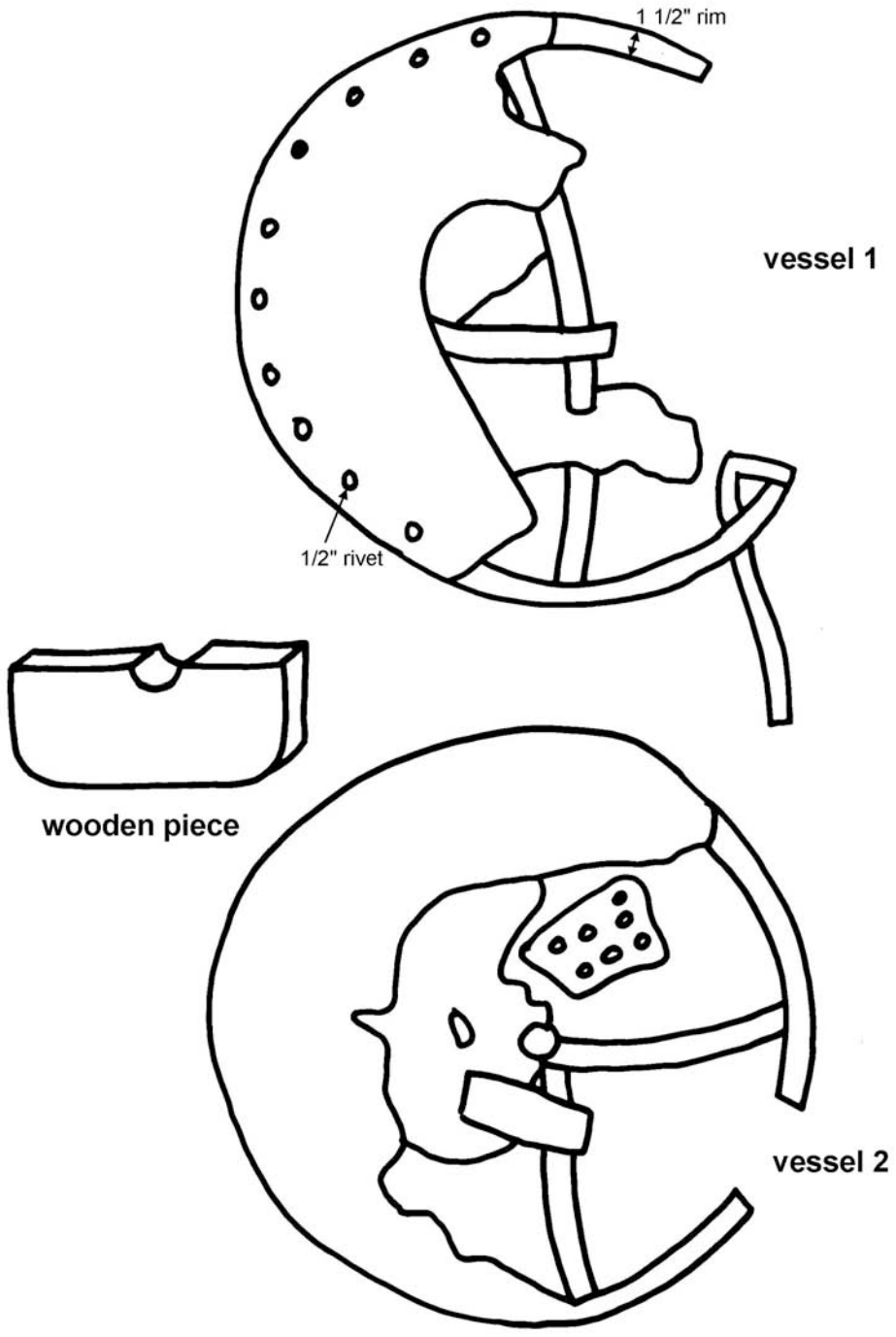
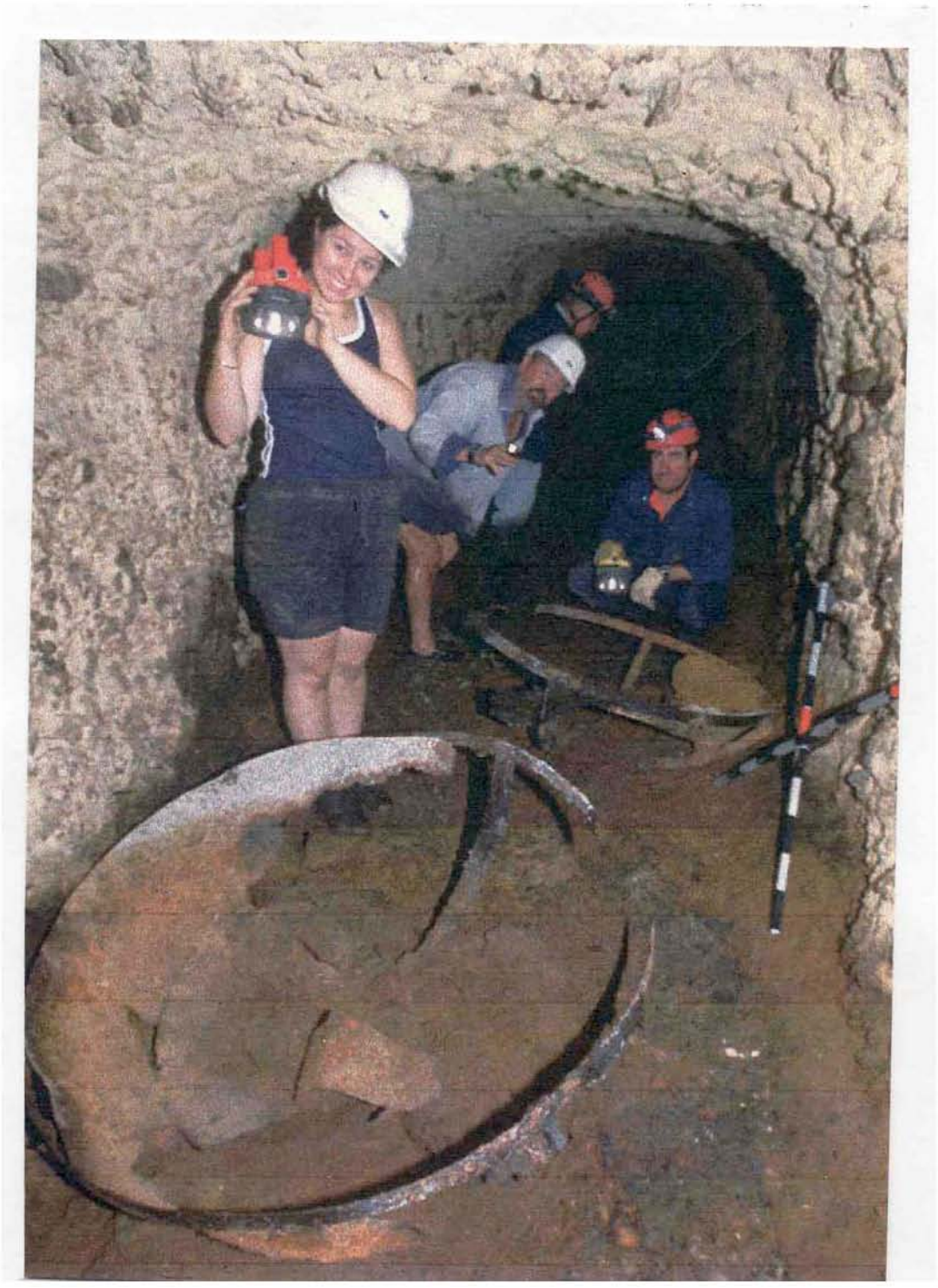


Figure 4a. Sketch of the iron vessels (1 and 2) and wooden item located in tunnel N3 [Vicki Richards].

Figure 4b. Photo of the iron vessels with part of the inspection team. [Patrick Baker].



Though the area surrounding the 'coracle site' was 'dry' i.e. it was not inundated, the ground was soft, damp and quite muddy underfoot, disguising and potentially masking the presence of smaller cultural materials. Nonetheless it was evident that, as with the still inundated sections of the tunnels, cultural materials remain in the sediments and in some cases in the walls and attached to the ceilings.

Associated cultural remains at the 'plaque site'

The group then proceeded back to the junction of the tunnels noting, in a number of locations, fragments of timber that had apparently fallen from the ceiling onto the floor. Timbers were still in evidence on some parts of the roof and in one location a square-sectioned fastening, possibly a hand-wrought spike, was seen cemented into the limestone. A shaft S2, in this general area of tunnel N3, appeared as a wall built of worked limestone rocks, serving to secure the lower end of the in-fill and closing the shaft.

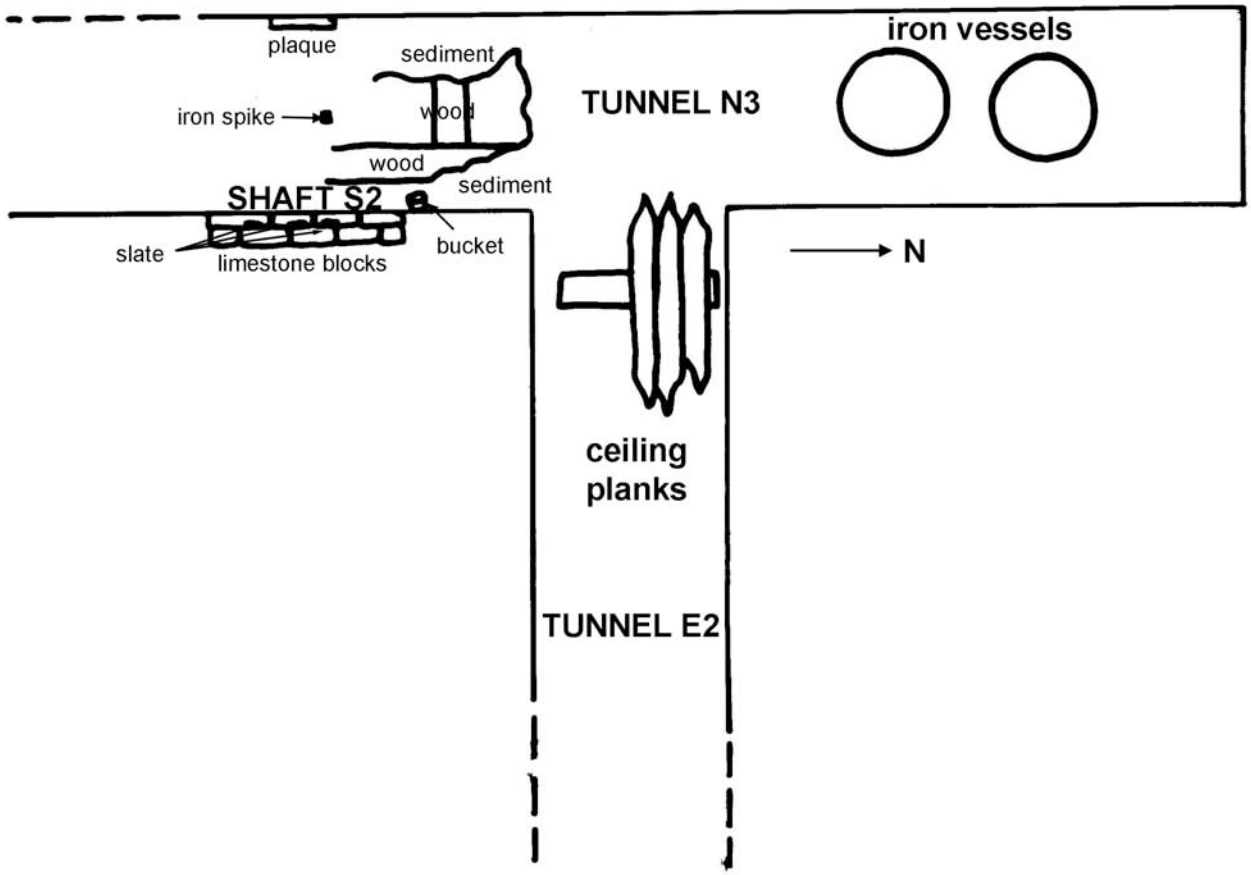


Figure 5. Sketch of shaft S2 and ceiling E2 area [Vicki Richards].

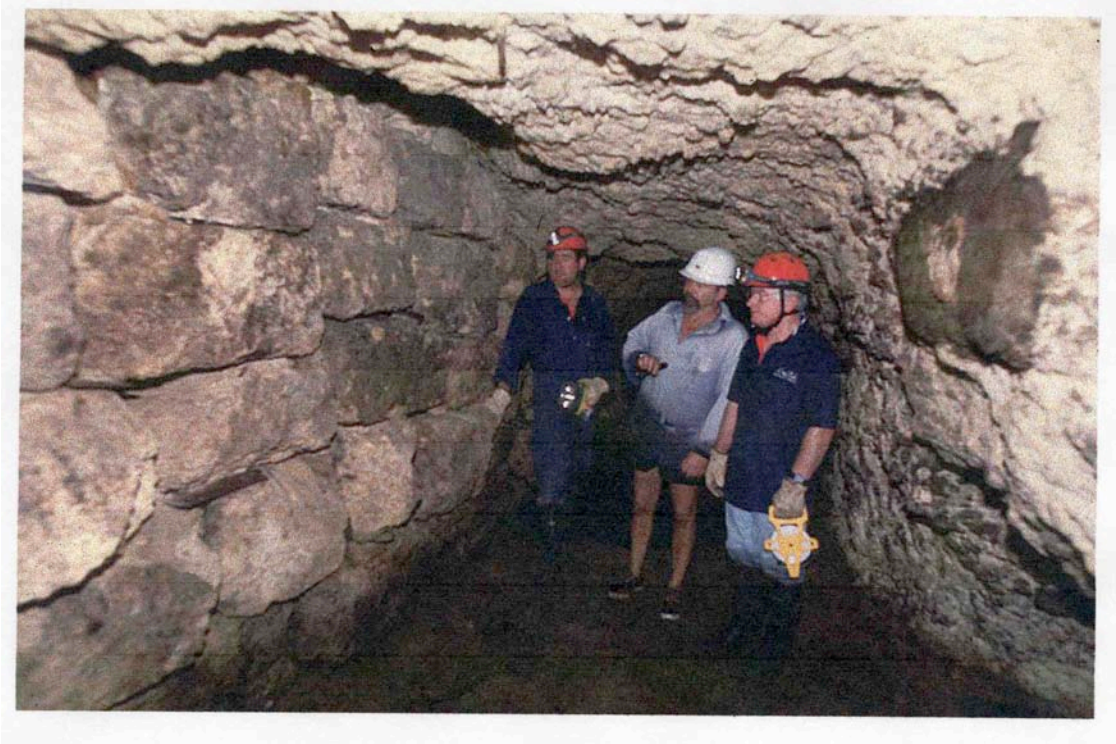
Opposite was a commemorative plaque fixed to the western wall, its wording barely legible in the poor light. The shaft opening had been enclosed with large limestone blocks and mortar. Amongst the joins between the blocks, some pieces of loose slate were also

found. In addition, a square headed iron spike, standing about 5cm proud of the tunnel ceiling, was located between shaft S2 and the plaque. Timbers were located on the floor approximately 3m south of the junction with tunnel E2, partially buried with sediment. These were in good condition and appeared to be in a track-like arrangement.

Examination of the sediments in the water adjacent indicated that, as with the remainder of the tunnel complex they ranged from ankle to knee deep on a rough stone floor and they also contained timbers and other materials.

Four timbers were located on the ceiling at the very western end of tunnel E2, immediately before the junction with tunnel N3. The timbers were fastened with square headed iron spikes, similar to those observed in isolation in the ceiling opposite shaft S2. Evidently this area was a focus of convict related activity and given the presence of the plaque and the coracles the northern end of N3 may have been the last underground 'face' worked and/or the closed shaft at S2 may have been the exit to the workings.

Figure 6. Photo of the limestone wall at shaft S2. The plaque is on the wall opposite [Patrick Baker].



The convict raft

From S2 the group entered the boats and returned via Tunnel E2 to the base of shafts S3 to S1. From S1 they proceeded on foot in totally dry conditions along NE2, stopping briefly to examine abandoned piping and air ducting that appeared related to the attempts to rid the tunnels of oil. The remains of a water bore B2 were also examined. These were a pipe reaching from the surface down to valves and the like on the tunnel floor. From there the group walked to tunnel NW2 stopping at an area known as the 'boat landing'. From the boat landing the group proceeded east about 20m on foot along E5 to the water's edge, where a long timber object previously known to the Prison staff as 'The Punt' was located—though at the time of the visit this information was not conveyed to the Museum team, apparently for purposes of obtaining as objective an analysis of the remains as was possible.

The remains were built to imperial measurements measuring 9ft (2.74 m) in length and 3ft (0.9 m) wide at the widest section; all constructed from two large timbers 9ft (2.74 m) in length, 1ft 6" (45.7 cm) wide and approximately 9" (22.8 cm) deep. These two timbers were fastened with two square headed iron fastenings positioned about half to 1 m from either end, traversing the entire width of both timbers. The ends of the timbers were cut off at an angle on both sides, encrusted with about 3mm of damp anaerobic sediment and approximately one third of its length exposed to the atmosphere with the remainder immersed in fresh water. The wood, tested by the conservator, appeared to be in an excellent state of preservation.

Constructed of two very thick pieces of what appeared to be a softwood, fastened with two iron through bolts, having shaped ends, lying totally waterlogged, partly on the bottom and half-way up the slope, it appeared to be a raft capable of carrying equipment and two people. Certainly it fitted the description 'punt' given to it by prison staff. In contrast, however, to the 'coracle site' and the adjacent 'plaque site' in tunnel N3, evidence of convict related activity was not apparent.

Figure 7a. Photograph of the 'raft'. Patrick Baker.

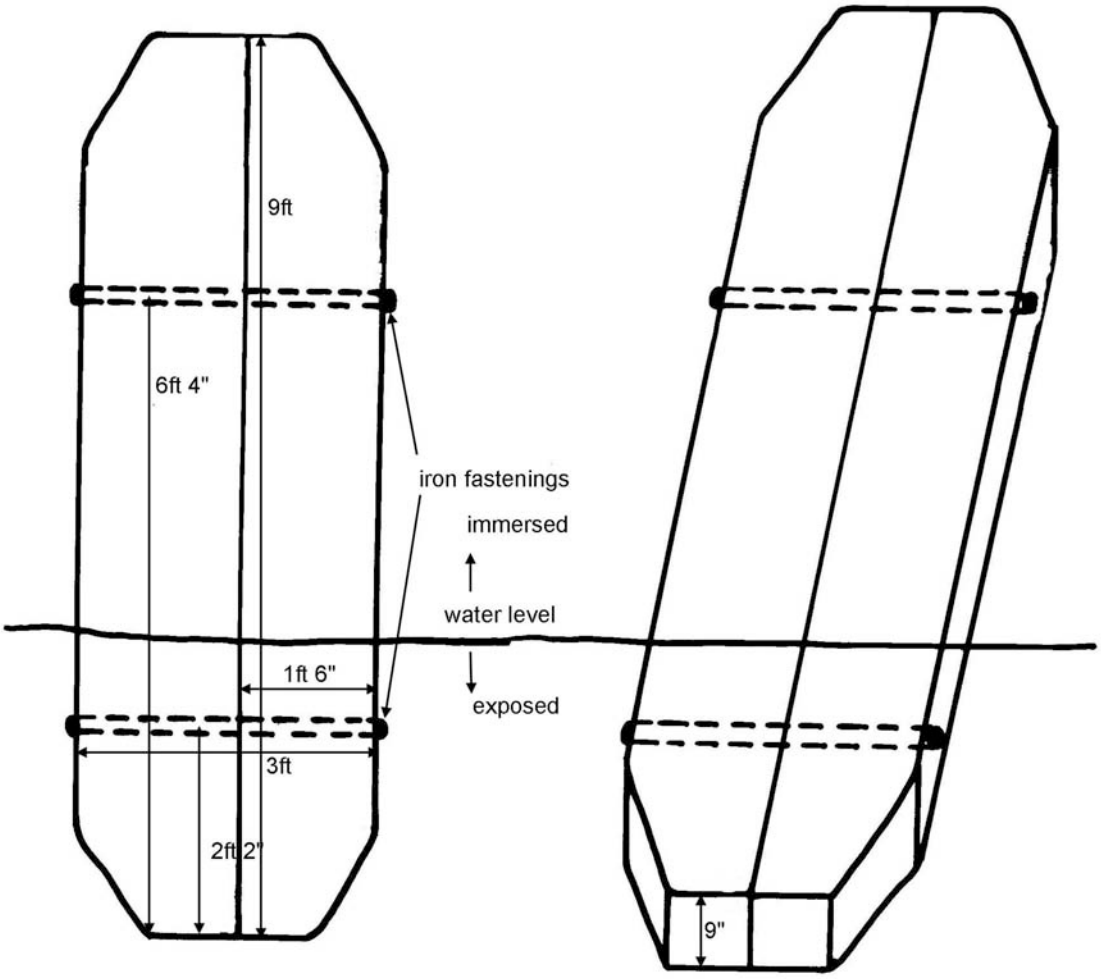


Figure 7b. Sketch of the wooden raft located in tunnel E5 [Vicki Richards].

The group then made its way to S1 via NW2 and NE2 returning to the surface.

Post inspection discussion

In a short debriefing en-route and at the surface, it was agreed by all present that the materials were of historic significance. It was also agreed that with winter still two months off, a 'window of opportunity' existed of about six weeks, for further work. Given the 'dry' nature of the remains at the 'coracle site' and at the 'plaque site' it was agreed further analyses might best be effected by terrestrial archaeologists. In that regard, Department of Archaeology staff from the University of Western Australia, notably Dr Alistair Patterson, were already working in association with heritage Architects and Prison staff. They were seeking fieldwork opportunities for their students. It was agreed that, as a priority, an approach be made to have students, working under the supervision of historical archaeologists, examine and record the dry areas around the 'plaque site' at Shaft S2 and north along N3 past the 'coracle site' to the wall north. A test excavation

was also considered warranted. It was evident that early rains could bring the water table up and submerge the proposed area of study and that the prison hierarchy should effect their inspection and test excavation in the short term.
It was also considered that to water dredge the sediments in the inundated section of Tunnel N3 close to the closed shaft S2 and the plaque could provide indication of the extern of the submerged deposits, though the nature of the pollution in the sediments could preclude diving on safety grounds. It was evident that before any underwater work was undertaken attention would need be paid to the effect of contamination on diver safety and on artefact handling issues.
The Museum group then left the site at about midday.

Subsequent Research

Following the inspection, the Museum team, through Mr Coley, came in receipt of the 1921 MWSS & BU Plan shown in Appendix 1. This was an extremely important document in respect of the remains examined given the references to the sites mentioned above. The salient points are:

1) The word ***'Dry'*** appears at the 'plaque site' at the junction of the two tunnels with shading indicating those areas inundated in 1921.
2) The 'Coracle Site' was dry in 1921 and it appears marked with three crosses and the notation ***'Old Gear'.*** This is in apparent reference to the materials visible on this inspection.
3) The notation ***'Tablet A'*** appears at the plaque site, which again was dry in 1921. The words written on the plan above it read '***Notes on Tablet A Excavations for Fremantle Water Supply by Prison Labour 1888. Eyre Evans Warder'.***
4) Adjacent to the Tablet, again written on the plan are the words '***Big shaft with daylight visible'.*** This is plugged with limestone blocks.
5) On the 1921 plan at the 'Convict Raft' site, just into the inundated section, appears the word '***Punt'***

CONCLUSIONS
With the exception of the 'modern vessel' first inspected, the remains all pre-date 1921 and are expected to be convict-related.
While the 'coracles' and the 'convict raft' may not have been used to transport people, such as the guards, they almost certainly were used to transport tools, food, lighting and the like and they could also have been used to move debris from the excavations as required.
The words *Old Gear* and *Punt* appearing in the 1921 plan, indicate that these objects all pre-date it. That the word *Punt* appears within the area of inundation and not against dry ground indicates that it had become waterlogged and had sunk by 1921.

RECOMMENDATIONS

Note: The initial conservation assessment carried out during this inspection was preliminary and not extensive. The maritime archaeological assessments were also preliminary and were conducted in a non-disturbance fashion.

a) Following a terrestrial archaeological assessment of the 'coracle site' and the 'plaque site' in which it is expected that the 'coracles' will remain in situ and undisturbed, a more thorough assessment of each should be carried out by staff of the Department of Materials Conservation. This would assist in the selection and application of the most appropriate methods of recovery and treatment, if that is deemed the best course of action.

b) The same applies at the Punt site. There an archaeological 'test' of the landing adjacent is also indicated.

c) A maritime archaeological test excavation of a number of inundated areas could be considered if safety considerations do not preclude it.

PROPOSED CONSERVATION TREATMENTS

The Iron or steel tank or vessel

Having ascertained that this is modern and that it will not necessarily become part of the tunnel collection or interpretive facility any decision on prospective treatment of this object would await a decision on its future.

The Prison 'coracles'

These vessels are fragile and will need additional support when they are recovered to prevent any further damage. On recovery the vessels should be placed in water and kept wet until the commencement of the conservation treatment.

The concretion and corrosion product layers should be removed by the flame deconcretion method to minimise any further physical damage to the artefacts. This method involves gently heating the outer surfaces with an oxy-acetylene torch, which causes the scale to separate from the residual metal with minimal damage to the underlying parent metal. Assuming the iron alloy is of low quality (not spring steel) the remaining material should be cleaned in a bath of 2% citric acid solution. After the artefacts are clean, the excess citric acid should be neutralised in a bath of 2% caustic soda solution, then soaked in water to remove any excess caustic soda solution and dewatered with methylated spirits to minimise flash rusting. Finally a protective coating should be applied over the entire surface. The type of coating used will be dependent on the aesthetic finish required.

<u>Storage and Display</u>

Following treatment the vessels should be displayed out of public reach, in a controlled environment where the relative humidity does not exceed 50% and the light levels are below 300 lux. If this is not practicable, however, the vessels should not be displayed outside. Avoid placing the vessels on chipboard or unsealed wood. Any wooden supports

can be coated with a water-based polyurethane finish. Monitor the vessels regularly for signs of corrosion.

The Punt

The preferred conservation treatment for waterlogged wood is impregnation with different grades of the water-soluble wax, polyethylene glycol (PEG), followed by freeze-drying. This wooden vessel, however, appears to be in excellent condition and therefore, total immersion and impregnation would not be necessary. Surface consolidation by PEG would be adequate to stabilise the outer surfaces, followed by slow air-drying.

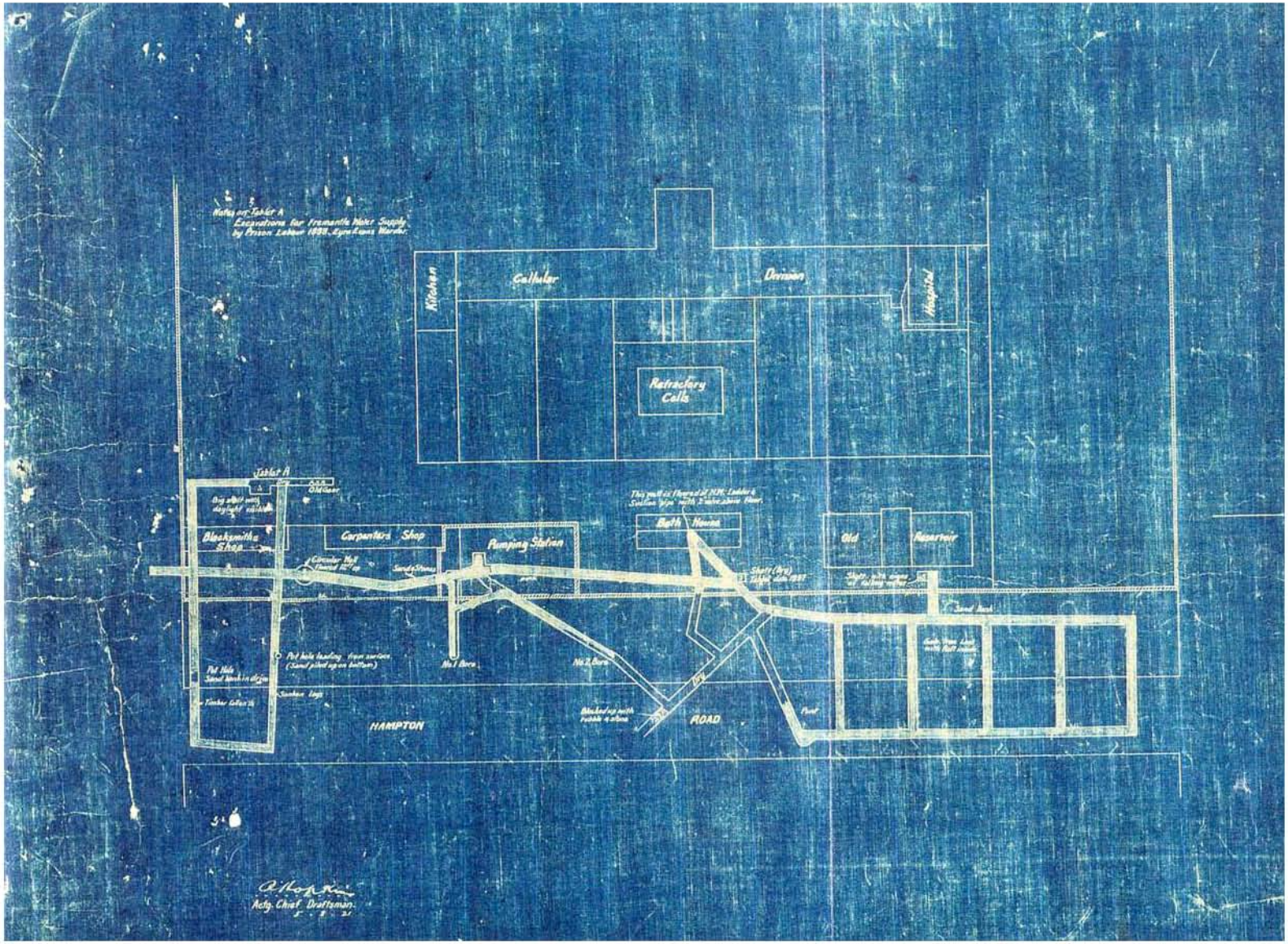
The vessel should be kept wet at all times prior to the commencement of the conservation treatment. The vessel should be mechanically cleaned of all surface detritus. An aqueous solution of PEG 3350 (15%v/v) should then be applied to all surfaces. Four to five coatings would be the minimum required. The vessel should be wrapped in plastic after each coat to maximise penetration and minimise drying. Over the course of a few weeks the plastic should be removed in stages and the vessel allowed to dry very slowly to minimise cracking, warping and checking of the wood. The heads of the iron fastenings should be protected with a surface coating.

Storage and Display

Ideally, wooden items should be displayed in a mild environment, with conditions maintained at about 18°C and a relative humidity of 45-55%. As these conditions are rarely encountered in most situations, reasonable precautions must be taken to minimise potential problems. Wooden items must never be placed in direct contact with floors and/or outside walls, which are often damp. Lighting should be kept to a minimum and direct sunlight avoided. Monitor the wood regularly for signs of deterioration and mould growth.

Appendix 1

Figure 1. 1921 Part of Plan entitled: Drives and Shafts at Pumping Station Fremantle. 5/81921.
Scale 50 ft to the inch.


Notes on Tablet A
Excavations for Fremantle Water Supply
by Prison Labour 1898. Eyre & Lewis Wardle.
Kitchen
Cellular
Division
Hospital
Refractory Cells
Tablet A
Old Gaol
Blacksmith's Shop
Carpenter's Shop
Pumping Station
Bath House
Old
Reservoir
Sandstone
Pot Hole
Timber Gallows
No. 1 Bore
No. 2 Bore
HAMPTON
ROAD
Pond
Acty. Chief Draftsman.

Appendix 1

Part of an article appearing in the West Australian April 6 2004.

Visitors can travel back in time on Fremantle's underground waterway

Jail tunnels open to public

The system built in the 1890s to supply the city with water is still in good condition

By Carmelo Amalfi

FREMANTLE'S network of underground tunnels will be open to the public by Christmas.

Low tide under Fremantle Prison has exposed timber watercraft and floating "wheelbarrows" used by convicts to build the 1km-long network of water supply tunnels from the late 1890s.

Under a State Government plan, paying customers will be able to don hard hats and harnesses to access the limestone labyrinth more than 20m below the surface.

The prison tunnels will undergo a $300,000 refurbishment as part of a $4 million master plan before State Cabinet.

Details will be released at Catalpa Day on Easter Monday when the prison will re-enact the daring 1876 escape at Port Beach by Irish Fenians.

Executive manager Graeme Gammie said the tunnels were an extension of the existing well system, with the main excavations using mostly prison labour.

Initially, three steam engines pumped water into a concrete reservoir, which is still on the site, to supply nearby residents. The first wells were dug in 1852 to supply convicts at Fremantle. Water is now used to reticulate the prison lawns and gardens.

"The tunnels themselves are in terrific condition and they are very stable," Mr Gammie said during a tour of the tunnels in inflatable rafts. The air was damp and humid, partly submerged in a tunnel under Hampton Road outside the prison grounds.

In another tunnel near Fothergill

"We're getting boats made at the moment based on a plastic boat design used in the tunnels in the 1920s. This will be a unique

Subterranean system: Visitors will be able to tour the tunnels below Fremantle Prison, above, by climbing down a shaft, below. PICTURES: BARRY BAKER

FREO'S TUNNELS

Fremantle Prison was built by British convicts in 1859 and closed as a jail in 1991

The 1km network of limestone tunnels, sitting 20m below the jail, were completed in 1898 to supply water to the prison and nearby residents

The tunnels were closed in 1910 when the Victoria Dam was built