ENGINEERS
AUSTRALIA

Inner Newcastle Engineering Heritage Walk

Engineering Heritage
Australia

Contents

Introduction

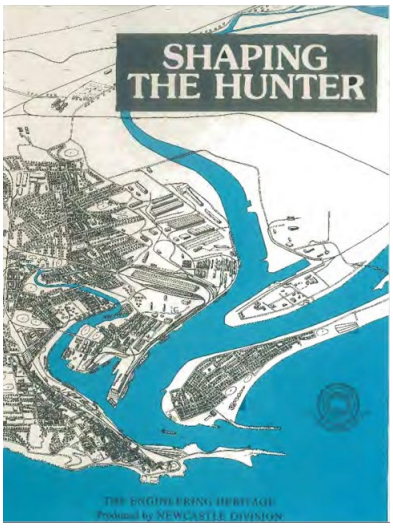
> 'Newcastle's main legacy from engineers is the shape of the city itself, in particular the Port and the Lower Hunter River.'[1]

Newcastle is steeped in engineering heritage and history. Australia's second oldest city was founded on the need to engineer the area's resource recovery and export and to develop the town needed to house those involved in this industry. From when Shortland found coal in Newcastle in 1797 engineers have been instrumental in creating one of the greatest coal ports in the world. The steel industry, which stood proud from 1915 to 1999, resulted in major engineering advances in steelmaking and the development of a myriad of engineering businesses to support it and other activities in the Hunter. Similarly, the electric energy industry in the Hunter blossomed from the early power stations at Sydney Street and Zaara Street to the coal giants at Eraring and Bayswater. Newcastle in the early 2020s is gearing up to continue a role in the new electricity industry as it changes to more renewable sources.

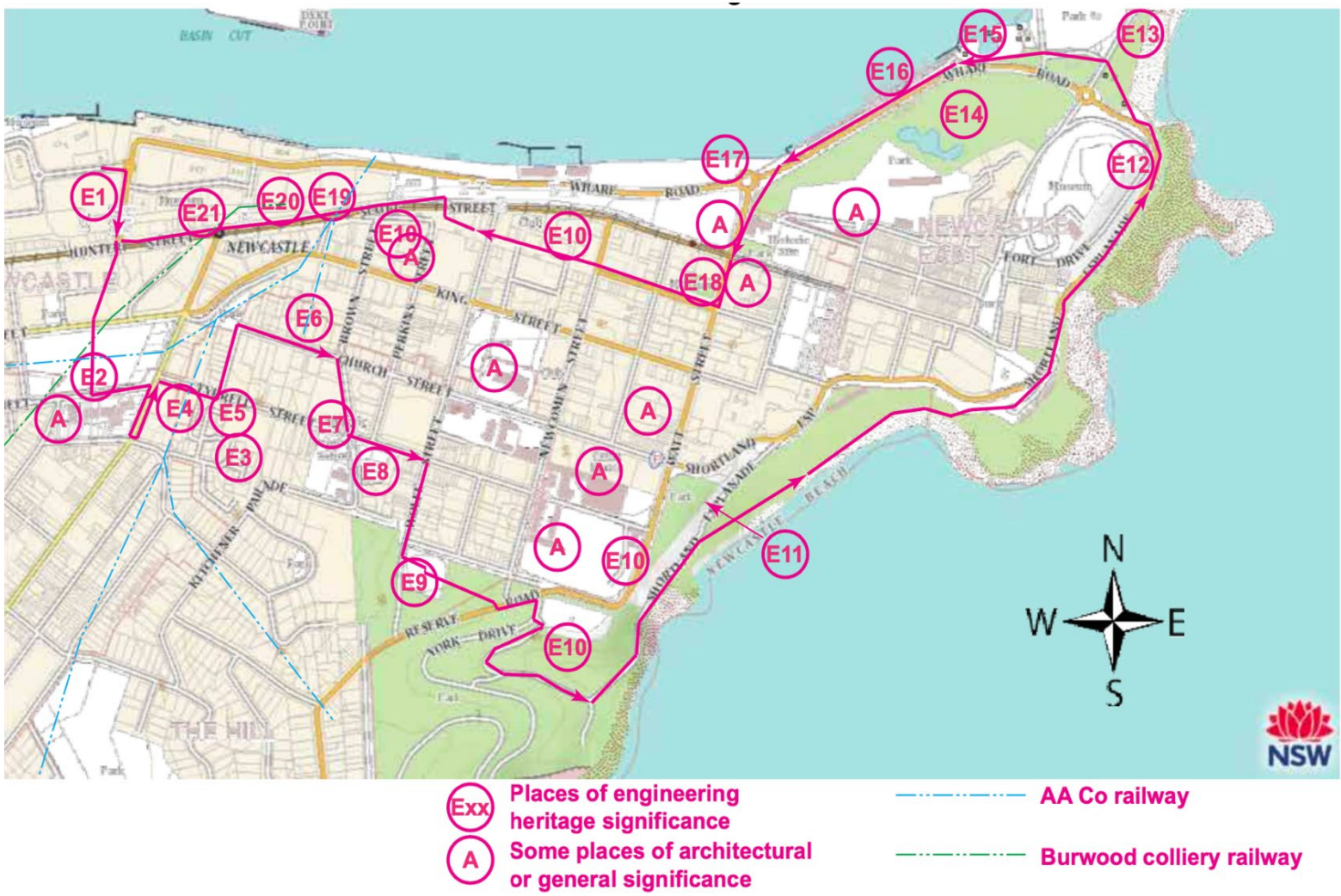
In this walk we visit remnants of our engineering past. Even though the engineering heritage of some sites is represented by mere fragments of the past, visiting these sites can remind us of the great role engineering had in developing the Newcastle we now appreciate.

To learn more about Newcastle's engineering heritage we recommend:

- Armstrong, John, ed. *Shaping the Hunter*. Newcastle: Institution of Engineers Australia, 1983.
- McHugh. *Evan. Reshaping the Hunter: How Engineering Innovation Reinvented a Region.* Newcastle: Engineers Australia, 2022.



[1] Ian Stewart. "Taming the River and the Sea: The Port of Newcastle". In Shaping The Hunter. (Newcastle: Institution of Engineers Australia 1983). 11.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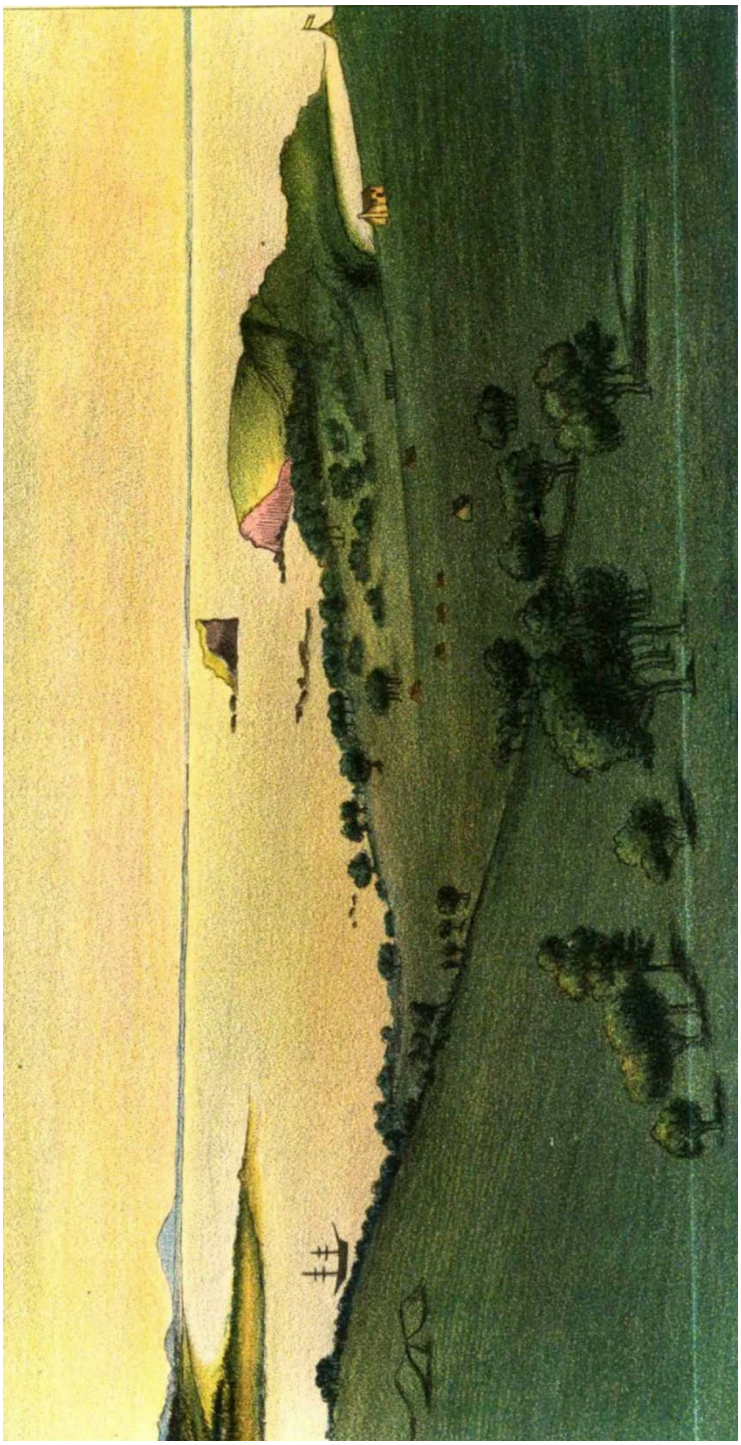
NSW
Exx
Places of engineering heritage significance
A
Some places of architectural or general significance
AA Co railway
Burwood colliery railway

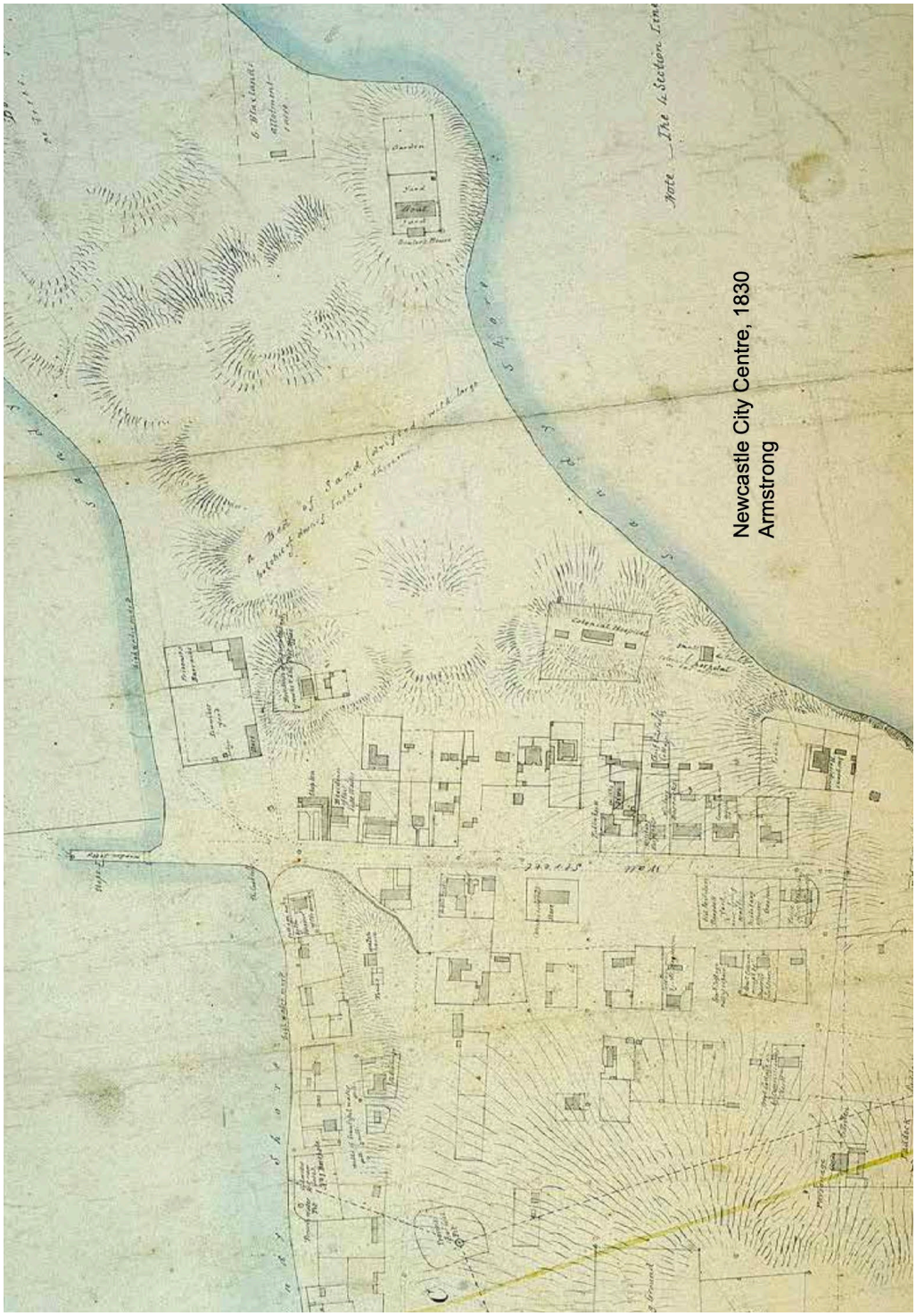
E1	Railway workshops built from 1874, incl. 1885 Craven crane.
E2	Crossing-keeper's cottage and bridge remnants. AA Co. Railway 1848 to 1921, Burwood line to 1953.
E3	Site of AA Co. 'B' Pit, 1835.
E4	Site of NESCA 'Sydney Street Power Station', 1890 to 1953.
E5	AA Co. Railway formation crosses Tyrrell St, from 1835.
E6	Site of AA Co. 'A' Pit, from 1831.
E7	Leading light tower (Black marker) built 1866.
E8	Hunter Water reservoirs, 1882 and 1918.
E9	Obelisk beside former reservoir built 1850 on site of windmill demolished 1847.
E10	Sites of known convict mine shafts c.1814 onwards.
E11	Drainage tunnel from early shaft workings c.1814.
E12	Early mine workings in cliff face behind concrete from 1804 (Fort Scratchley above).
E13	'Macquarie Pier', earliest rock-fill breakwater from 1818, finally stabilised 1872.
E14	Site of Zaara St power station, 1917 to 1959.
E15	'Cornish' boat harbour (in Pilot Station), 1874.
E16	Steam crane pedestals, 1861.
E17	National Engineering Landmark plaque for Newcastle Harbour, 1989.
E18	IEAust plaque giving street name origins.
E19	Brick base of 'Iron Bridge' pier formed part of railway fence. Built 1864, replacing timber bridge of 1833; last train 1921.
E20	Electric tram substation building, now offices. Trams ran from 1923 to 1950.
E21	Burwood Line remnants were in roadway. Last train ran in 1953.

Newcastle Harbour at Early 18th Century

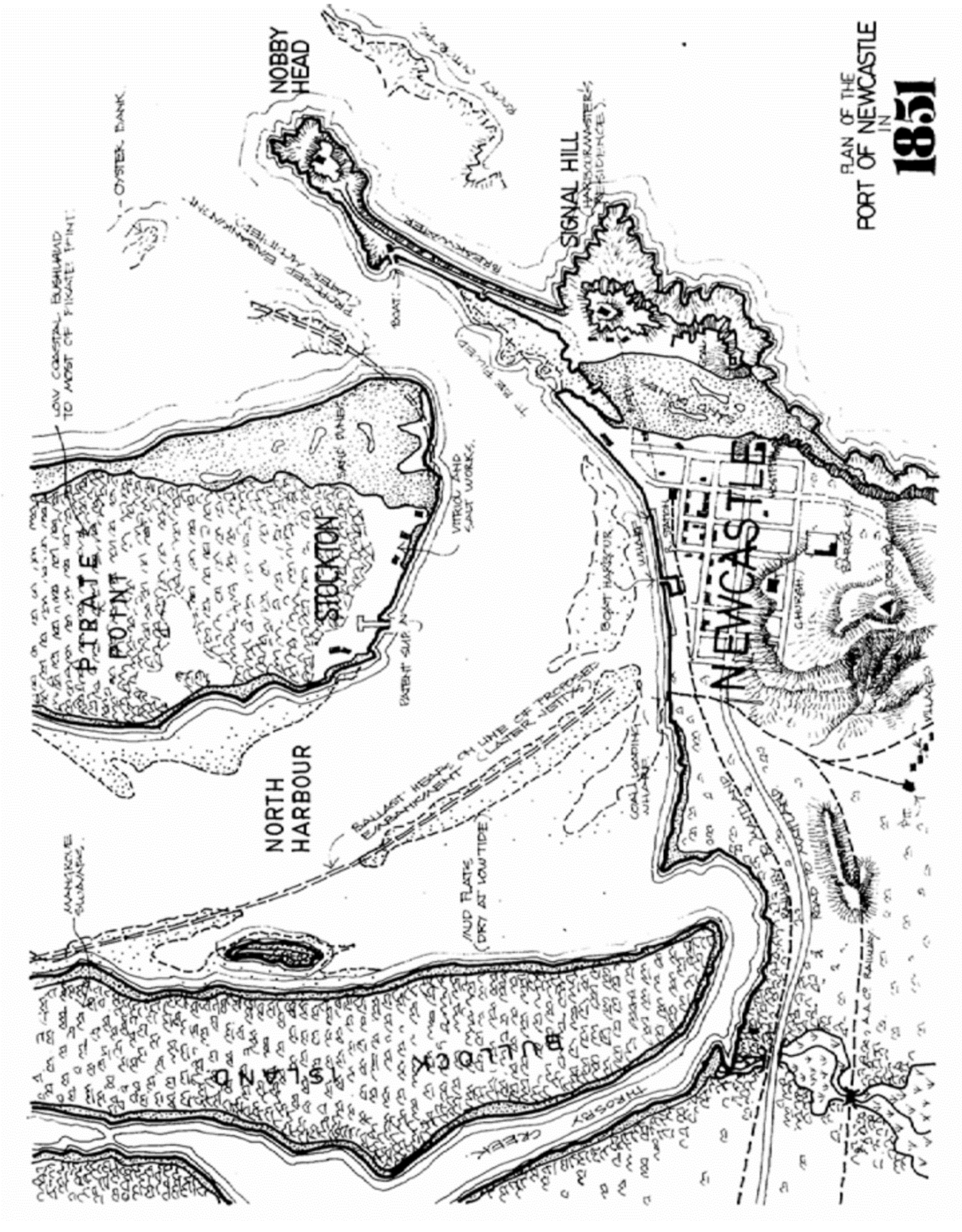
Newcastle in 1825 by Charles Martin (2017)

Scan the following QR Code for a digital view of Newcastle Harbour in 1825. This digital model was created over many years by the University of Newcastle's Hunter (Living) Histories initiative (HHI).

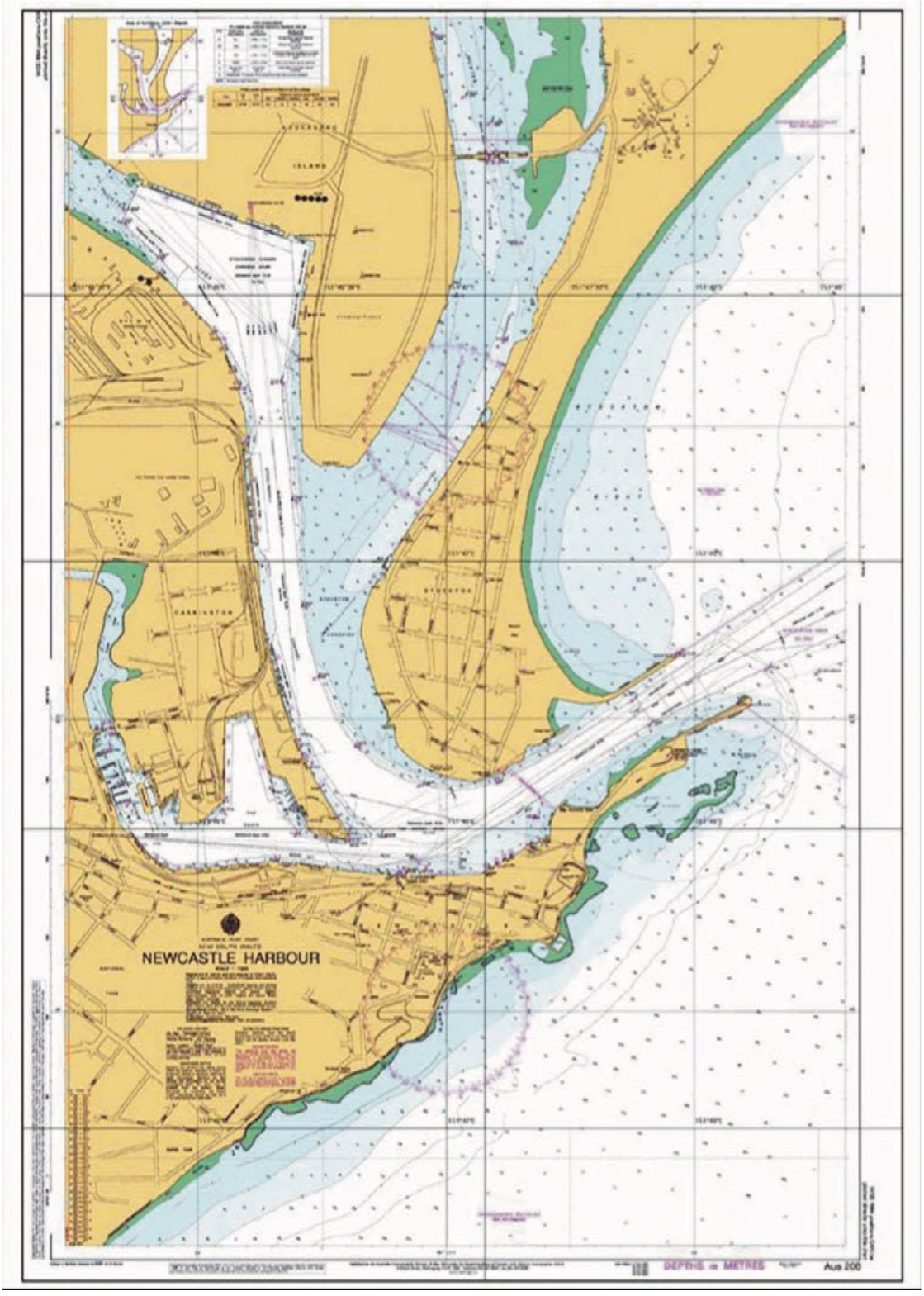




Newcastle City Centre, 1830
Armstrong


PLAN OF THE
PORT OF NEWCASTLE
IN
1851
NOBBY HEAD
SIGNAL HILL
NEWCASTLE
STOCKTON
PIRATE POINT
NORTH HARBOUR
BULLOCK ISLAND

Newcastle Harbour Today



Railway workshops

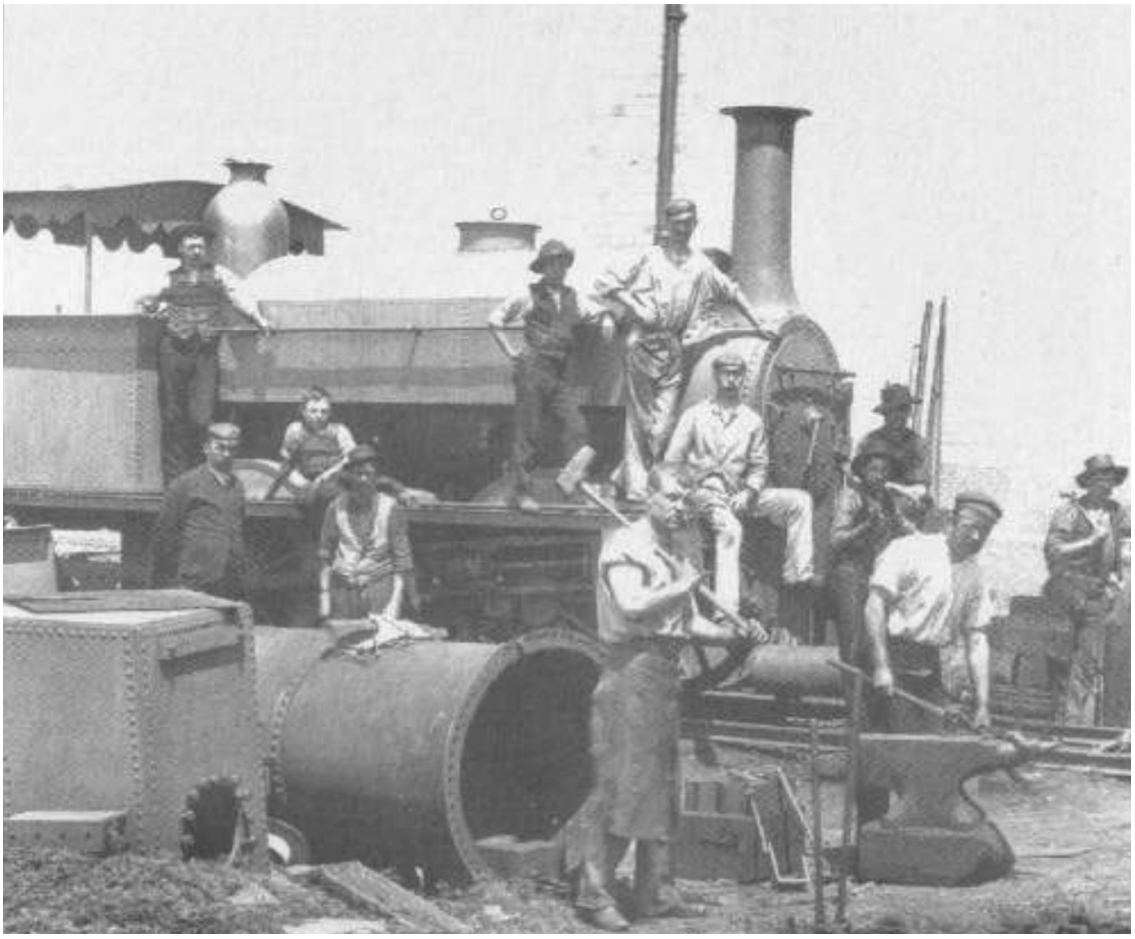
The tour begins at the Newcastle Museum which was originally built as railway workshops for the Great Northern lines.

The museum consists of three buildings[2]:

- The former Locomotive Boiler Shop constructed between 1882 – 1887.
- The New Erecting Shop constructed in 1920.
- The Blacksmith's and Wheel Shop, one of the oldest of the three buildings and built in 1880 out of local bricks.

Honeysuckle Workshops Newcastle

[2] Newcastle Museum Website. https://newcastlemuseum.com.au/about/museum-history. (Viewed 13 October 2023).



Honeysuckle Workshops

The Craven Crane

The Craven Crane is a 16 ton overhead travelling crane manufactured in Britain in 1885 by Craven Bros of Manchester. The crane is rope driven, originally powered by a remote steam engine, and was specifically located in this building for the heavy lifts required during boiler work on steam locomotives.

The crane represents the epitome of 19th century mechanical power transmission technology, the system on which all major workshops depended prior to the introduction of electric power transmission in the 1890s.

The crane is complete and original. It was restored in 1995, but no modifications or major repairs were necessary. Unlike others of the same type, the rope transmission has not been replaced by direct electric drives, nor has it been relocated from its original working situation.

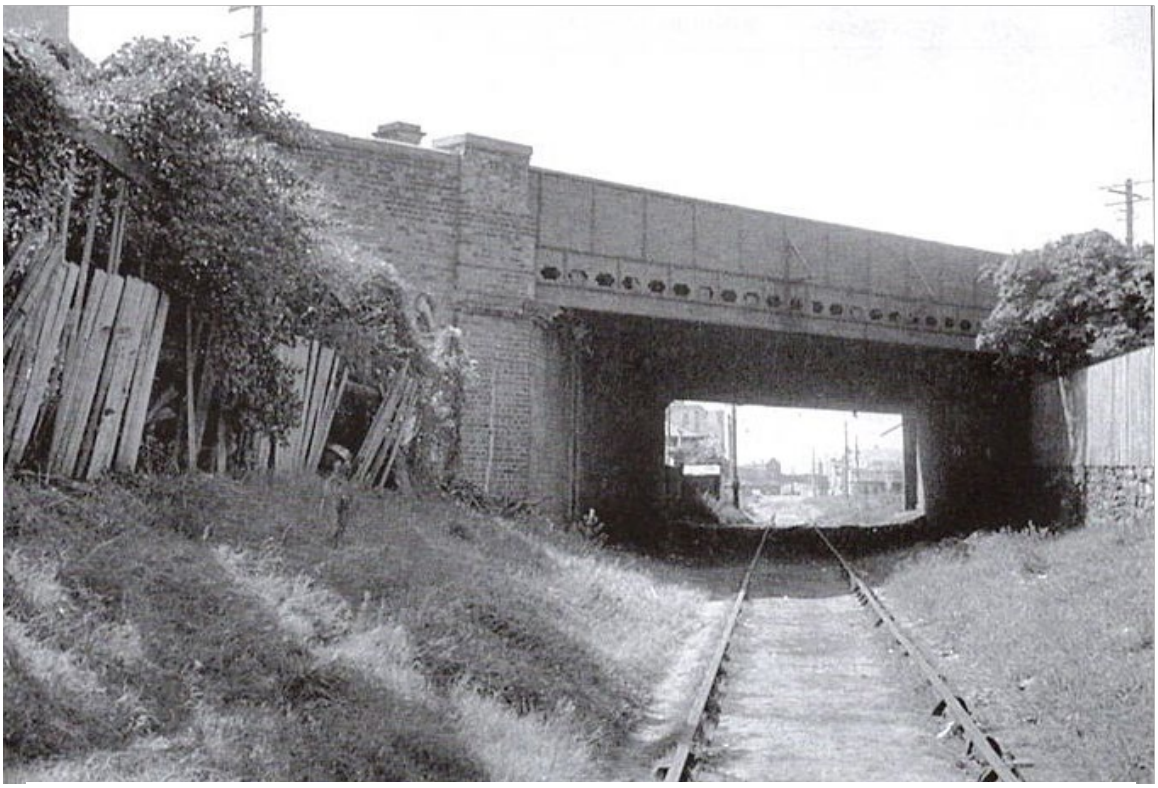
It is believed to be the only rope drive crane still operating anywhere in the world.

AA Co. Railway Line

The iron bridge over the Burwood line was built in 1883 to carry Laman Street: the brick end posts of the bridge can still be seen.

North of Laman Street the Burwood line crossed the AA Company line to its Hamilton pits. The still extant Crossing-Keeper's cottage was occupied by the man charged with operating the gates controlling traffic on the two railway lines.

The cottage can be seen in the top photo on p.15.



Laman Street Overbridge across the Burwood Railway looking toward Hunter Street in 1944 (CC Singleton, ARHS Rail Resource Centre 16501 as cited in Andrews)

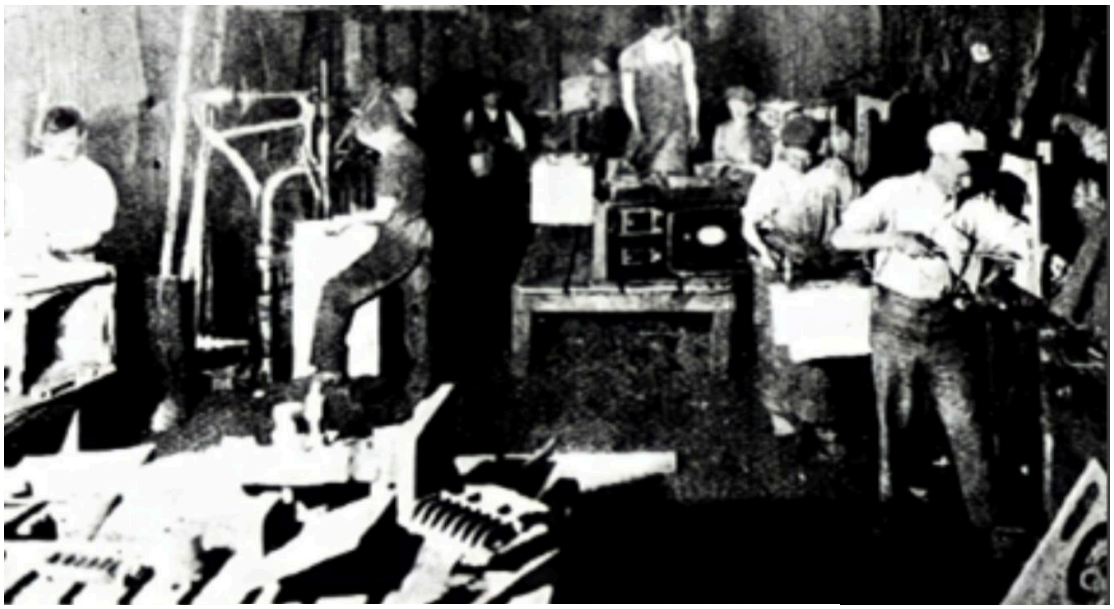
View from City Hall across Civil Park

View of Civic Park and adjacent Railway Line

Gibson's Foundry

The area in and around Civic Park was a centre of industry in the late nineteenth and early twentieth centuries. Prior to being refitted out as a multipurpose building, the site at 291 King Street was originally the Gibson's British Iron foundry. Gibson's work included 'the casting of ornamental pillars and other work used in the decoration of house balconies and awnings'.[3]

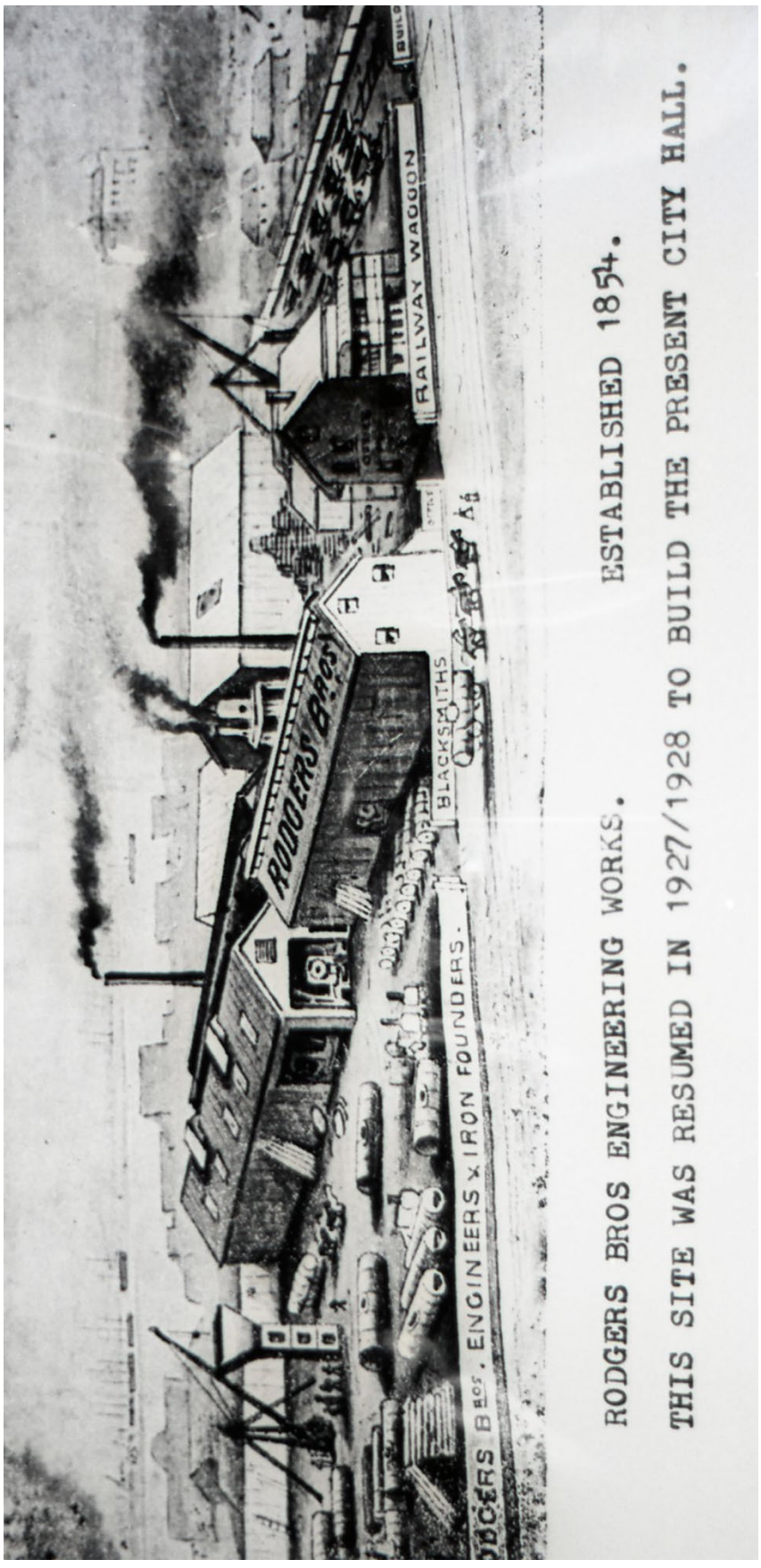
Gibson's Crucible Steel Casting

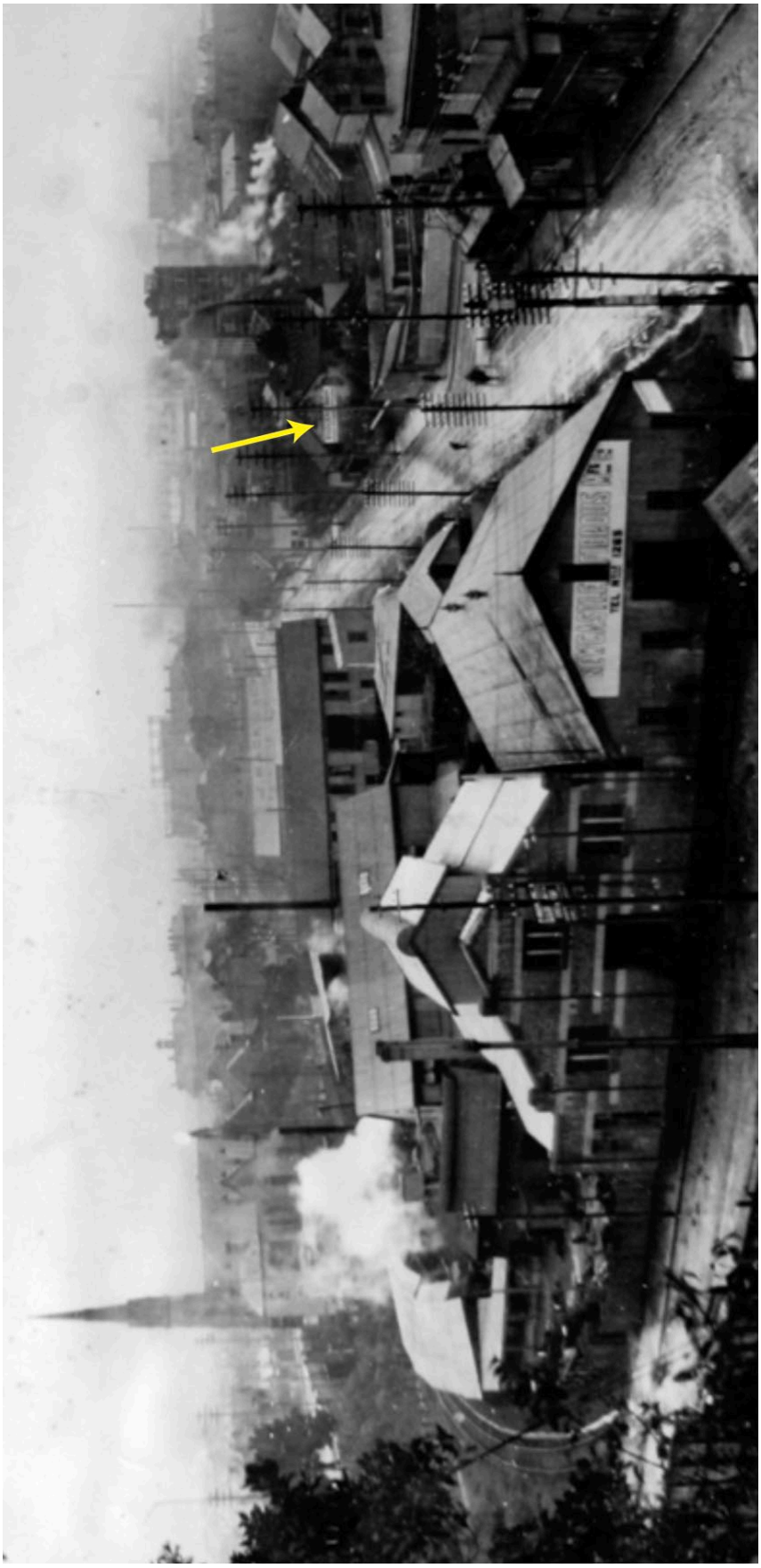


Gibson's Finishing Department – 'Simplex Steam'

[3] 'Gibson's British Iron Foundry'. *Newcastle Morning Herald and Miners' Advocate*. 9 September 1897. 10.

Roger Brothers Foundry





Roger Brothers Foundry at Site of Present Newcastle City Hall

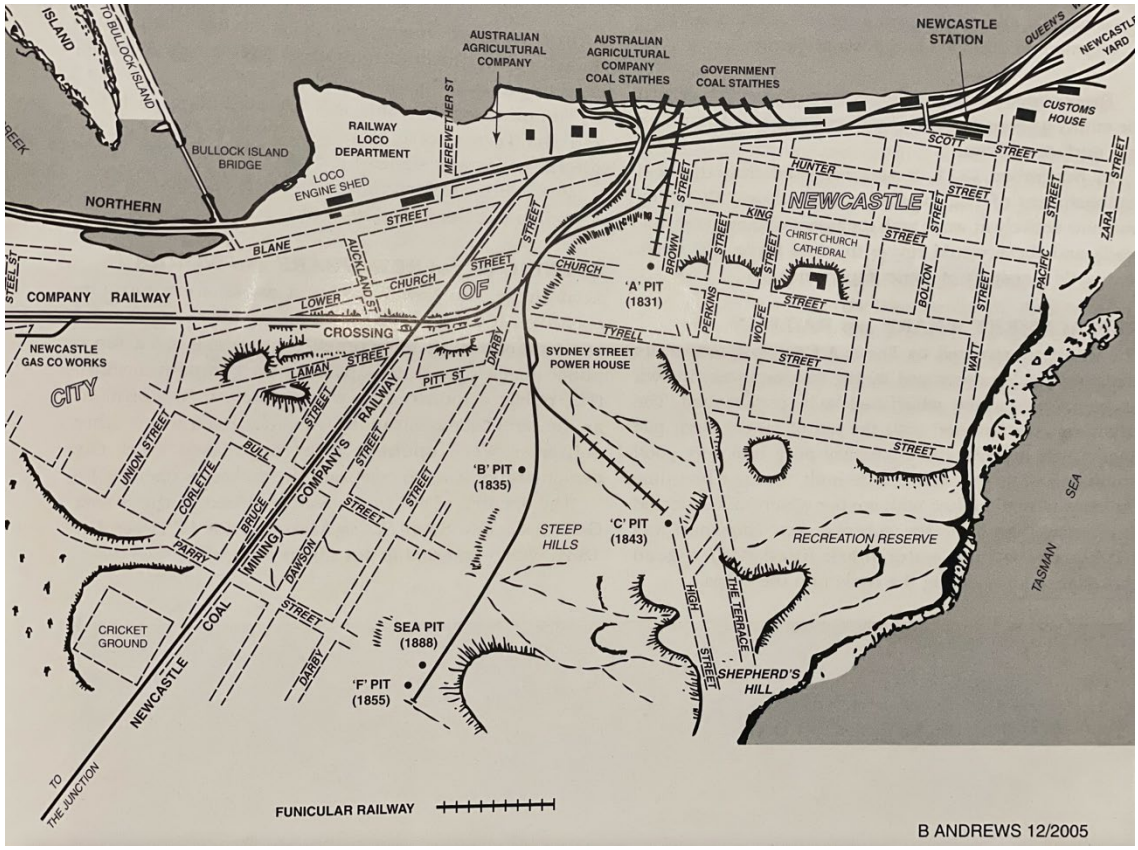
Site of AA Company 'A' and 'B' Pits

In May 1804 the Governor directed that coal was not to be mined by individuals, who were apparently acting in a 'shameful manner', and that prisoners would be used for the mining of coal under the direction of professional miners.

The Australian Agricultural Company, which had originally been established as a land development company with the assistance of the British Parliament's crown grant of one million acres in the Port Stephens area, started mining coal at the direction of the British Government in 1827. As the government was eager to get out of coal mining, the AA Co. took over the responsibility of mining all coal in the colony from 1830[4].

The AA Company became a very successful company in coal and later in livestock, becoming the largest beef producer in Australia.

The company's first mine was the 'A' Pit, situated in Church Street near Brown Street. Coal was taken from the mine down an inclined wooden planking plane to the harbour[5]. Mines were later established at the 'B' Pit in 1837 and 'C' Pit in 1843. Once the Borehole Seam was discovered, further pits were established further out of town, however the company returned to the Newcastle city area in 1855 and sank the 'F' Pit to mine the Yard Seam.



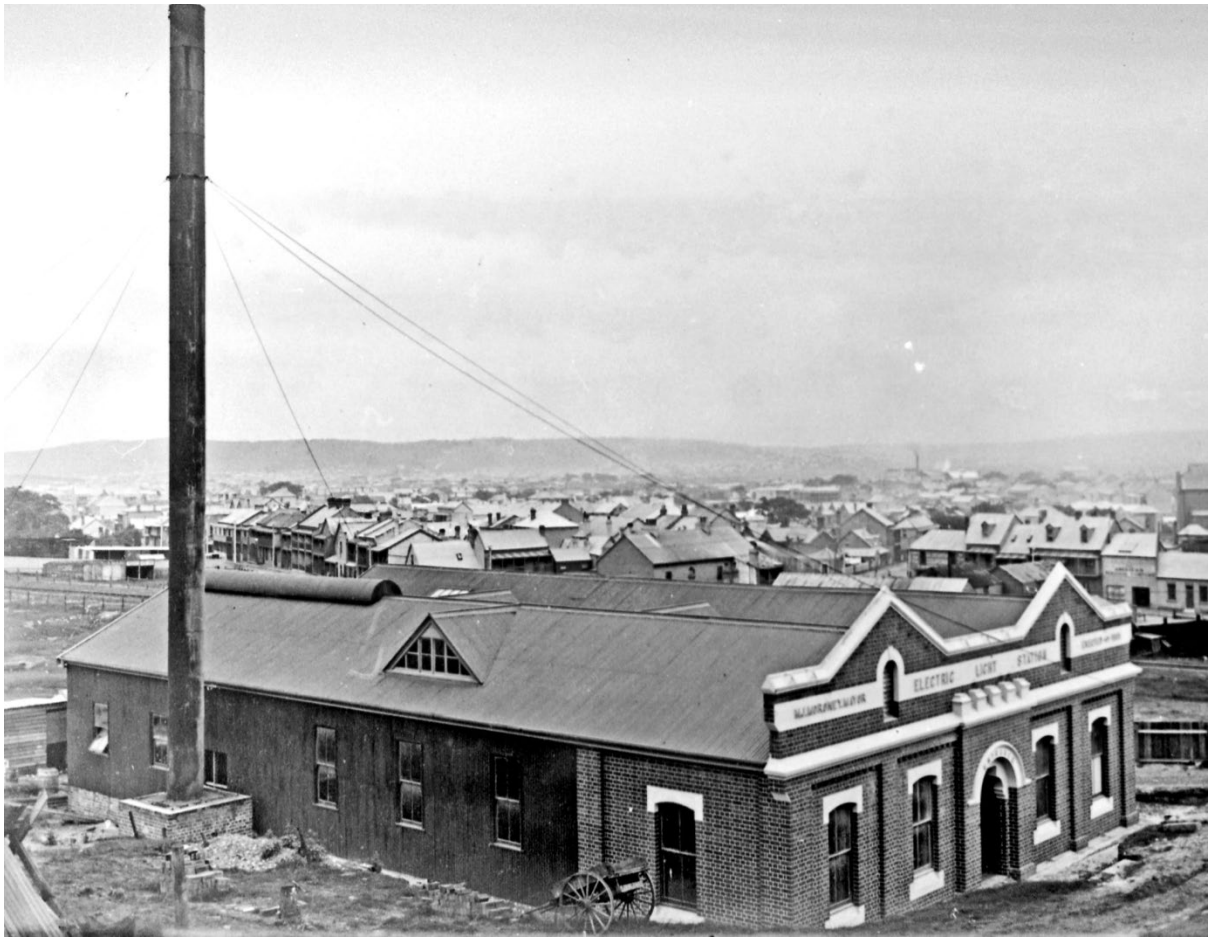
AA Company Collieries and Railways at Newcastle.

[4] Brian Robert Andrews. *Coal, Railways and Mines Volume 1: The Colliery Railways of the Newcastle District and the Early Coal Shipping Facilities*. (Iron Horse Press 2009). 9.
[5] Brian Robert Andrews. *Coal, Railways and Mines Volume 1: The Colliery Railways of the Newcastle District and the Early Coal Shipping Facilities*. (Iron Horse Press 2009). 13.

Site of Sydney Street Power Station

The Sydney Street Power Station was the first power station to be built in the Newcastle area. It was located at what is now the corner of Darby and Tyrrell Streets (Sydney Street was later renamed Tyrrell Street). Tenders were called for the lighting of the city in 1889 by Newcastle Borough Council and after a number of disputes with the Newcastle Gas and Coke Company, the station was commissioned and the streetlights in Newcastle were switched on 31 December 1890[6].

The station consisted of two Babcock and Wilcox boilers supplying steam to two Westinghouse reciprocating engines of around 100 kW. The generators supplied 50 Hz single phase power at 250/ 2200 volts. The Fuel supplies were readily available as the coal mines at the turn of the century were located near-by.



Sydney Street (now Tyrrell Street) Power Station

[6] Terry Wall. "Taming the River and the Sea: The Port of Newcastle". In Shaping The Hunter. (Newcastle: Institution of Engineers Australia 1983). 136.

Lead Light Tower

The Lead Light Tower, the remaining one of a pair, was used in the navigation of ships into the port in the mid-19th century. When aligned to each other, the two lights were expected to provide a dead reckoning navigational aid for ships entering the harbour.[7]

The tower was built in 1865.

Lead Light Tower

[7] NSW Government Website - https://www.nsw.gov.au/visiting-and-exploring-nsw/locations-and-attractions/lead-light-tower#:~:text=The%20Lead%20Light%20Tower%2C%20the,for%20ships%20entering%20the%20harbour. (viewed 6 November 2023).

Hunter Water Reservoirs

Newcastle No 1 Reservoir was completed in 1882 and received its first water in December 1885. It has now been decommissioned.

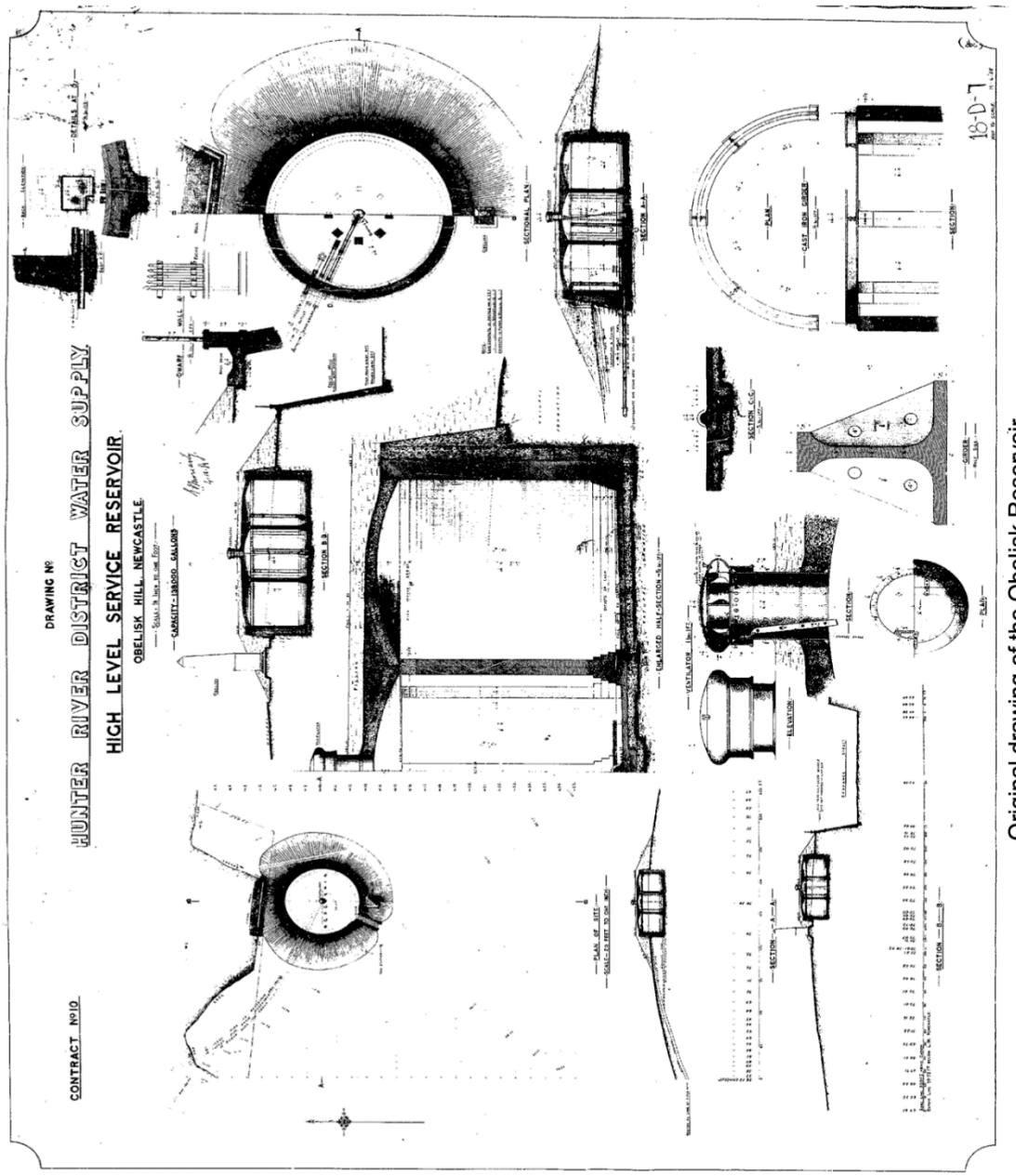
Newcastle No 2 Reservoir was completed in 1916 and is still in use.[8]

No. 1 Reservoir, 1882,, Brown St Newcastle.
Cast iron beams made in Rodger Bros foundry.

[8] 'Newcastle Reservoirs'. Hunter Water website - https://www.hunterwater.com.au/documents/assets/src/uploads/documents/Heritage-Assets/water/Newcastle-Reservoirs-s170-Form-2023-Final.pdf . (viewed 7 November 2023).

Newcastle Obelisk

The obelisk is located beside the former reservoir built in 1850 on the site of a windmill which was demolished in 1847.



Original drawing of the Obelisk Reservoir

Gibson Kiosk South Newcastle Beach

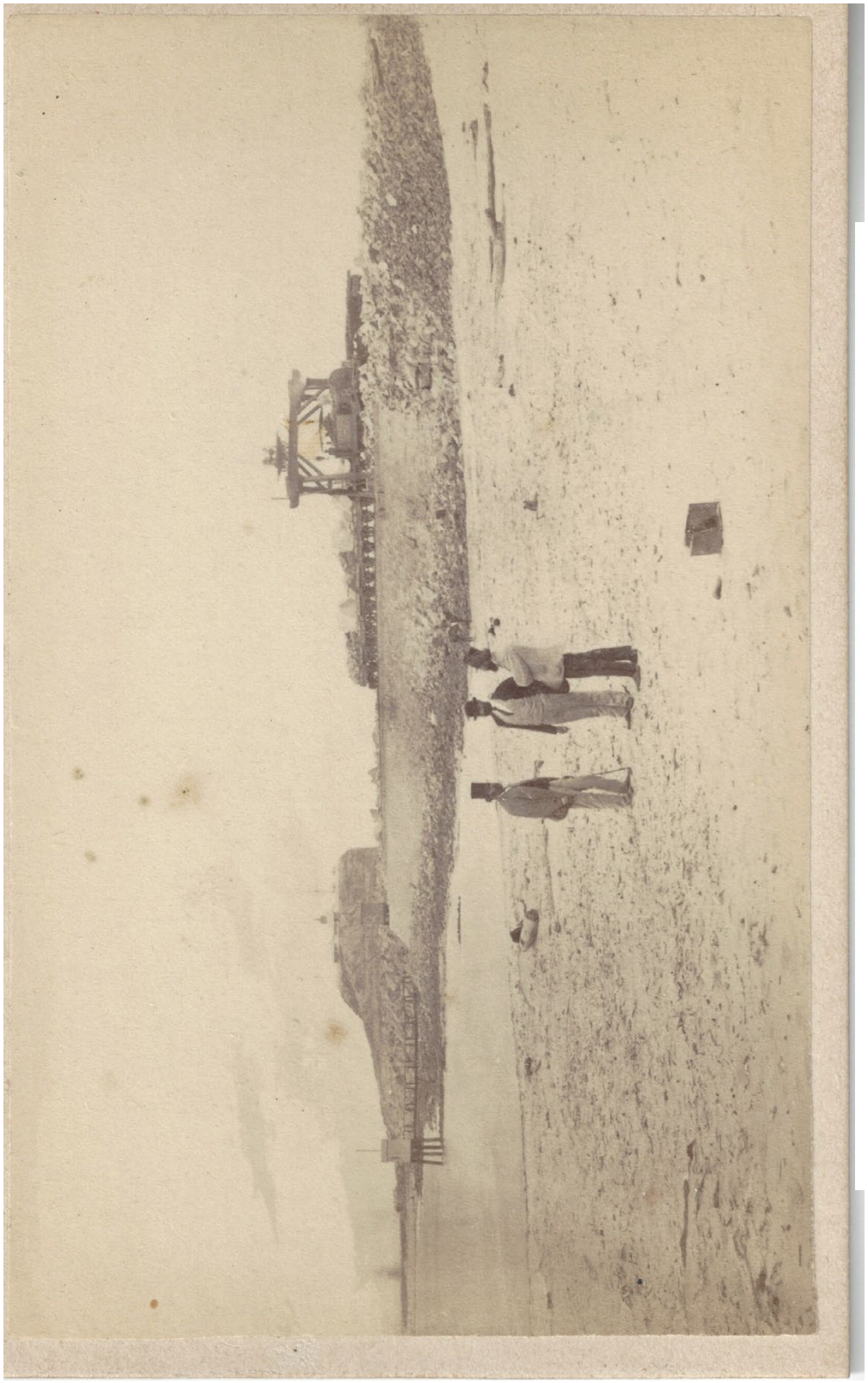
Some of the tapered column bases can still be seen, plus some of the upper walls. The date of its demolition is not known (photo taken 1918).

Drainage tunnel from early shaft workings c1814 onwards

The c. 1850 brick culvert in Church Street Newcastle drains through an old mine tunnel to South Newcastle Beach.

Macquarie Pier

Macquarie Pier is the earliest rock-fill breakwater from 1818, finally stabilised 1872.



Newcastle Breakwater under construction, circa 22 October 1870 – 1 December 1870

Zaara Street Power Station

Zaara Street Power Station was built by the NSW Government Railways (NSWGR) from 1915. The station began generating in 1915 with a 2.5 MW turbogenerator in a temporary building where the power station would soon be built. The station supplied electric energy to the railway stations and yards and also supplied the coal cranes at Western Basin Carrington[9].

The station's generation capacity was progressively increased over the years such that by 1921 the generation capacity was 12.5 MW. By the end of World War II the total installed generating capacity was 70.75 MW[10].

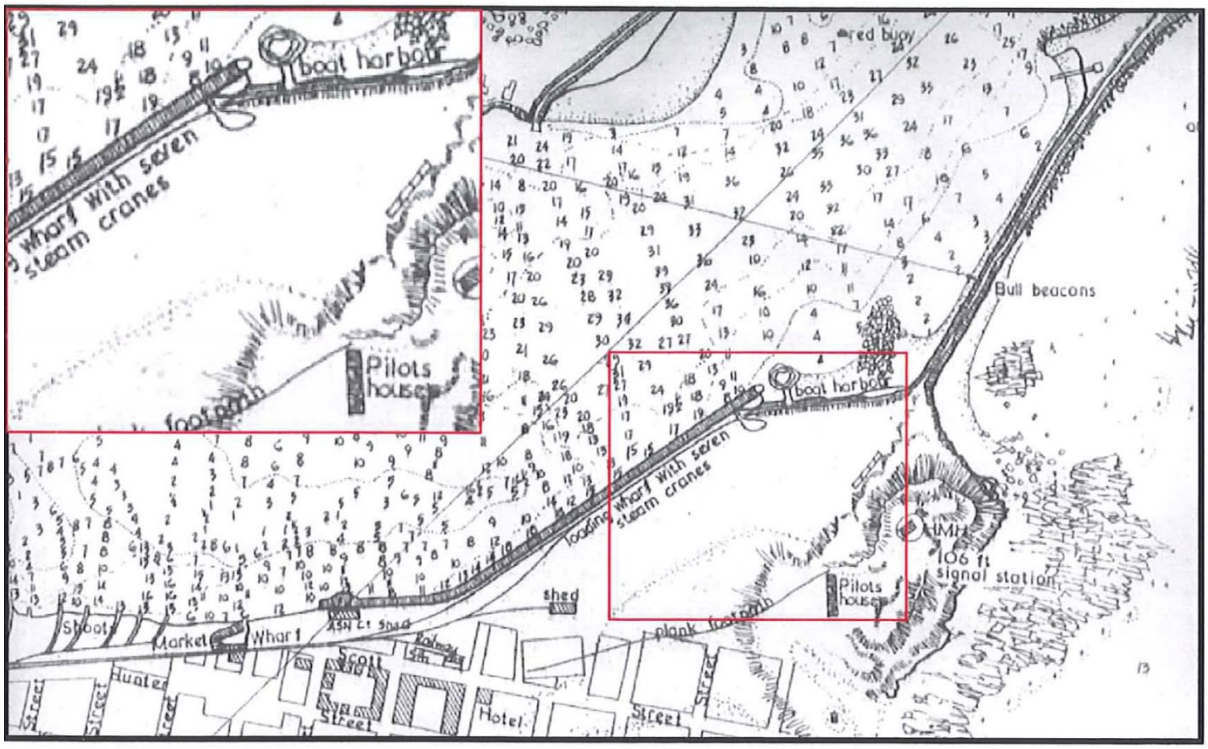
The station was decommissioned in 1975 and demolished in 1978

.

Zaara Street Power Station

[9] Louise Parker. 'Zaara Street Power Station'. *Regional History Research Project for Open Foundation*. (1989). 1.
[10] 'Zaara Street Power Station' Wikipedia, viewed 25 August 2023.

‘Cornish’ Boat Harbour (in Pilot Station – 1874



Gowlland and Boulton Survey of Newcastle showing Boat Harbour 1866

Boat Harbour and Pilot Station 1902

Carrington Hydraulic Engine House

Built in 1877, the building housed the first large scale hydraulic power system to be established in Australia, providing power for the original coal loading cranes.[11]

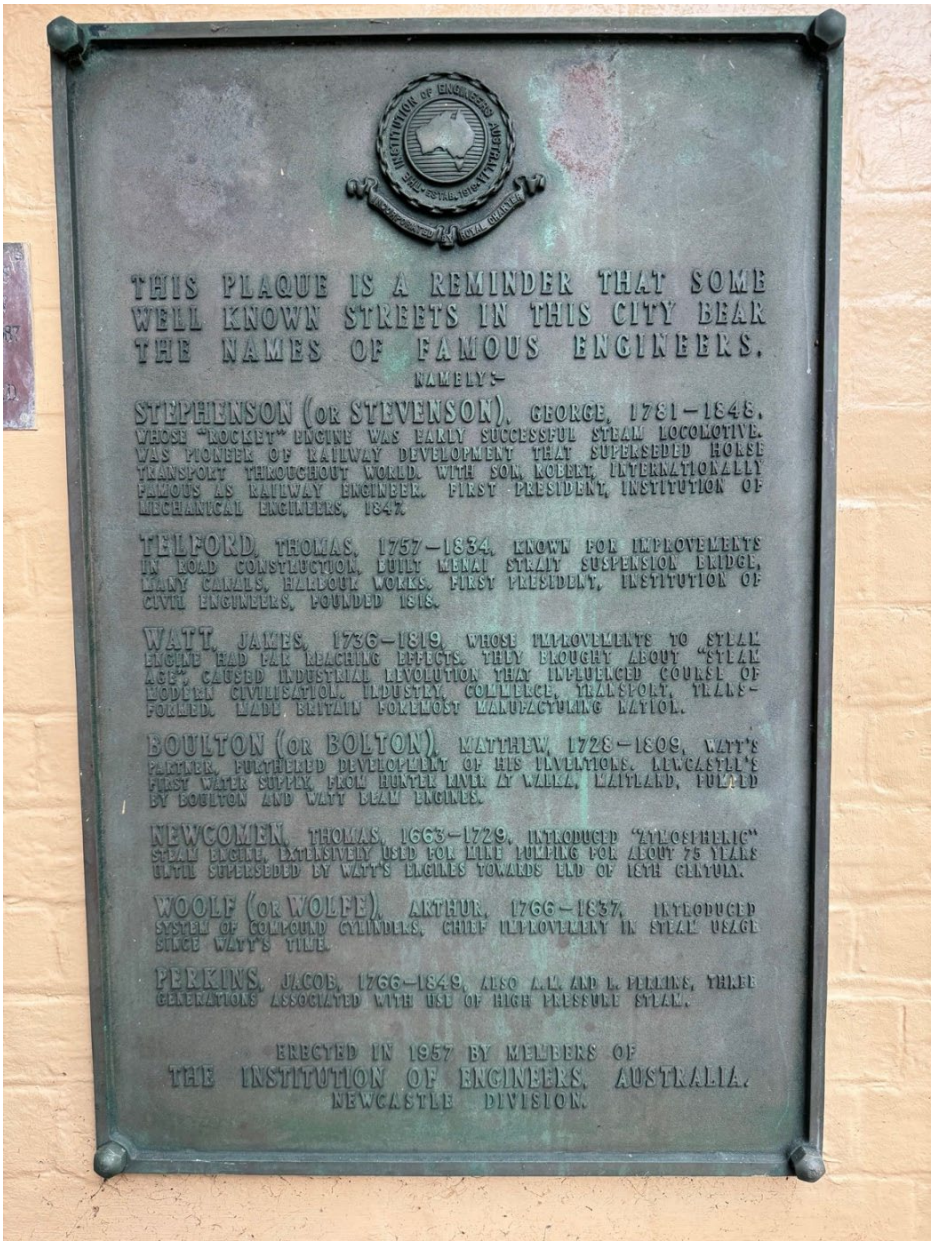
[11] "Carrington Hydraulic Engine House". Port of Newcastle Website. https://www.portofnewcastle.com.au/landside/major-projects/newcastle-hydraulic-engine-house/ (viewd 8 November 2023.

BHP Iron and Steelworks

Operations began at the BHP Steelworks in March 1915 and at its peak the steel works employed 11,000 people. The plant was closed on 30 September 1999.

Newcastle Streets Named After Famous Engineers

Not many Novocastrians are aware that quite a number of the city's streets are named after world famous engineers. The following photograph is of the plaque mounted on the building at 74 Hunter Street which was the original Newcastle Post Office. The plaque lists the streets named after engineers.



Rail Bridge over Hunter Street

Coal from AA Company mines crossed Hunter Street adjacent to Burwood Street (notice the alignment of Burwood Street which brought the railway line to the port). The original timber bridge built in 1831 was replaced by an iron bridge built in 1865. The bridge carried the railway line over Hunter Street and the Great Northern Railway to the AA Company cola loader on the wharf.

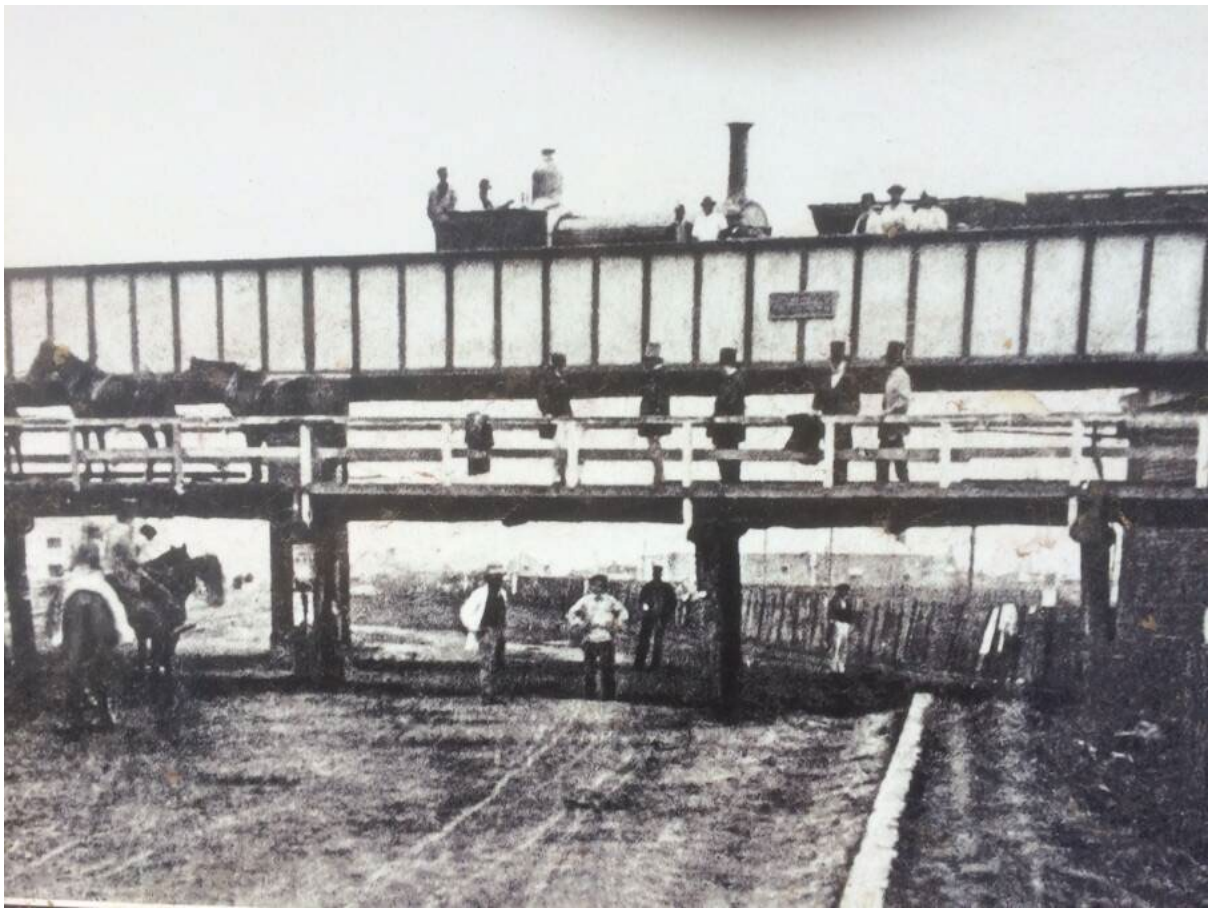


Photo Taken April 1865

(Newcastle Morning Herald 29 November 2019)

Brick base of ‘Iron Bridge’ Pier

This remnant brick pier was part of the bridge erected in 1865 by the Australian Agricultural Company (AACO.)

Appendix

1. The Craven Crane

ENGINEERS AUSTRALIA
Newcastle Division

Engineering Heritage Australia (Newcastle)

The Craven Crane

The **Craven Crane** is a 16 ton overhead travelling crane manufactured in Britain in 1885 by Craven Bros of Manchester. The crane is rope driven, originally powered by a remote steam engine, and was specifically located in this building for the heavy lifts required during boiler work on steam locomotives.

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The crane is complete and original. It was restored in 1995, but no modifications or major repairs were necessary. Unlike others of the same type, the rope transmission has not been replaced by direct electric drives, nor has it been relocated from its original working situation.

It is believed to be the only rope drive crane still operating anywhere in the world.

Time Line

The crane was bought for installation in the Boiler Shop (this building) when the structure was nearing completion. The building had to be heightened to cater for this crane.

1878: First plans for the new Locomotive Boiler Shop were prepared.

1882: Construction commenced on the new building.

1885: The plans are changed and the roof raised to cater for the Craven Crane. The crane was ordered from Craven Brothers in Manchester, England.

1886: "Craven Brothers 16-ton rope powered travelling crane [and one] crab winch for lifting locomotives" arrived in Newcastle on 24 April, on the ship *Loch Uhr*.

1887: The new boiler shop was occupied.

1887-1929: The boiler shop operated as the second largest locomotive boiler shop in NSW.

c1913: The lineshaft power source was probably changed from steam engine to an electric motor (As in the existing arrangement, the electric motor drove the lineshaft running beneath the crane beams. The rope drive takes power from the lineshaft through the original gearbox).

1929: Operations were relocated to the new Cardiff Loco Workshops and the Honeysuckle Boiler Shop was vacated. The crane was too small for current Locos, and was left behind.

1929-1951: The Boiler Shop was used for various workshop activities until it was converted to a small diesel operated power station. The crane was used to lift seven 533kW generators into position.

1957: The power station equipment was transferred to Bourke;

after 1957: The boiler shop was converted back to a garage and storage facility for the Railways.
The crane was disconnected from its power source and used occasionally (unpowered) to change the overhead light globes.

1995: Conservation report prepared by C & M Doring and work carried out by Hunter Valley Training Company for Honeysuckle Development Corporation.

2002: Members of Newcastle Branch of Engineering Heritage Australia commence maintaining and demonstrating the crane.

The general arrangement shows the 'crab' winch. The winch has 2 hoists, 16 ton and 1 ton, and each hoist has 2 speeds. Selection between hoists and speeds is done via dog clutches on the winch. Different pulley sizes on the drive belts result in the lowering speed being faster than the raising speed.

The crane is operated by three sets of belts:
Crane long travel – forward and reverse;
Winch cross travel – left and right;
Winch hoist – raise and lower
Note different hoist belt pulley sizes on right.

The belts are powered by the three main wheels that draw power from the rope drive

The crane is operated by mechanical levers from within the cabin that 'hangs' beneath the crane.

The lineshaft provides power to the main belt that operates the rope drive through a gearbox on the west wall. The rope drive is an endless loop of rope which is held in tension by a pulley and counterweight.

The drive shafts to the winch are supported by bearings that cleverly alternate their support as the carriage passes

2. The Cornish Dock

A Brief History of the building of the Cornish Dock

Compiled from a report to NPC by Hunter History Consultants Pty Ltd.

The first wharf, a pier was constructed in 1816 at the foot of Watt Street. The Circular Wharf, a stone quay of about 300 metres, replaced it in the 1840s.

In 1866, the NSW Government allocated funds for 'building and other works required in providing accommodation for the Pilots at Newcastle". The provision of new accommodation for the pilot boats became a matter of urgency in 1864 when the section of old convict stockade occupied by the pilots, collapsed destroying two whaleboats.

On 17 April 1866 tenders were called for the deposit of stone ballast in the embankment leading from the eastern end of Newcastle wharf to the southern breakwater. Two months later, tenders were called for the masonry foundation for the coal staithes and this contract was let to E.D. Dyson.

The Pilot Station today

In 1866 it was announced that a pilot boat harbour would be built at the eastern extremity of a proposed eastward extension to Queens Wharf. Blocking off the western extension of the existing natural boat harbour and creating a mound on the eastern side created the Pilot Boat Harbour. Quarters for pilots existed in other areas nearby, including Nobbys.

In 1882 the sea walls at the western side of the entrance to the dock as well as part of the western wall inside the dock were constructed in stone. A set of stone steps was also constructed at this time. The dock was used for different purposes during the century and was recognised as Australia's only remaining Cornish boat dock.

In the early 1990s the stone seawall and bed which formed the boat dock were experiencing an increasing amount of collapse and undermining. In 1998 the refurbishment of the dock was undertaken to preserve this historical landmark.

The prime objective of work required on sandstone/bluestone block walls which were not in reasonable condition was to retain the original character of the wall while repairing the areas of collapse within the wall. This was achieved by recovering re-useable blocks from the wall, as it was demolished, as well as recovering blocks from the seabed that had fallen from the wall.

Refurbishment work – 1998

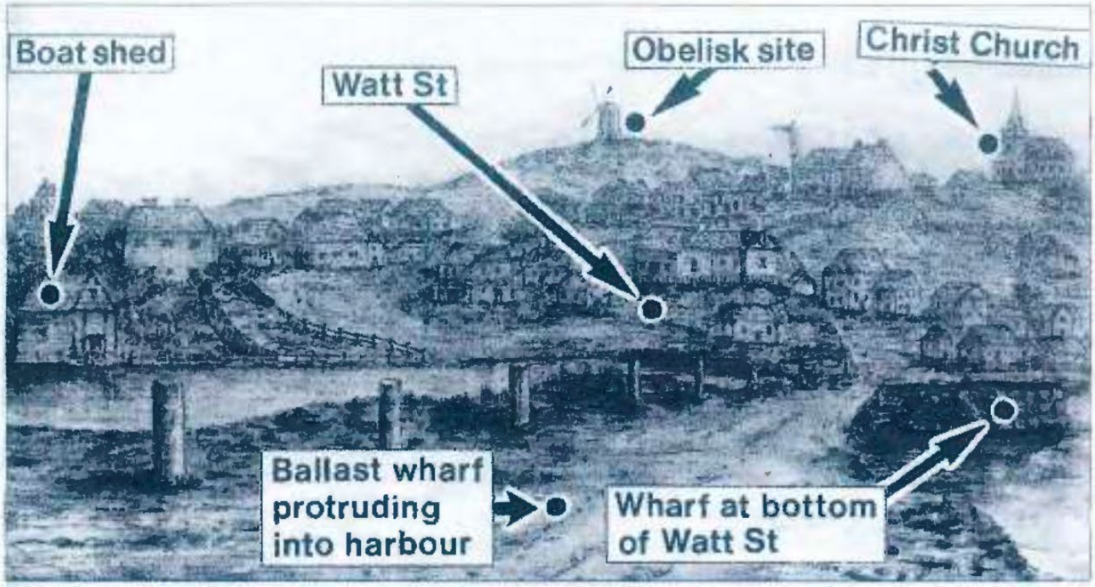
More history - www.newportcorp.com.au

H:\Wharf\Marketing\Website stuff\Web CONTENT\cornish dock.doc

3. What Lies Beneath

What Lies Beneath

Watery secrets are harboured by some of Newcastle's most well-used parkland.



VANISHED: A rare glimpse of early Newcastle, drawn in 1845, from the ballast wharf extending towards Nobbys. The enclosed boat harbour was in front of Customs House, while the boatshed, at left, was in front of the old stockade site (now the Convict Lumber Yard).

probably reached to almost past today's third former harbour tug berth, heading east, towards Nobbys (see map).

The forgotten wharf was probably one of the last and biggest projects undertaken by the convicts still left in Newcastle. Most had been transferred to Port Macquarie in 1823.

A rare glimpse into what the wharf looked like was provided by the late Newcastle history expert Bert Lovett many years ago.

Mr Lovett produced a rare drawing done by an unknown artist, possibly in 1845. It's from the unusual viewpoint of looking back to the city (pictured) from the harbour edge of the circular wharf.

And if it looks a little odd today, that's because everything in the scene depicted has vanished.

In the distance is Newcastle's first windmill (erected 1820, then demolished 1847) which is now the Obelisk site. Most drawings of the era were of the harbour, not the town's landmarks.

Much of today's circular wharf story comes from research ages ago from Ted Coulin, a former Newcastle branch manager of the former Maritime Services Board (now NPC).

Mr Coulin said the stone ballast wharf was declared a public structure in August 1848. This came eight years after ship masters were officially allowed to dump stone into the harbour from moored ships.

EARLY DAYS: The city as it was, east of Newcastle Railway Station.

But he said the giant wharf disappeared by the 1860s with plans for new wharves east of Watt Street. Rail lines had to be extended to service ships loading coal. The boat harbour was then filled in.

Mr Coulin said an interesting feature of the ballast structure was the early steamer landing at Watt Street wharf.

The landing, which accommodated early paddlewheelers like the William the Fourth, was faced with stone blocks.

We know because tenders were called in May 1847 for this purpose.

Square-cut stone was sent from Sydney and prisoners laid it under the supervision of Major MacPherson, who was in charge of the nearby convict stockade.

But the boat harbour itself was begun by a famous military engineer George Barney, of Sydney's "circular cove" fame.

Mr Coulin said that a decision was then made in March 1861 to recycle the large steamer landing stones from the circular wharf.

These were used to construct a sloping embankment at the small replacement boat dock at the new Market Street wharf.

But over decades this also later vanished and a third boat harbour was built, also on Wharf Road, at Perkins Street (1902-1960).

Then, probably in late 1983, members of the Institute of Engineers and Newcastle Maritime Museum alerted Newcastle council to 48 barnacle-encrusted stone slabs.

They were from the old Market Street dock. But they were in danger of being smothered by debris being dumped to create the new Foreshore, which then opened in 1988.

The stone pieces were quickly saved, stored, then later all cemented together.

The rare legacy of the city's convict past now forms the base of the large anchor on display outside Fort Scratchley, off Parnell Place, Newcastle East.

From Newcastle Herald 10 July 2003 Mike Scanlon