ACT Heritage Council

Notice of Approval of Conservation Management Plan under Section 61K of the *Heritage Act 2004*

The ACT Heritage Council (the Council) has approved the "*John Fowler Road Locomotive No. 16161 Conservation Management Plan"* (Lovell Chen, 2020) for the John Fowler Locomotive No 16161 on 7 June 2023.

In approving this Conservation Management Plan, the Council is satisfied on reasonable grounds that the conservation policies and actions contained therein will ensure the conservation and responsible management the John Fowler Locomotive No 16161.

This approval is current for a period of five years from the date of approval.

Conditions of Approval

The Council's approval of this Conservation Management Plan is conditional, and sets out:

- The statement of significance set out in the ACT Heritage Register entry retains precedence over the assessment of heritage significance in Section 4 of the Conservation Management Plan.

Meaghan Russell
A/g DirectorApprovals and Advice (as delegate for),
ACT Heritage Council
7 June 2023

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John Fowler Road Locomotive No. 16161

Conservation Management Plan

August 2020

Prepared by

LOVELL CHEN

Prepared for

ACT Government | Suburban Land Agency

Date	Document status	Prepared by
02/07/2020	Draft	Lovell Chen and Rohan Lamb
31/08/2020	Complete draft for review by Heritage ACT	Lovell Chen and Rohan Lamb
01/11/2023	Approved Final Version	Lovell Chen and Rohan Lamb

Cover image: Steam traction engine no. 16161 towing a road grader, Canberra, 1920s
Source: (National Archives of Australia, Mildenhall Collection)

John Fowler Road Locomotive No. 16161

Conservation Management Plan

Prepared for

ACT Government's Suburban Land Agency (SLA)

August 2020

TABLE OF CONTENTS

LIST OF FIGURES

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1.0 INTRODUCTION

This Conservation Management Plan (CMP) was prepared for the ACT Government's Suburban Land Agency (SLA) by Rohan Lamb (see below) and Lovell Chen. It addresses John Fowler Road Locomotive no. 16161 (the road locomotive),a three-speed, fully-sprung, class B6 compound road locomotive manufactured by John Fowler & Co (Leeds) Ltd, England and shipped to Canberra in 1925.

This CMP updates the previous CMP prepared in April 2015 by Rohan Lamb and Lovell Chen. In particular, this report updates the previous CMP to:

- acknowledge the inclusion of the road locomotive in the ACT Heritage Register in September 2016, under the *Heritage Act 2004* (ACT)'
- ensure consistency with ACT heritage legislation and policy, including the ACT Heritage Council's *Conservation Management Plans—Guiding Principles* (2015) and *Heritage Assessment Policy* (2018);
- include inspection reports and a description of maintenance and conservation works undertaken since April 2015;
- include a new condition report prepared by Rohan Lamb in January 2020;
- identify necessary maintenance and conservation works; and
- reflect the aspirations of the current owner in relation to the location of the locomotive.

Rohan Lamb

Rohan Lamb MIEAust is a qualified mechanical engineer, and has been associated with the conservation, restoration, and operation of vintage steam powered heritage machinery for over 20 years. He is active in researching and writing on a broad range of industrial heritage topics and is a member of Engineers Australia. Since 2007 he has written several reports on the history of traction engines for the Attorney-General's Department (Ministry of the Arts). He is presently Deputy Chairman of the National Trust of Australia's (Victoria) Industrial History Committee.

1.1 Methodology

This CMP has regard for *Conservation Management Plans: Guiding Principles*, prepared by the ACT Heritage Council (2015). It also reflects the principles and processes set out in the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013* and its Practice Notes (Appendix E). The *Australia ICOMOS Burra Charter, 2013* establishes a standard of practice for those involved in assessing, managing and undertaking works to places of cultural significance.

'Place' is defined at Article 1 of the *Australia ICOMOS Burra Charter, 2013* as:

... a geographically defined area. It may include elements, objects, spaces and views. Place may have tangible and intangible dimensions.

Recognising that the focus of the *Australia ICOMOS Burra Charter, 2013* is not on movable objects, this CMP also has regard for the significance assessment process set out in *Significance 2.0 - a guide to assessing the significance of collections* (2009), prepared by the Collections Council of Australia Ltd.

1.2 Location

The road locomotive is currently located at Lanyon Homestead, part Block 1669 Tuggeranong. Statutory heritage controls

1.2.1 Heritage Act 2004

The road locomotive is included in the ACT Heritage Register, maintained by the ACT Heritage Council. The guiding conservation objective is that the locomotive shall be conserved and appropriately managed

in a manner respecting its heritage significance. The registration includes the following statement of significance:

> John Fowler Locomotive 16161 has a special association with the development of Canberra between the years 1925 and 1927. It is one of only two 'B6' class road locomotives custom-built for the Federal Capital Territory (FCT) to facilitate civil construction of the burgeoning city. John Fowler Locomotive 16161 belonged to a class of the most powerful road locomotives ever built. It was capable of immense haulage, more so than any plant in possession of the FCT. The engine has survived largely unaltered, is an excellent example of its type, and with minor servicing has been brought up to operational standards [criteria (a) (b) (d)].

A full copy of thecitation is i at Appendix B.

1.2.2 Protection of Moveable Cultural Heritage Act 1986

The John Fowler road locomotive no. 16161 is subject to the provisions of the *Protection of Moveable Cultural Heritage Act* 1986 and the *Protection of Moveable Cultural Heritage Regulations 2018*.

A National Cultural Heritage Control List (Control List) is established at Schedule 1 of the Regulations. The Control List is divided into nine parts, each covering a type of cultural object, and describing the criteria that an individual object must meet to be an Australian protected object. The Control List also divides protected objects into two export 'classes': Class A, objects that may not be exported, and Class B, objects that may be exported if granted a permit under the Act. The road locomotive is considered under Part 4 of Schedule 1 as an 'object of applied science or technology' as a Class B object.

Under s 10 of the Act, A person may apply to the Minister for a permit to export class B objects. The National Cultural Heritage Committee or Minister shall not recommend or grant a permit if they are 'satisfied that the object is of such importance to Australia, or a part of Australia, for those reasons, that its loss to Australia would significantly diminish the cultural heritage of Australia'. In February 2014, the road locomotive was denied an export permit in February 2014 by the delegate of the Minister of the Ministry of the Arts under the Act.

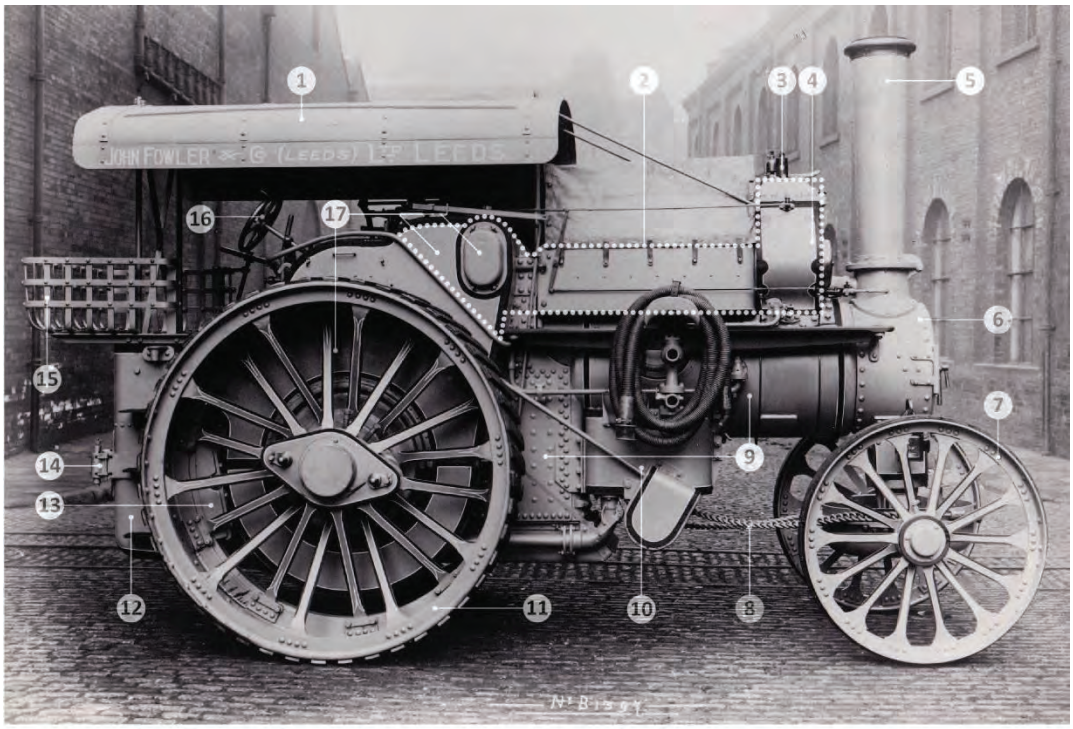
1.3 References

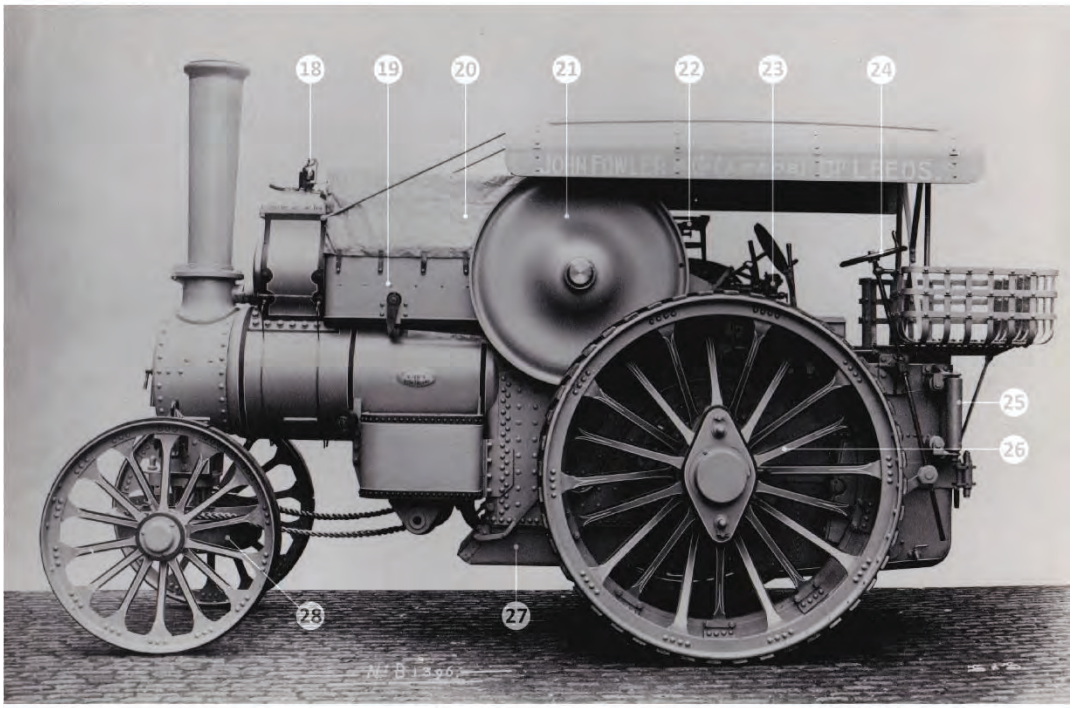
This CMP draws on a number of works relating to the history of John Fowler & Co (Leeds) Ltd, including primary records held by the Museum of English Rural Life, Reading (MERL), and a comprehensive history of the company by Michael Lane, *The Story of the Steam Plough Works*, 1980. The Fowler build specification sheets of the local Victorian agent survive and are held in the archives of the Melbourne Steam Traction Engine Club Inc. (MSTEC). The Australian context draws on a report by Rohan Lamb, *Steam Traction Engines in Australia*, 2007.

First-hand accounts of working with the Canberra traction engine fleet from the late Bill Ginn, and late Wally Wilkinson have been referred to, along with various records held in the National Archives of Australia. These sources are referred to as relevant in this document and in the bibliography.

1.4 Definitions

This report uses definitions drawn from the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013* Article. The Charter is included at Appendix E. The key features and components of road locomotives are indicated on the following annotated photographs (Figure 1).





1. Canopy
2. Engine
3. Pickering governor
4. Cylinder
5. Chimney
6. Smokebox
7. Front wheels (steering)
8. Steering chains
9. Boiler (barrel & firebox)
10. Front water tank
11. Rear wheel
12. Rear water tank
13. Rear brake
14. Draw bar
15. Wood basket
16. Steering wheel
17. Gears (under covers)
18. Whistle
19. Motion cover
20. Dust Cover
21. Flywheel
22. Regulator handle
23. Water pump
24. Rear brake handwheel
25. Cable guide rollers
26. Whinch drum
27. Ashpan
28. Spud pan

Figure 1 Definitions—features of a road locomotive
Source: Museum of English and Rural Life (base photographs, showing John Fowler & Co class B7 compound road locomotive no. 12619)

2.0 HISTORY

This chapter provides a summary history of the John Fowler Road Locomotive.

2.1 Introduction

This summary history includes contextual history on mobile steam engines, their use in the development of the Federal Capital and the purchase and use of John Fowler road locomotives nos. 16161 and 16162.

2.1.1 Timeline

1840s	First steam-powered traction engines developed
Late 1870s-	Traction engines begin to be employed in Australian agriculture, mining, road transport and saw-milling
1880s	Road locomotives emerge as a refinement of the traction engine
1881	John Fowler & Co are first to apply the compound steam engine to a traction engine
1898-1914	Around 900 engines are imported to Australia from Britain and the USA
1908	Yass-Canberra site chosen as the location for the Federal Capital
1911-1924	Traction engines used around Canberra to haul crushed rock, cement, pipes, coal and timber buildings. Used in Cotter dam construction site and road construction.
1913	Department of Home Affairs (DHA) acquires six traction engines for hauling materials for the construction of Canberra from the Queanbeyan Railway Station
1914	Railway line constructed from Queanbeyan, terminating at Kingston Powerhouse
1916	Fitter's Workshop opens with the purpose of servicing all DHA equipment
Mid-1924	Department of Works and Railways (formerly DHA) recommends purchase of two new traction engines. Calls for tenders.
Nov 1924	John Fowler & Co is awarded tender—Road locomotives nos. 16161 and 16162 are built to order.
Jan-Feb 1925	Road locomotives nos. 16161 and 16162 are despatched from Leeds.
Mid-1925-1927	Road locomotives nos. 16161 and 16162 are based at Kingston depot. Main period of construction in Canberra, including roads, bridges, business sites and sewerage. Uses include rock, pipe and brick haulage, pile driving and towing an elevated grader
c. 1927-1932	Either no. 16161 or no. 16162 is transferred to the newly constructed abattoir, to supply steam for heating and to drive machinery. An engine is used to drive a rock crushing plant at Black Mountain quarry. Remaining engine stored at Kingston.
c. 1932-1947	Road locomotives nos. 16161 and 16162 are stored at Kingston, with very little use
Jan 1947	Road locomotive no 16161 purchased by Mr T A Fields of Lanyon Station. Used to drive a chaff cutter and for clearing Yellow Box trees
Early 1950s	Road locomotive no 16161 sold to Mervyn Davis—used to mill timber at Reids Flat
1959	Engine ceased work due to failure of boiler tubes
1962	Purchased and repaired by traction engine preservationist Bob McLeod, Cowra, NSW.

1972-2015	Purchased by Doug Wallis and stored at a location in Sydney.
2015	Purchased by the Land Development Agency (now Suburban Land Agency). Moved to Lanyon Homestead.
2016	The John Fowler Road Locomotive included as an object in the ACT Heritage Register

2.2 Mobile steam engines

2.2.1 Traction engines

The harnessing of steam power underpinned the industrial revolution. The traction engine was a later development of steam power and had to wait for a greater understanding of how steam worked, and for the development of better materials and more efficient boilers and engines. With the advent of the mobile steam engine, it was not long until the means to make the engine self-propelled were applied and the first traction engines emerged in the 1840s. Many ideas were tried over the following years with engines taking on many different configurations. By the 1870s the design standardised on the form generally associated with traction engines today (Figure 2).[1]

Traction engines played an important role in the pattern of development of Australia's early agricultural, mining, road transport and sawmilling industries from the late-1870s until the 1940s. Their mobility and power changed the way tasks were handled, by removing much of the manual labour and the need to maintain teams of horses or bullocks. They had a significant positive economic and social impact in Australia where labour was scarce, and distances great.

British manufacturers were at the forefront of the development of the traction engine. The vast majority of the traction engines, steam rollers, steam wagons, and stationary steam engines used in Australia were exported from Britain. Starting in the late 1890s lighter traction engines made in the USA challenged the British dominance of the market for agricultural use, but for road haulage British makers were unchallenged. Australian manufacturers were relatively successful in supplying a larger proportion of the local requirement for stationary steam engines to mines, factories, and the local ship building industries, and to a lesser extent making steam rollers. They were less successful when it came to traction engines, with only a handful built by Victorian manufacturers.[2]

2.2.2 Road locomotives

The road locomotive was a later refinement of the traction engine; the term came into use during the 1880s to describe an engine suited to prolonged operation over roads undertaking heavy haulage duties.

While road locomotives differed in detail between manufacturers, there were features common to the majority. Road locomotives were generally of a heavier or more robust construction than a general-purpose traction engine with larger diameter spring-mounted axles, wider gears, and enlarged bearing surfaces to cope with heavy loads. They typically had three speeds which provided a faster gear for road travel (general purpose traction engines typically had two speeds). They were also fitted with a front belly water tank to provide additional travelling range before refilling; a disc-type flywheel; side motion covers; and larger wheels (Figure 3).

These features made road locomotives the most expensive type of engine available. As a consequence, they were far less common than general purpose agricultural traction engines. It also limited the potential client base for road locomotives. In the case of John Fowler & Co (Leeds), one of the major manufacturers of traction engines and road locomotives (see Section 2.2.4), the vast majority of its road locomotives supplied to Australia were sold to government customers, including shire councils and government departments.

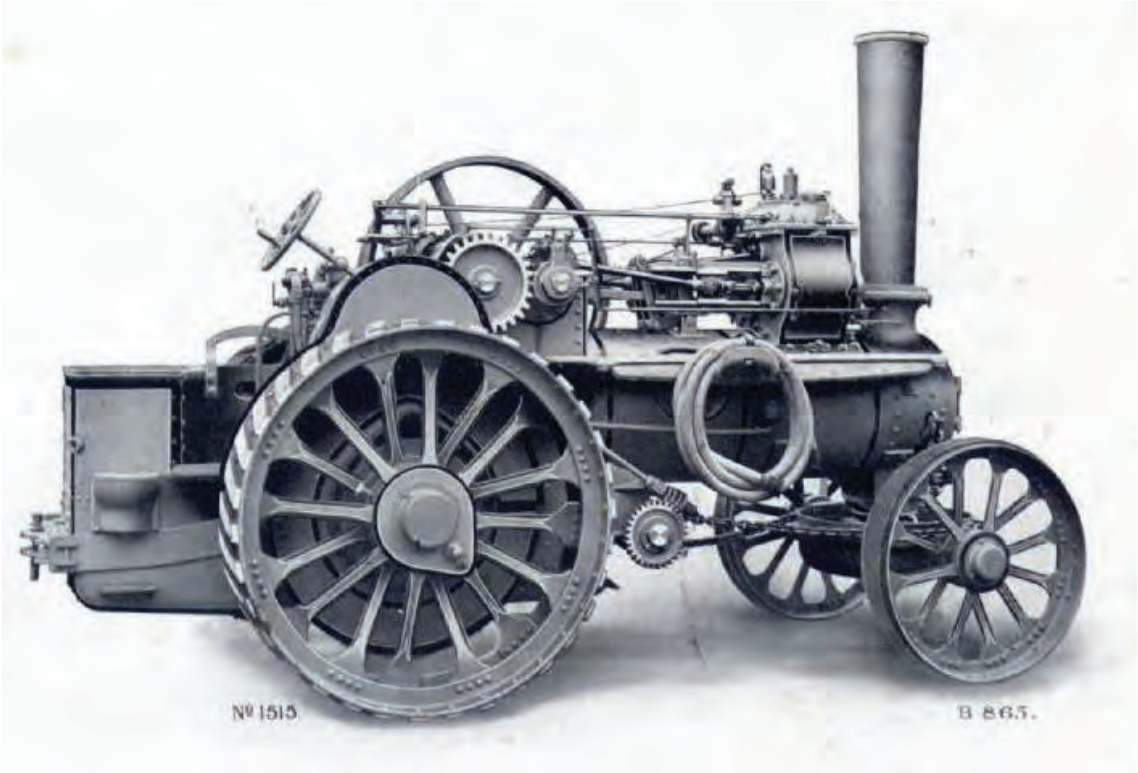


Figure 2 Example of a Fowler general purpose compound traction engine
Source: John Fowler & Co (Leeds), Traction Engines, undated catalogue, c.1910

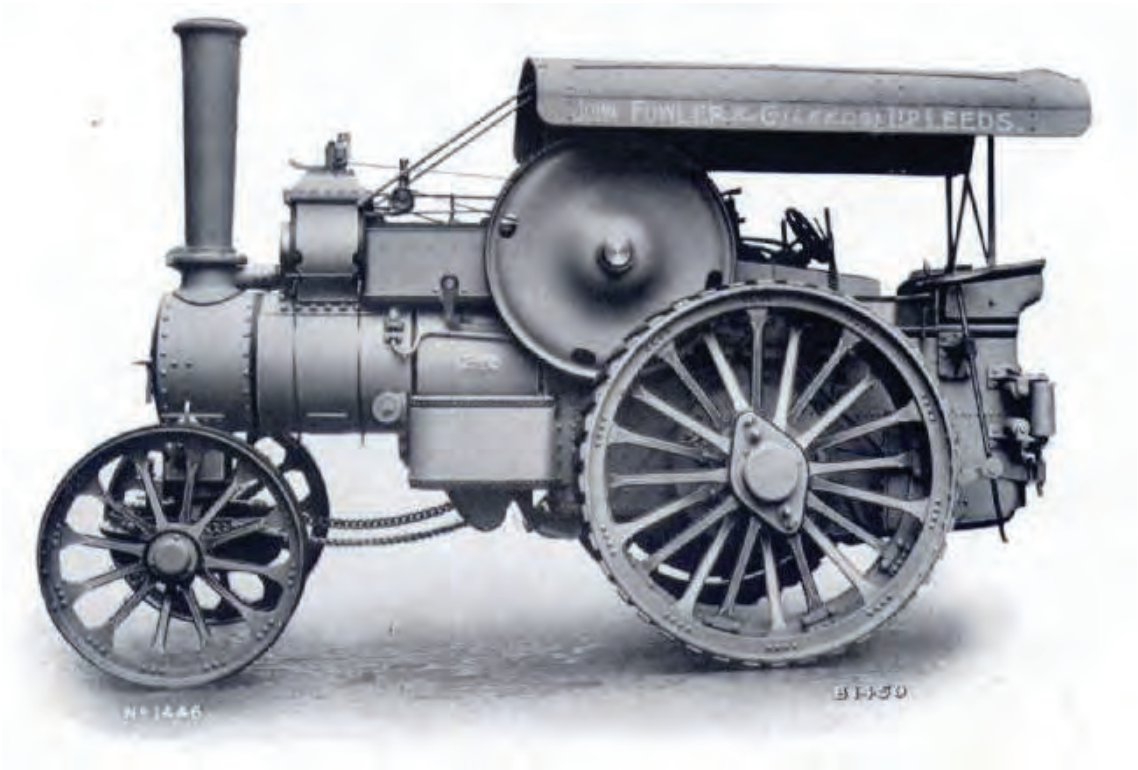


Figure 3 Example of a Fowler compound road locomotive
Source: John Fowler & Co (Leeds), Traction Engines, undated catalogue, c.1910

2.2.3 The Australian market

The sale of traction engines and road locomotives in Australia in significant numbers started in the 1880s and grew annually until the 1893 recession. It was not until after 1898 that the market recovered.

The heyday for traction engine sales was between 1898 and 1914 when over 80 per cent of all engines ever imported into Australia were sold. This amounted to approximately 900 engines imported from Britain and the USA.[3] World War I severely disrupted sales, and the market never recovered. The war was a time of great technological innovation, and by the early-1920s tractors and trucks powered by internal combustion engines were making appreciable inroads into the traditional roles of the traction engine. These vehicles were cheaper to purchase, did not require any qualifications to operate, and did not require a waiting time in the morning while it raised steam. There was still a place for steam road rollers, and sales of these were strong in the 1920s with widespread road building programs to support the expansion of motor vehicle use.

With so many traction engines sold before the war, there was a substantial second-hand market, which impacted on the sale of new engines. New traction engine sales in the post-World War I period were sporadic with most engines being purchased by government bodies for specific projects such as land clearing or construction.[4]

2.2.4 John Fowler & Co (Leeds) Ltd

The firm of John Fowler & Co (Leeds) Ltd had its origins in the 1850s when John Fowler, an agricultural engineer and inventor developed machinery for the draining and ploughing of fields. His first steam cultivation system was developed in 1855 which comprised towing a plough between two pulleys across the field.

John Fowler died in 1864, and the business was carried on by his brother Robert Fowler and Robert Eddison. Initially Fowler (Robert) only built the ploughs and windlass used for his new method of cultivation leaving the steam engines to others. This changed in 1859 when the steam plough works was established. The steam cultivation system ultimately matured into using two mobile steam ploughing engines, one on each side of the field which towed a balance plough between them. After each row was ploughed the engines moved forward before towing the plough back in the other direction.

John Fowler & Co was very successful and dominated the market for ploughing engines. It was a natural extension for the business to expand into building steam locomotives, traction engines, steam rollers, and stationary steam engines. The company's products were regularly awarded medals at agricultural and engineering exhibitions and were exported around the world. John Fowler & Co was also the first to apply the compound steam engine to a traction engine in 1881. Previously, all engines were single cylinder, thus only using the steam once. By taking advantage of the increased boiler pressure possible steam was used twice by a compound engine, resulting in more power and greater efficiency.

The Australian market was significant for Fowlers, with over 450 steam traction engines and road locomotives supplied as well as narrow gauge locomotives and road rollers. In recognition of the importance of the Australian market, Fowlers were one of the only British makers to establish an office in Australia. The office was in Sydney. There were also agents in each state. Welch, Perrin & Co in Melbourne was Fowlers most successful Australian agent and sold over 140 engines in Victoria.

As noted, the market for traction engines never recovered after World War I. Fowlers experienced an increase in steam roller sales until the late 1920s when this also ceased, reflecting the transition to internal-combustion engines. During the 1920s, traction engine sales were largely confined to government departments. This included 12 specially configured B6 stump puller engines sold during 1920/21 for land clearing by the governments of NSW (four engines), South Australia (two engines) and

Western Australia (six engines).[5] The sale of these engines was significant as multiple engines were ordered at once. While ploughing engines were sold in pairs, it was unusual to sell more than one traction engine at a time to a customer. The sale of multiple traction engines in general only occurred with government orders. The purchase of two road locomotives in the one order by the Department of Works and Railways was therefore a unique event in Australia for Fowlers.

The two road locomotives supplied to Canberra (no.16161 & 16162) were among the last road locomotives to be supplied to Australia, thus marking the end of an era which started in the 1880s. Only one other road locomotive was supplied by the company after this; engine no.16163 was a special road locomotive supplied to the Timbrebongie Shire in August 1925.[6]

2.3 Federal capital 1911-1927

In 1908, the 'limestone plains' at Yass-Canberra site was selected as the location for the federal capital. The decision was the outcome of a commitment made at Federation to establish a new national capital within New South Wales that was at least 100 miles from Sydney. Until the new city was established, Melbourne was to be the temporary capital of the federated state.

The sparsely treed Yass-Canberra site was located in the broad valley of the Molonglo River, surrounded by limestone outcrops (Figure 4). Discovery and settlement of the limestone plains followed the establishment of a passage across the Blue Mountains to Bathurst Plains in 1815, and a road to the Goulburn Plains in 1820. The abundance of pasture in the area was a significant attraction to the European settlers. Pre-national capital development in the area included a number of stock stations; the area between the St John's Church complex (1840s) and Acton Ridge, flanked to the east and west by fording points over the Molonglo River, was a focus for the small community.[7]

Construction of the new federal capital was the responsibility of the Department of Home Affairs (DHA). To facilitate the major infrastructure and construction works required, the Department set about purchasing a fleet of mobile steam plant from 1911 (Section 2.3.1), and in 1914 a rail line was constructed from Queanbeyan terminating at the Kingston Power House. It was from Kingston that the vast amount of materials needed would be hauled and disseminated through the federal capital site. Between 1920 and 1927, light rail lines were constructed to link: Kingston to Civic; and the Commonwealth Brickworks at Yarralumla to construction sites in the emerging capital, including the Power House, Parliament House and Hotel Canberra.[8]

The pace of development in Canberra between 1913 and the mid-1920s was slow. In the period to 1924, a total of £3.4 million was invested in the construction of the city;[9] and in 1916 and 1917 annual expenditure on capital works was only £8,000.[10] The Federal Capital Commission (FCC), established under the *Seat of Government (Administration) Act* of 1924, was tasked with overseeing the relocation of Parliament from Melbourne to Canberra. The FCC was responsible for the construction and administration of Canberra from 1 January 1925 to 1 May 1930, when it was disbanded. It was a dynamic, fast-acting agency.

Figure 4 View of the federal capital site looking west from Mount Pleasant by Penleigh Boyd (1890-1923), 1913
Source: Reproduced from Paul Reid, *Canberra Following Griffin*, NAA 2002, held in the Historic Memorials Collection, Parliament House Art Collection, Canberra

2.3.1 Canberra's traction engine fleet

The first traction engine purchased in 1911 by the DHA was not steam powered, but an internal combustion powered vehicle. This was an Australian made tractor by the Caldwell-Vale Motor and Tractor Construction Company Ltd. It was purchased at a cost of £1,100 and rated at 60-80 horsepower. The tractor was used for carting cement, timber and other materials from the Queanbeyan railway station.[11] These tractors were an innovative four-wheel drive design and were built at Auburn, Sydney. The first was built in 1910, so the Department was an early adopter of this type of engine. This motor traction engine was not as robust as a steam traction engine, and it was soon to experience mechanical trouble. It was discarded and laid up in the store at Queanbeyan only two years after its purchase.[12] This unsuccessful experiment with an internal combustion-powered traction engine is likely to have influenced the DHA's decision to use steam powered traction engines for the majority of its haulage work.

Given the urgency of construction, the DHA sourced all of the initial fleet of steam traction engines second hand: by September 1913 it had acquired six traction engines and 34 wagons for hauling materials from the railway station.[13] The steam traction engines were purchased from shire councils in New South Wales; with other second-hand engines offered by machinery agents. The engines from the shire councils had been used for road construction and haulage and were more suited to this task than general purpose traction engines used by farmers. They also had wagons associated with them, and these were purchased as well. There was no preference for a particular engine manufacturer; the composition of the fleet was dictated by what was available at the time. The engine makers were all British and included John Fowler & Co (Leeds) Ltd, Robey & Co Ltd, J & H McLaren Ltd, Fodens Ltd, and Charles Burrell & Sons Ltd. The DHA also purchased new plant, including an Austral Otis steam roller built in Melbourne in 1913[14], and at least one American built Keystone excavator in 1916.[15]

2.3.2 Traction engine depot and workshop

With such a large fleet of machinery the DHA oversaw construction of a traction engine shed with coaling staging for easy refuelling of the engines, and workshops to maintain the fleet.[16] The shed was

located in the precinct around the Kingston Power House site on the southern bank of the Molonglo River, close to the terminus of the rail spur from Queanbeyan.

A temporary workshop building was erected in 1914. This was replaced by the Fitters' Workshop designed by John Smith Murdoch, a substantial structure constructed of unpainted concrete panels with a gabled roof clad with orange terracotta tiles, in 1916.[17] The Fitters' Workshop, located to the south-east of the Power House, serviced all the construction equipment owned by the Department (Figure 5). Internally, the space is a single volume (Figure 6).

Figure 5 View of the Power House and Fitters' Workshop (right) from the west, 1916
Source: National Archives of Australia

Figure 6 Fitters' Workshop interior in the permanent building (undated, c. 1920s)
Source: National Library of Australia

The Fitter's Workshop appears to have had an association with the traction engine fleet. A budget item dated January 1917 refers to a 'New fitters shop for provision of Traction Engine Fitters'.[18] In January 1921, the fitter's workshop was described as being used only for storage of construction plant.[19] However, by 1922, various galvanised steel additions had been built to the south-east of the main workshop, possibly for use as a 'machinery store and engine shed'.[20] Activity at the sheds expanded to include:

> repairs, maintenance, and renewal of the various units of plant in operation in the Territory, including Power House equipment, Brickworks machinery, traction engines and wagons, steam-roller, portable steam engines, pumps, keystone navvy, compressors and pneumatic tools, rock crushers, motor cars and the hand tools in use[21]

The peak of activity at the Fitter's Workshop coincided with the main period of work for the traction engines and declined after 1929.[22]

2.3.3 Federal capital works, 1911-1924

During the establishment phase of the capital the main projects underway included the Power House, Cotter Dam, the bridge over the Murrumbidgee River, along with road construction and establishing the brickworks (Figure 7).

Duties for the traction engine fleet included haulage of wagons filled with crushed rock from the Mugga quarry; transport of cement and pipes to the Cotter dam construction site; road construction; and haulage of timber buildings (Figure 8, Figure 9 and Figure 10). Coal was also delivered to the boiler house at the Duntroon Military College.[23] Initially haulage was from the railway yard at Queanbeyan, and later from the Power House siding at Kingston. The journey was 37km from Queanbeyan out to the Cotter Dam site, which required an overnight stay before returning to Queanbeyan the next day. Once the depot at Kingston was open, the distance was reduced to 27 km from the depot to the dam site, and a round trip was completed in a day. Along the road were coal and water stops, and two or three men were repairing the road daily. The vibration was physically taxing for the drivers and they were only permitted to do three trips a week out to the Cotter Dam, and to do short hauls elsewhere on the other days.[24]

The roads at the time were very basic, and the damage caused by the traction engines was commented on in the local newspaper:

> From the brick-yards to the junction of the Murrumbidgee and Cotter Rivers, the road is at present very much cut up by the heavy traffic caused by teams and traction engines employed in carrying the cast iron water pipes and other heavy ironwork, also the cement, which is required at the Cotter River for building the dam.[25]

A notable occasion involving the Robey traction engine and a Keystone excavator occurred on 23 August 1923 when the machines were used at the ceremony to turn the first sod for the construction of the new Parliament House (Figure 10).[26]

Figure 7 Construction of the bridge over the Murrumbidgee River, with a McLaren traction engine in the foreground c.1913
Source: National Library of Australia

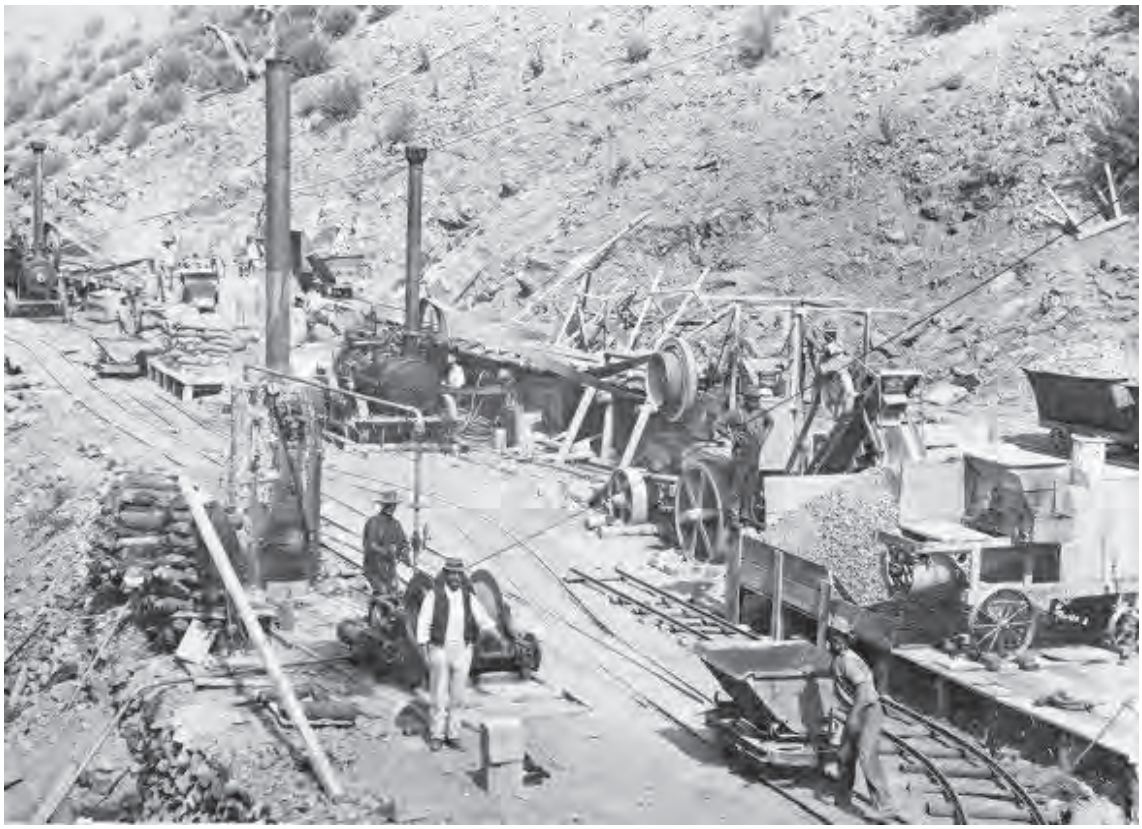


Figure 8 Various steam powered machinery at the Cotter Dam construction site: wo portable steam engines are driving rock crushers, and in the foreground a vertical boiler supplies steam to a winch, c.1912
Source: National Library of Australia

Figure 9 McLaren (left) & Fowler compound traction engines moving a timber canteen building from the Molonglo camp, Canberra
Source: National Archives of Australia (Mildenhall Collection)

Figure 10 Robey compound traction engine and haulage wagon at the first sod ceremony marking the start of construction of Parliament House, 28 August 1923
Source: National Archives of Australia (Mildenhall Collection)

Figure 11 Robey compound traction engine pulling a road plough (undated, c.1920s)
Source: National Library of Australia

2.4 Fowler road locomotives nos. 16161 and 16162

2.4.1 Use in Canberra, 1925-1948

By May 1924 the Works Director of the Department of Works & Railways (the successor body to the Department of Home Affairs) had completed a review of the condition of the existing steam plant, and recommended that two new traction engines be purchased.[27] The intended function of the new engines was the haulage of construction materials from the railway yard, and bricks from the brickworks out to the various sites.

Despite the advances made by internal combustion power tractors and trucks after World War I, steam-powered road locomotives were still the most powerful machine available. By the end of the 1920s this had changed with much more heavily built internal combustion powered machinery available, and by the early-1930s the diesel engine became available for earthmoving machines. In mid-1924 the Director General recommended that two new engines be purchased.[28]

Tenders were called by the Department of Works & Railways, Melbourne for the supply and delivery of two heavy duty compound steam road locomotives in September 1924.[29] This tender was handled directly by John Fowler & Co's Sydney office rather than the local agent, the Clyde Engineering Co Ltd, Granville. The closing date was the 24 October 1924, and Fowler & Co was advised in November 1924 of the acceptance of its tender for two road locomotives for a total of £3,000.[30]

It is worth noting that the budget for these engines was set by the Department before the tenders were called, and that the tender of John Fowler & Co. was exactly £3,000.[31] This suggests that the Department may already have decided to use Fowler engines and the tender process was a formality. Fowler's tender was the fourth cheapest out of seven tenders received. Given the technical

requirements of the Department it is likely that many of the tenders would not have been able to fully meet the performance they required. The preference for using Fowler road locomotives may have been due to the company's reputation for building a high class engine (see Section 2.2.4), and the Department's experience with a Fowler road locomotive (no. 12608) purchased second-hand as part of the original group of engines in 1913.[32]

The two engines, numbers 16161 and 16162, were specifically built for this order. Road locomotive no.16161 was despatched from the company's works at Leeds, Yorkshire, on 24 January 1925. The second engine, no.16162 was despatched a month later, on 24 February 1925.[33]

Prior to their despatch, oral history passed down from Wally Wilkinson, one of the original Canberra engine drivers, suggested that engine no.16161 was exhibited at the British Empire Exhibition at Wembley of 1924. Wilkinson had grown up in Bellingen and worked for the Bellingen Timber Syndicate as a driver of their Fowler traction engine. When the Dorrigo railway opened in 1924 it caused the closure of the Syndicate's tramway, so Wilkinson left Bellingen and went to Canberra. He arrived in time to be sent to Sydney to take delivery of the two road locomotives.

Wilkinson erected the engines in Sydney and supervised their transport by rail to Canberra.[34] The preparation of engine no.16161 was also recalled by Alf Pepper, who worked at Fowlers between 1895 and 1946. He was highly experienced in their construction, and operation, and recalled in correspondence with Bob McLeod preparing no.16161 for the exhibition.[35]

The exhibition at Wembley was open for two periods, from May to October 1924, and between May and October 1925.[36] Based on the date of the order, and the production records, the completion of the engines falls in the period when the exhibition was closed.[37]

The engines are thought to have been set to work by the second half of 1925. They were based at the depot at the Kingston Power House. Being the newest and most powerful engines they were assigned to haulage work, where they towed up to seven wagons at a time with each loaded with 15 tonnes of crushed rock from the quarry, hauled wagons loaded with pipes, and carted bricks from the brickworks.[38]

The most intense period of construction work for the engines reportedly only lasted until 1927. Aside from haulage work the engines were used for pile driving, and towing an elevating grader. These two activities were recorded in a series of photographs by Jack Mildenhall (Figure 12, Figure 13, Figure 14 and Figure 15).

The series of photographs of one of the engines towing an elevating grader were taken in the first half of 1926, and show the engine working at two different times. In one instance it is working on levelling sites in the business area of South Ainslie (Figure 12 and Figure 13).[39] These photographs show the engine fitted with spuds on the rear wheels: these are cleats which are attached to provide additional grip on muddy ground. Use of the elevating grader resulted in significant savings in time and labour, and was an early form of continuous excavator for large earthworks. A contemporary photograph of the engine and elevating grader forming a roadway at an unidentified location is at Figure 14.

The elevating grader, and eight dump wagons were purchased around 1925-26, and were listed in a report about FCC expenditure on imported items.[40] The grader and wagons were most likely purchased at the same time and intended to work together. The elevating grader was manufactured by the Austin Manufacturing Company of Chicago, USA and was referred to as a New Era Senior model.[41] All the functions of the grader were controlled by hand wheels, and the elevator was driven from the rear wheels.[42] With an extensive road construction program, and other large sites to be levelled with long cuts possible, this machine was ideally suited to the FCC's requirements.

Once the two Fowler road locomotives were in service six of the original traction engines were sold at auction in April 1926. These included the two McLarens, the Foden, one Fowler, and two other traction engines.[43] By 1928, the FCC had three Fowler road locomotives, a Robey traction engine, two steam rollers, a steam wagon, Keystone and Ruston Proctor shovels, and two portable steam engines, with much of this plant at the Kingston depot.[44]

With the main thrust of construction completed during 1927 the FCC started to dispose of surplus plant. In April 1928 the FCC sold off plant with most of it associated with the sewer construction,[45] and the FCC held a further sale of road making plant in September 1929 which included the Western dump wagons.[46]

After the main period of construction work was over, haulage work, if required, was irregular, and with three road locomotives available there was a surplus of engines. It appears the engines were to find other uses, mainly in stationary applications either at the recently established abattoir or driving the gravel screening plant at the Black Mountain quarry.

Figure 12 One of the Fowler road locomotives hauling a 'New Era' elevating grader at the South Ainslie business sites (c. Jan-June 1926)
Source: National Archives of Australia (Mildenhall Collection)

Figure 13 Another view of one of the two Fowler road locomotives at the South Ainslie business sites (c. Jan-June 1926): due to the soft ground the rear wheels are fitted with spuds (cleats) to improve traction
Source: National Archives of Australia (Mildenhall Collection)

Figure 14 One of the Fowler road locomotives towing the New Era elevating grader while forming a road way
Source: National Archives of Australia (Mildenhall Collection)

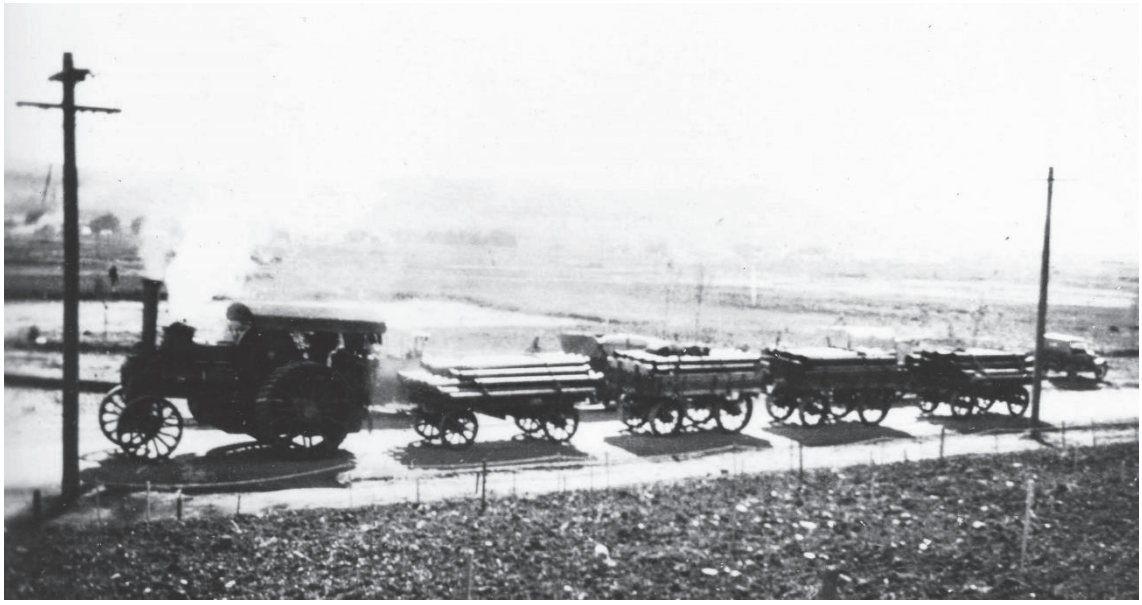


Figure 15 One of the Fowler road locomotives hauling four wagons loaded with water pipes (undated, c.1925-27)
Source: National Library of Australia

Figure 16 Fowler road locomotive no.16162 being used to drive piles for a bridge
Source: National Archives of Australia (Mildenhall Collection)

The use of the engines in stationary applications is consistent with the oral history of the engines only being used for a short period from 1925 to 1927.[47] This is support by evidence that two road locomotives were used at an abattoir, and one was used to drive a quarry rock crushing plant.

In 1926 an abattoir was opened in the Federal Capital Territory (FCT).[48] Two of the FCC's traction engines were recorded as being at the abattoir on a list of government owned boilers in the FCT dated June 1931. One of these was recorded as boiler no.54, Fowler No.2 traction engine, which is either no.16161 or 16162 (the list did not note a maker's number), and the other engine was noted as boiler no.6 Fowler No.3 traction engine, with the makers no.12608 recorded. The second of the 1925 Fowler road locomotives was recorded as boiler no.53, Fowler No.1 which was located at the plant yard.[49]

The June 1931 list does not show any other boilers in service at the abattoir, so the conclusion is that all the steam requirements were being met by the road locomotives. It is not recorded why the original boilers were not in use, and they were not listed indicating they were out of service and did not warrant inspection by 1931. There were boilers installed at the time of construction as it is recorded that the Fitters' Shop installed boilers, steam pans and connected them during 1925-26.[50] It is most likely that either engine no.16161 or 16162 was transferred after the completion of construction works sometime after 1927. The engines were effectively at the abattoir on a permanent basis, but if required, it would have been possible to take the engine elsewhere when the abattoir was not working.

Two traction engines were recorded in an article detailing the unhygienic condition of the abattoir, and its inefficient layout. The traction engines were noted as costing £6 a week to run, which had been reduced by 10/- per week.[51] The engines appear to have been used to supply steam for heating which would have been via a pipe connected directly to the boiler, and to drive machinery via a flat belt on the flywheel. The abattoirs were extensively modernised between 1931 and 1932. When the modernisation of the works was completed in July 1932 it was noted that the 'old smoking traction engines which were the first and last memory carried away by visitors to the place, have been removed'.[52] The article stated that electric motors had been installed instead, suggesting at least one of the road locomotives had been used to drive machinery, and a boiler installed to supply steam for heating.

The FCC was prompt in its disposal of Fowler engine no.12608; the engine was advertised for sale by tender in July 1932, which was not long after the abattoir modernisation had been completed. This left only Fowler road locomotives no.16161 & 16162 in the FCC fleet.[53]

The other stationary application recorded was the use of the road locomotives to drive a rock crushing plant at the Black Mountain quarry (Figure 17). The engine was parked in a makeshift shed and drove the jaw crusher and trommel screen via a flat belt from its flywheel. The engine would not necessarily have been used at the quarry on a full-time basis. The driven pulley was high up above the storage bins. The belt off the flywheel was therefore elevated at approximately 45 degrees, rather than the usual horizontal position for driving a plant at ground level. This required several planks of the canopy to be removed above the flywheel to clear the belt (Figure 18).

2.4.2 John Fowler Road Locomotive nos. 16161 and 16162, 1947 – late-1950s

The two Fowler road locomotive engines were retained by the FCC and stored at Kingston until the late 1940s. They appear to have been the last two mobile steam engines in government ownership but saw very little if any use.[54]

During the late 1940s the government established the Commonwealth Disposals Commission to undertake the sale of a vast amount of surplus government owned items. An auction was held over 21 and 22 January 1947 at the Department of Works & Housing Stores, Kingston, and this included one of the Fowler road locomotive engines, which was listed as '1 Traction Engine'.[55] The engine sold for £170,

and while the new owner was not mentioned in the article, it was noted as a Fowler traction engine.[56] It can be positively identified as engine no.16161 because it was the only traction engine for sale, and it matches the date and comments in the boiler inspection report completed at the time.

As part of the process of transfer of ownership it was inspected by the NSW Licensed Boiler Inspector Hector Fraser and issued with the NSW boiler no. 9B 265 on 17 February 1947. The report included the comment, noting its recent purchase: 'Boiler recently bought from Federal Government Canberra' and recorded the new owner as Mr T A Fields of Lanyon Station. The inspector noted that the manhole was missing, and that a new one had been ordered, and a new pressure gauge with 4" (102mm) face graduated to 300 pounds (2068 kPa) was required.[57] The missing manhole meant the boiler could not be closed up, and hence the boiler could not raise steam. The engine was unable to be driven out to Lanyon under its own power until these items were fixed. This is engine no.16161 as the boiler number was stamped on the side of the boiler and this is still present. The engine was driven out to the property by one of the old drivers, Bill Ginn with his wife following in a truck carrying extra wood and water to supply the engine. Bill Ginn commented that the engine was purchased to drive a chaff cutter at Lanyon.[58]

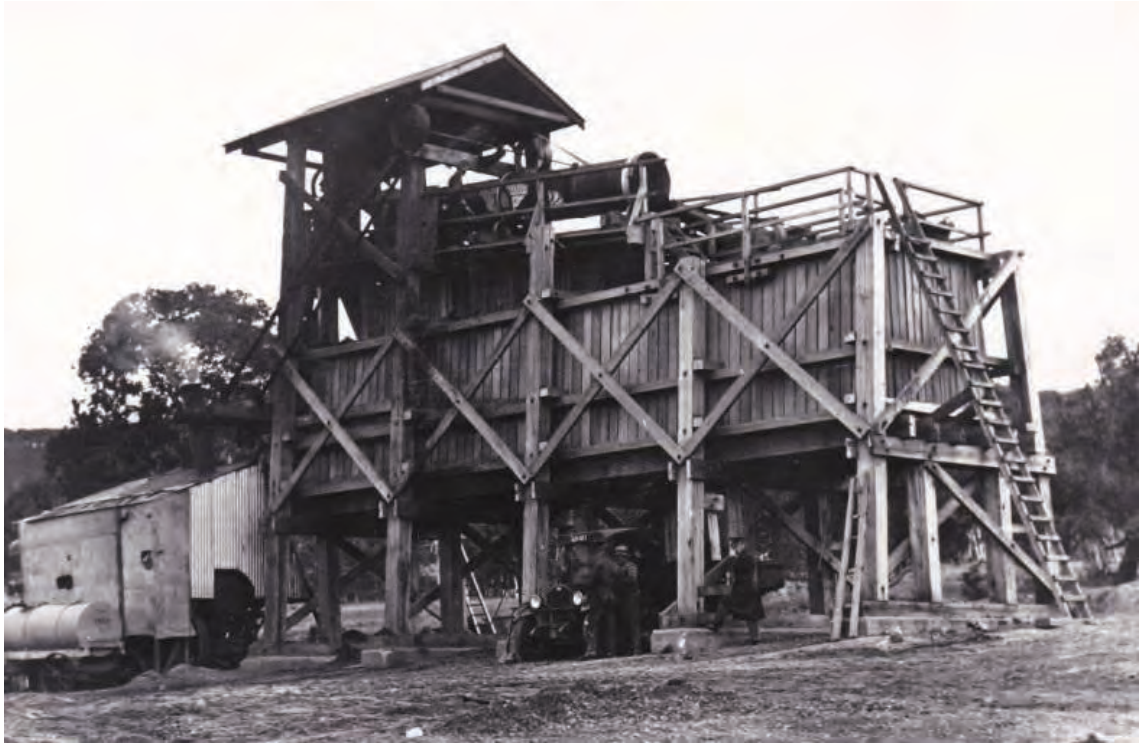


Figure 17 Black Mountain quarry gravel crushing and screening plant. The Fowler road locomotive no.16162 is in the shed to the left with an extension to the chimney through the roof, and a water cart parked to the side, c.1928
Source: National Library of Australia (T C G Weston Photograph Albums)

Figure 18 Close up view of Fowler road locomotive no.16162 showing the slot in the canopy above the flywheel
Source: National Archives of Australia (Mildenhall Collection)

The second engine, no.16162 was sold a year later at another Commonwealth Disposal Commission auction. This auction was held on 29 and 30 January 1948 at the same location and listed the engine as 'Fowler Steam Traction Engine, 20 tons'. The engine was reported as selling for the highest price of any item at the auction for £255 pounds. The article reported that the engine had been sold to Mr W R Edwards who intended to use it to clear sections of Lanyon station.[59] This report is at odds with the boiler inspection report,[60] completed by Hector Fraser on 30 January 1948 which recorded the owner as Mr L Donoghue & Hopkins, Queanbeyan. The inspector noted the 'Boiler bought at sale at Canberra where same was inspected', and the boiler was issued with the NSW boiler no.9B 327.[61] Donoghue & Hopkins were saw millers who operated a mill at McQuoid Street, Queanbeyan.[62]

Lanyon is located on the southern outskirts of Canberra and was the largest single parcel of freehold land in the Australian Capital Territory - it was acquired by the Federal Government in 1974. Thomas Field's father, also called Thomas Field, had built up an extensive network of pastoral properties and operated a meat export empire with the company name T A Field Ltd.[63] The Fowler road locomotive was used for clearing Yellow box trees on the property, and was replaced in this task by crawler tractors by 1951.[64]

Once surplus to requirements at Lanyon, the engine was sold to Mervyn Davis, a saw miller at Yass in the early 1950s. Davis purchased a small sawmill from H Pollack around 1948-1952. Pollack had been operating a saw mill on Alfred Chown's property 'Highfield' where he powered the saw bench using an engine from a car.[65] The mill, which 10km from Reids Flat produced 1,500 super feet of Cyprus pine, and was advertised for sale in 1947.[66]

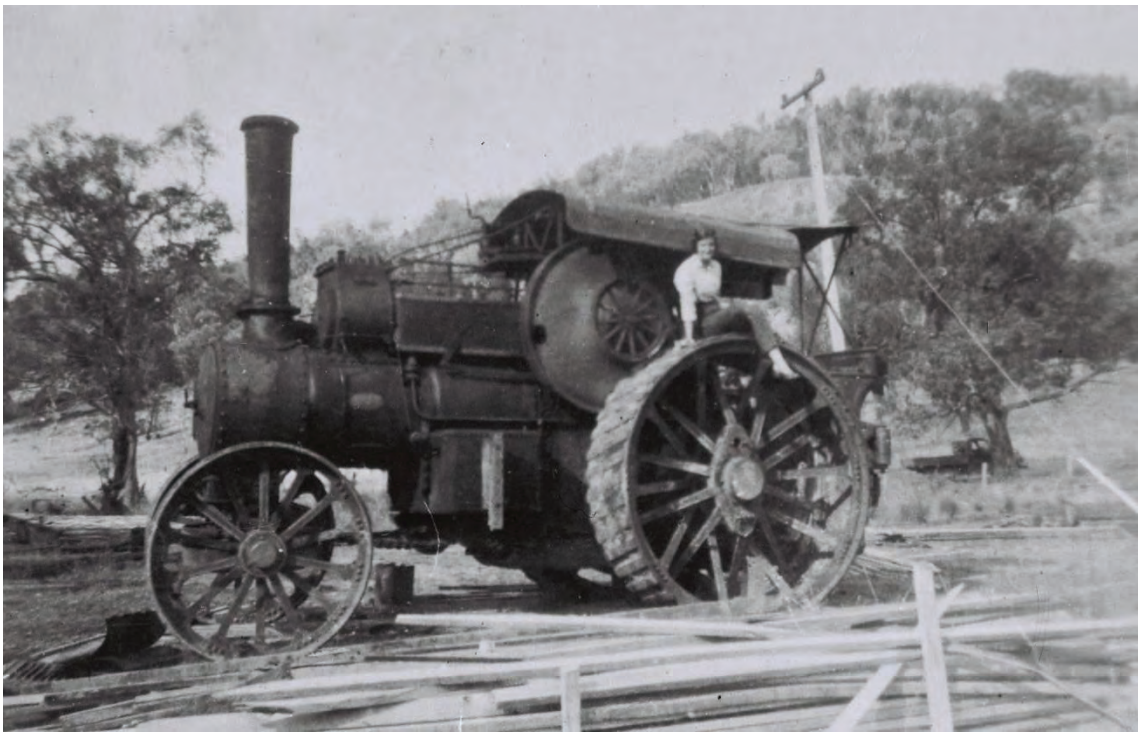


Figure 19 Fowler no.16161 at the saw mill operated by Alfred Chown, Reids Flat, c.1956: the photograph shows a small wooden pulley made from a car wheel rim pulley fitted to the flywheel
Source: Charlie Chown

Davis moved the mill to a site next to Graham Creek, Reids Flat. The sawmill was enlarged and had two saw benches. The breaking down bench, with a 4'6" (1372mm) circular saw, and the running-off bench with a 3' (914mm) saw. These were driven by the Fowler engine via a countershaft in front of the engine driven by a flat belt off the flywheel. At some point the canopy of the engine was modified by Davis with the rear corner removed, and the brake gear taken off, so the engine could be positioned to clear a pole from a sawmill building (Figure 19).[67]

In 1955 the mill was purchased by Alfred Chown, who ran the mill with his sons, Alan and Francis Charles 'Charlie' Chown. Timber was sourced from Alfred Chown's property, as well as from other private properties in the area. They would haul the logs to mill with old Blitz trucks. They supplied Cyprus pine, stringybark, ironbark, and red box timbers, and would sell as much as they could cut to Godfrey's timber yard at Goulburn. At its peak the mill was shipping out 2,500 super feet every week.

Alan Chown lived in a hut at the mill and would get up early to stoke up the coals from the day before and get the fire going, and the engine would be ready by 7am. Charlie Chown drove the engine, and it would use around 300 gallons (1135 litres) of water each day, which Charlie would carry to the engine by bucket from the adjacent creek. The engine was only ever used at the mill in a stationary capacity. It ceased to work around 1959 due to the failure of its boiler tubes and was replaced by a tractor.[68]

2.4.3 Fowler Road Locomotives nos. 16161 and 16162, c.1957 - present

The two engines had both completed their working lives during the 1950s in similar roles driving sawmills in NSW, with no.16162 at Medlow Bath, 300km from Canberra, and no.16161 at Reids Flat, 170km from Canberra.

2.4.4 Road Locomotive no.16162

The length of ownership and use by Donoghue & Hopkins of engine no.16162 is not known. They are thought to have sold the engine during the 1950s to another sawmiller, Les Cant of Medlow Bath, NSW. Cant used the engine to power his saw mill. Following an accident, Cant put the sawmill up for sale. The engine was sold in 1957 to an early preservationist, Bruce Macdonald who saved the engine from being scrapped. A friend of MacDonald, Don Collins purchased a half share in the engine, and it was taken to Auburn in Sydney. In 1964 the engine was driven to a property at Moss Vale and used for tree clearing by Collins for a number of years. In 1979, the engine was sold to developer Alan Marr for inclusion in a proposed museum at the Canberra brickworks.[69] This project fell through, and the National Museum of Australia purchased the Fowler road locomotive, and Austral Otis steam roller just before the auction in 1980.[70]

2.4.5 Road Locomotive no.16161

John Fowler Road Locomotive no.16161 was purchased in 1962 by Bob McLeod, from Cowra, NSW for £50 from Alf Chown. McLeod was 17 and had always had an interest in steam since childhood. In retrospect, he was one of the first generation of traction engine preservationists. Over the next year McLeod made the round trip from Cowra each weekend to prepare the engine to be driven home under steam. The boiler tubes were replaced with second-hand tubes from the railways, the feedwater pipes were repaired, bearings checked and adjusted, and the hand brake gear replaced after the previous owner had removed it. McLeod then drove the engine to Cowra covering the 72km over two weekends (Figure 20).[71]

In 1966 the engine was used by McLeod for an unusual recovery operation after a railway locomotive fell into the turntable pit at the Cowra roundhouse. With the railway's breakdown crane unable to get into a suitable position to lift the engine back onto the tracks, another means was required. A bulldozer seemed to be the answer but none of the local operators would attempt the job, so the railway men were out of ideas. McLeod had heard about the accident and went down where he was known to the local railway men. Upon hearing they had run out of options McLeod suggested using his traction engine. They did not believe it would be up to the task, but desperate to get the locomotive out of the pit the railway men decided to give it a go. Using the winch on the engine, and with Bob driving they were able to slowly haul the engine out several feet at a time until it was back on the tracks.[72] It was a remarkable feat for the young engine owner and the old Fowler engine (Figure 21).

McLeod was well known around Cowra for his engine collecting, and the Fowler Road Locomotive was a regular feature in street parades through Cowra (Figure 22 and Figure 23).[73] In 1972 McLeod advertised the engine for sale, and sold the engine to Doug Wallis.[74]

Figure 20 Fowler no.16161, shortly after conservation works by Bob McLeod, c.1963: note the short cut out section in the front edge of the original canopy
Source: Bob McLeod collection

Figure 21 Fowler engine no 16161 pulling NSW railway locomotive no.5476 out of the locomotive turntable pit, Cowra, in 1966: the Fowler engine can be seen in the background
Source: Bruce Macdonald collection

Figure 22 Fowler no.16161 in a street parade turning from Lachlan Street in to Kendall Street, Cowra, c.1964
Source: Bob McLeod collection

Figure 23 Fowler no.16161 climbs the hill in Kendall Street, Cowra, c.1966: the engine had been painted, and timber on the canopy replaced
Source: McLeod collection

2.4.6 Purchase by ACT Government and return to Canberra

Between 1972 and 2014, the engine was stored in a shed in Sydney. It was not used during this period;the engine was kept dry, and the boiler stored empty.

In 2014, following a grant from the Australian Government's National Cultural Heritage Account, the Land Development Agency (LDA) and the Cultural Facilities Corporation secured the purchase of the road locomotive.[75] The road locomotive was repaired in late 2015, including:

- Wheels removed and fitted with rubber, repainted according to original specification
- Ashpan repainted and fitted with new wedges
- Lagging timber and steel cladding on the boiler replaced with new materials
- New bolt fitted to crank shaft
- Asbestos gland packing removed
- Asbestos gaskets removed and replaced with rubber gaskets
- Cosmetic work (i.e. repainting of exterior, including touch-ups of pin-striping and polishing metal)

The road locomotive was transferred to its current location at Lanyon Homestead in 2016. It was featured at the launch of the 2016 Canberra and Region Heritage Festival, where the LDA presented the Chair of the ACT Heritage Council with a nomination application for the locomotive.[76]

In September 2016, John Fowler Road Locomotive 16161 was included in the ACT Heritage Register.[77]

3.0 PHYSICAL ANALYSIS

This chapter provides a physical description of the road locomotive, including comments on provenance, condition and intactness.

The assessment of the condition of the engine was based on photographs supplied by the LDA (March 2020), and documents referring to works completed by K & H. Ainsworth Engineering Pty Ltd in 2015,[78] as well as a condition report completed on 21 April 2020[79] A physical inspection was not possible due to the closure of the Lanyon Homestead in January 2020 at the time of the planned inspection (it was closed because of bush fires)

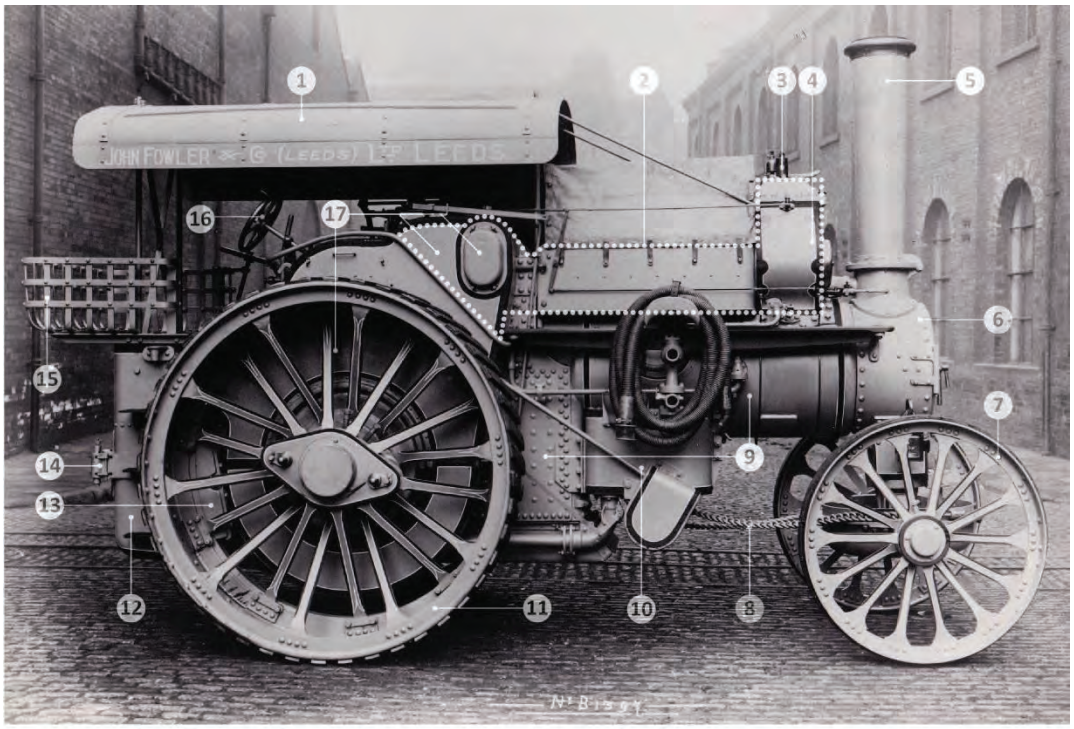
Terminology

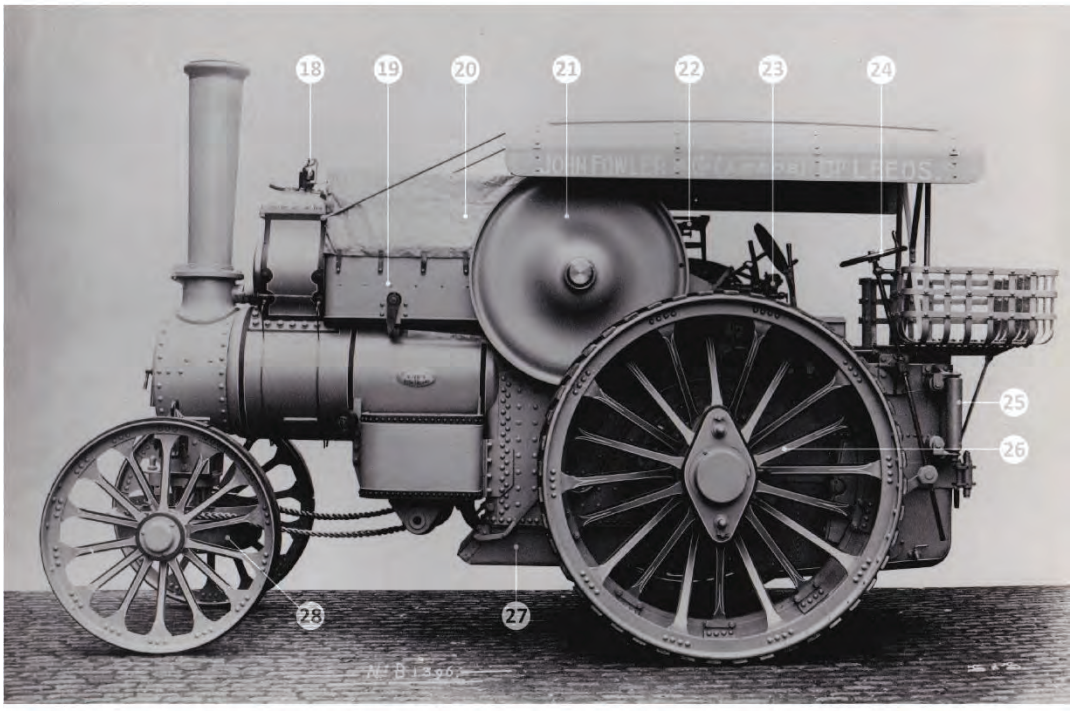
The key features and components of road locomotives are indicated in the annotated photographs at Figure 1.

3.1 Fowler's engine designation – Class B6

Road locomotive no.16161 is referred to by John Fowler & Co as a B6 road locomotive. The designation B6 identifies the model, and reflects the size of the engine: the 'B' indicated an engine of 8 nominal horsepower. Nominal horsepower (NHP) is an historical approximation of the power of an engine, and was based on the area of the piston and its speed. This did not take into account the steam pressure, so as boiler design improved over time and the working pressure increased, the engine became more powerful. The NHP rating did not reflect this and became meaningless. A more accurate measure of the power of an engine was indicated horsepower (IHP) which measured the output power of the engine. Fowlers tried to overcome this in 1881 by introducing letter designations for its various engine sizes, However engine men were set in their ways and would still refer to an engine's power by its NHP.[80]

Over the years as the design of engines improved, so did the indicated horsepower produced. The number in the model designation referred to major design revisions. If the boiler was substantially redesigned then Fowlers would issue a new level number, so in this instance it represents the sixth design of the B type boiler (Figure 25). In general this design revision superseded previous designs, however in the case of the class B engines there was a seventh boiler design referred to a B7 model. The B7 boiler was a variation of the B6 boiler, and was built in limited numbers. In general the B6 design was the last iteration of the B Class boiler and used until the end of production.





1. Canopy
2. Engine
3. Pickering governor
4. Cylinder
5. Chimney
6. Smokebox
7. Front wheels (steering)
8. Steering chains
9. Boiler (barrel & firebox)
10. Front water tank
11. Rear wheel
12. Rear water tank
13. Rear brake
14. Draw bar
15. Wood basket
16. Steering wheel
17. Gears (under covers)
18. Whistle
19. Motion cover
20. Dust Cover
21. Flywheel
22. Regulator handle
23. Water pump
24. Rear brake handwheel
25. Cable guide rollers
26. Whinch drum
27. Ashpan
28. Spud pan

Figure 24 General features of a road locomotive
Source: Museum of English and Rural Life (base photographs, showing John Fowler & Co class B7 compound road locomotive no. 12619)

When the B type boiler was updated to the B6 design in 1904 it was re-rated to either 8 NHP or 10 NHP depending on the type of engine built, and the latter could produce 70 IHP. The first B6 road locomotive were produced around 1907-8.[81] Engine no.16161 was referred to in the manufacturer's records as an 8 NHP engine.[82] By the 1920s the B6 road locomotives, or by their code name Super Lion engines were referred to as 10 NHP engines.[83] Forty-five of the 59 road locomotives built by Fowlers between 1921 and 1936 were 10 NHP B6 compound engines. The peak years were 1922 to 1925, after which only a further 20 engines were sold.[84]

There are no surviving photographs of engine nos.16161 or 16162 when they were new from Fowlers works. The closest equivalent was a class B7 compound road locomotive (no.12619) manufactured in 1911 (Figure 1). This engine was built for an Australian customer, W C H Roberts of Currawong, New South Wales, and visually includes all the features found on the two Canberra engines. For promotional purposes, John Fowler & Co took photographs of completed engines at their works in Leeds, England. When photographed at the works, an engine was painted grey as this improved its appearance in black and white photographs. Pinstripes were also included in the finish. It was then sent back to the shop to be finished in its final colours.

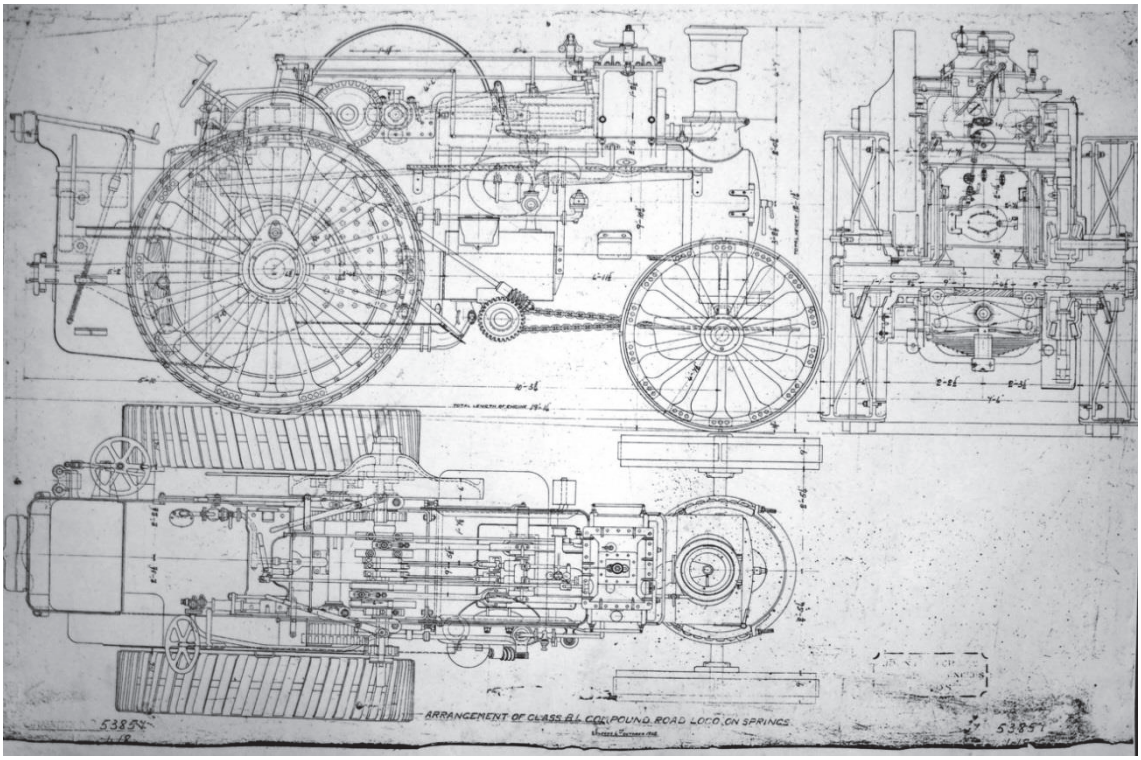


Figure 25 General arrangement drawing for a B6 compound road locomotive on springs, Fowler drawing no.53857, dated 6 October 1908
Source: Museum of English Rural Life

3.2 Identification markings

John Fowler & Co issued each machine made with a works serial number (Figure 26). (The nameplate of road locomotive no. 16161 is in the safekeeping of Ken Ainsworth of K & H Ainsworth Engineering.[85]) In the case of traction engines this number was prominently displayed on a brass plate mounted on the barrel boiler cladding. Some makers only showed the serial number on a plate attached to the engine, so once it was removed the identity of the engine was lost. John Fowler & Co was more systematic, and generally stamped the works number on other parts of the engine thus allowing it to still be identified even when the works plate was missing. In this case the serial number is stamped into the edge of the spectacle plate in front of the driver's position (Figure 27).

The boiler was inspected and registered in New South Wales and was issued with a boiler registration number, 9B 265, which was stamped into the right hand horn-plate of the boiler (Figure 28).

Figure 26 Manufacturer's nameplate: this is not presently fixed to the engine. It was normally screwed to the cladding on the flywheel side of the engine
Source: Rohan Lamb, December 2013

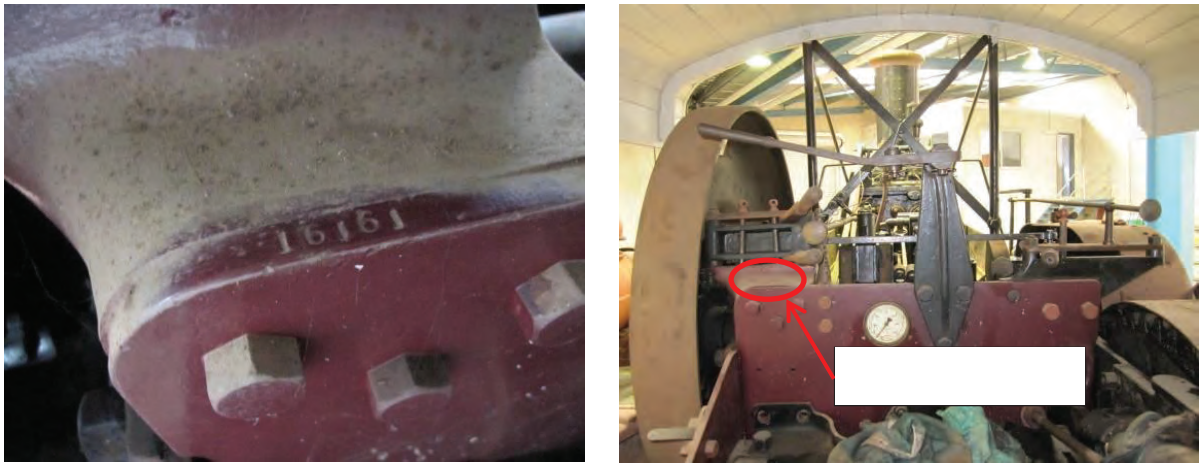


Figure 27 Left and right: Engine serial number 16161 stamped into the edge of the spectacle plate
Source: Rohan Lamb, December 2013

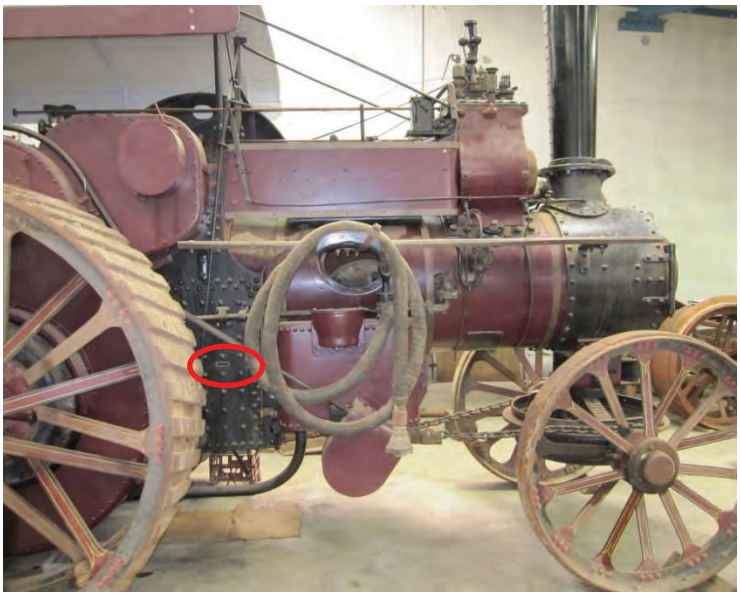


Figure 28 NSW boiler registration number 9B 265, stamped on right hand side boiler plate
Source: Rohan Lamb, December 2013

3.3 Timeline for manufacture and despatch

The date of manufacture for an engine is generally considered to be when it was despatched from the works if its despatch closely followed its completion. Accuracy of this date depends on the availability of manufacture's records. Engine no. 16161 was despatched from the company's Leeds works on 24 January 1925, so its date of manufacture is 1925.

Tenders were called by the Department for the supply of two road locomotives on 27 September 1924.[86] This tender was handled directly by John Fowler & Co' Sydney office rather than the local agent, The Clyde Engineering Co. Ltd., Granville. The closing date was the 24 October 1924, and Fowler & Co was advised in November 1924 of the acceptance of its tender for two road locomotives for a total of £3,000.[87]

The Leeds headquarters of Fowlers recorded receipt of the order on 2 December 1924. The first engine, no.16161 was ready for despatch on 24 January 1925, followed by no.16162 on the 24 February 1925.[88]

This relatively quick construction was possible because many parts were in stock, including the boiler. John Fowler & Co was known for its practice of building a batch of a particular size of boiler and holding them in stock.[89] They were assigned their works number at this point. In the case of engine no.16161 and 16162, they were part of a batch of six class B long box boilers built on 21 August 1923 with the consecutive numbers 16161 to 16166. Possibly reflecting the decline in the market for engines they were not sold until 1925. The first left in January 1925, and the last of the batch was sent out in December 1925.[90]

3.4 Specification of engine no.16161

The following provides a description of the engine as specified by Fowlers. Comments on intactness are at Section 3.6.

John Fowler & Co offered a range of options for its engines, and if a desired feature was not available, it would customise an engine to meet the specific requirements of the customer. The Department of Works & Railways sought heavily constructed engines for its requirements, and even made this reference directly in the title of the tender by referring to 'two heavy duty compound steam road

locomotives'.[91] Fowlers therefore tailored its tender to meet the Department's requirements. Features common to most of its road locomotives included the third road gear, disc type flywheel, front and rear tanks and fully sprung with front and rear springs to Fowler's patented design.

John Fowler & Co prepared detailed build specification sheets for all the engines it supplied to the Australian market. The sheets describe almost every feature of an engine (except paint colour and other finishes) and list the drawing numbers for the components. The sheets were used by agents for ordering spare parts. The full works specification sheets for engine nos. 16161 and 16162 are included at Appendix C.

3.4.1 Boiler

The boiler used was the class B6 long box design of riveted construction, it was made from steel plate and fitted with 36 tubes of 2¼" diameter (57.1mm). It was rated for a working pressure of 180 psi (1241 kPa). This was the standard configuration supplied for an engine that was exported. If an engine was built for a British customer it was fitted with a standard firebox, because the engine was expected to burn black coal. The fuel used in the colonies was often timber which was inferior to black coal, so to generate the required heat the firebox had to be larger. These were referred to by Fowlers as long box boilers. The boiler is the main structural element of the engine which all the other parts are mounted to.

3.4.2 Engine

The engine mounted on top of the boiler was of compound configuration which comprised a high pressure cylinder of 6¾" (171mm) and a low pressure cylinder of 11½" diameter (292mm), and both had a stroke of 12" (305mm) (Figure 29 & Figure 30). The compound configuration used the steam twice in two different sized cylinders which was more efficient than a single cylinder engine. The engine was fitted with Stephenson's linkages which when set in their alternative position reverse the direction of the engine, and a Pickering governor for stationary engine work (Figure 31).

3.4.3 Springs

The engine is fitted with front and rear springs (Figure 34 & Figure 35). These added to the price of an engine, so were generally only used on road locomotives, and general traction engines where long distances were envisaged. The rear spring design differed between manufacturers and was often the subject of a patent. The challenge was to allow movement of the rear axle while maintaining engagement of the drive gears.

The original patent (no.14242) for the rear spring design was lodged by Fowler's design draftsman George Tuer in 1892. This patent allowed the free movement of the hind axle on the springs, at the same time ensuring the proper engagement of the gearing on the power shafts.[92] This design had shortcomings whereby as the blocks became worn they tended to climb up the gear as it rotated resulting in a lurching motion to the engine. The later style which overcame this problem was referred by Fowlers as oil bath spring gear, and this type of compensating gear is fitted to engine no.16161.

The rear spring adjustment cover refers to a later patent no.1775 issued in 1903. This patent related to the rear axle bearings and the arrangement of the compensating levers in the spring assembly.[93] The rear springs were uprated and specified to be able to carry 16 tons on engines no.16161 and 16162.

Figure 29 Engine on top of the boiler looking forward towards the cylinder with the Stephenson's reversing links in the middle
Source: Rohan Lamb, December 2013

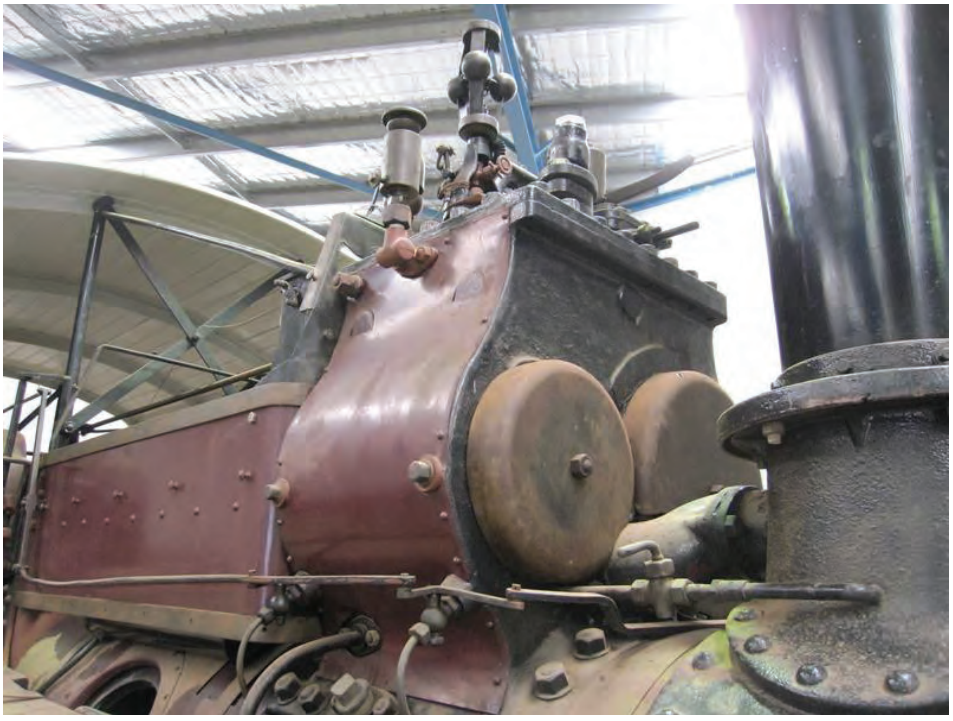


Figure 30 Cylinder of the engine showing the piston covers
Source: Rohan Lamb, December 2013

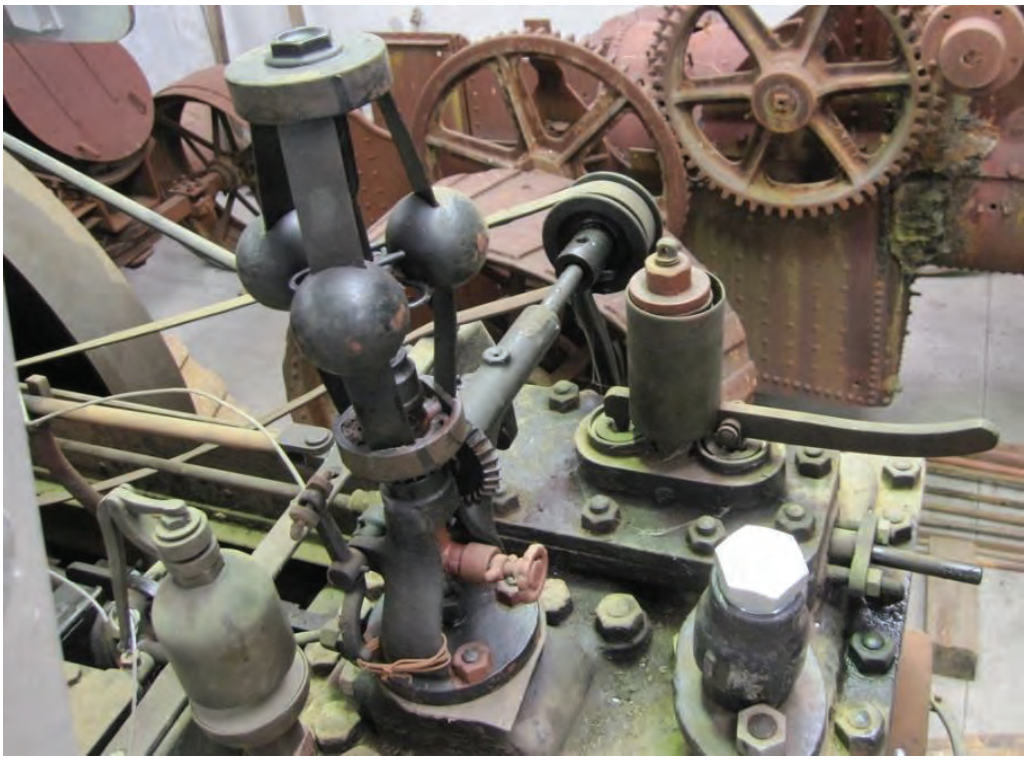


Figure 31 Top of the cylinder showing the Pickering governor and the boiler safety valve
Source: Rohan Lamb, December 2013

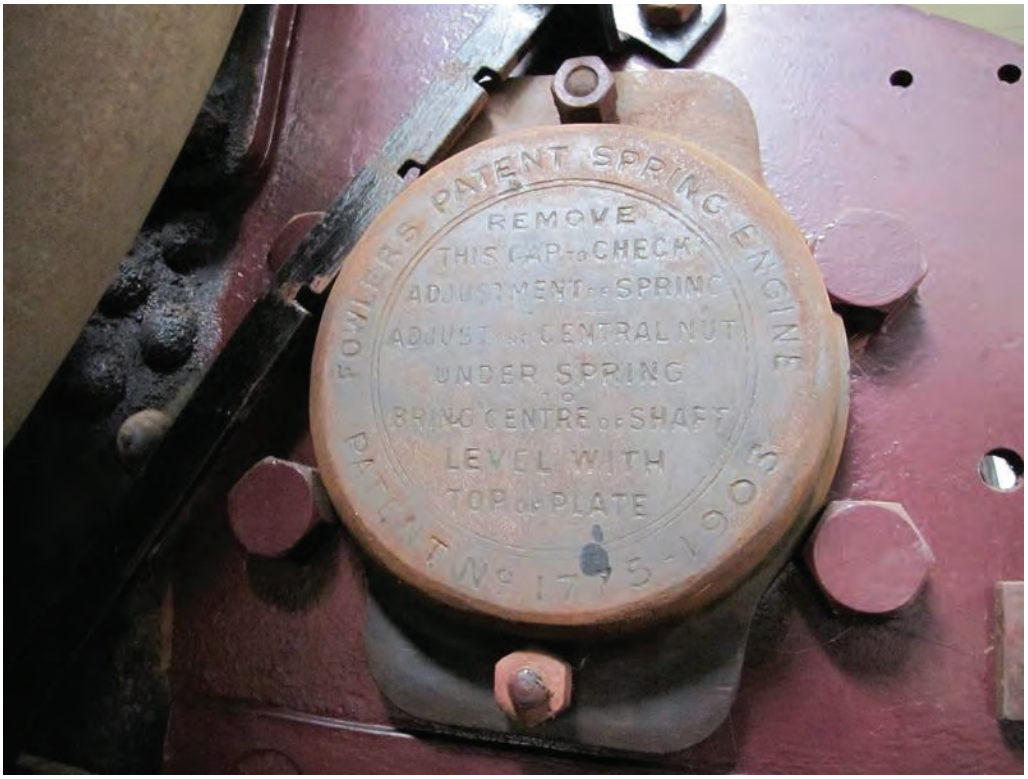


Figure 32 Rear axle spring adjustment cover: note the reference to patent no.1775-1903
Source: Rohan Lamb, December 2013

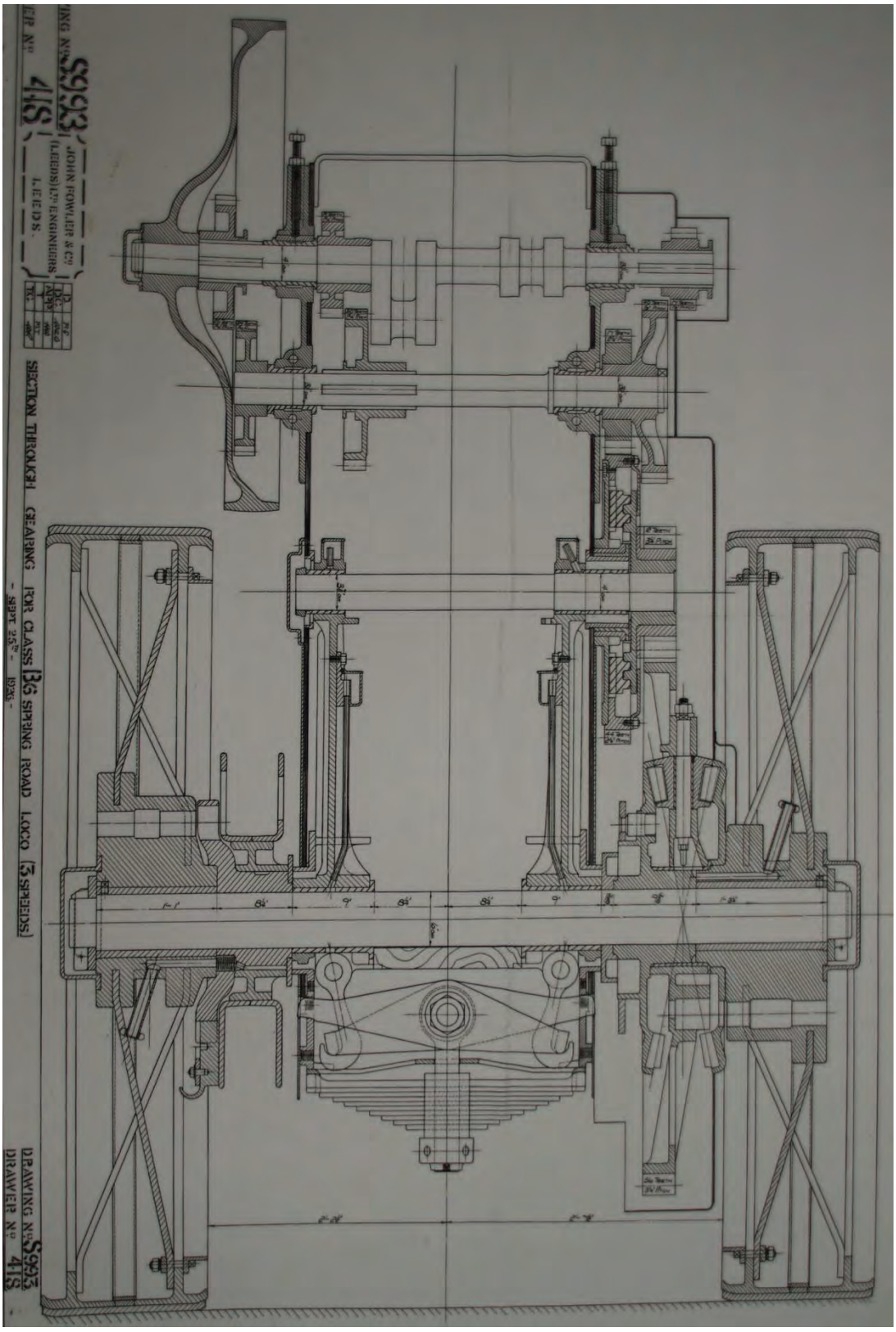


Figure 33 Section through the gearing for a Class B6 sprung three speed road locomotive, John Fowler & Co. (Leeds) Ltd., Drawing no. S993, dated 25 September 1925
Source: Museum of English & Rural Life

Figure 34 Front axle leaf spring

Figure 35 Rear axle leaf spring

3.4.4 Driving gears

The driving gears on engine no.16161 are ¼" (6.35mm) wider than on a general purpose B6 engine, and are 2½" (63.5mm) wide, compared with a general purpose B6 traction engine which are 2¼" (57.1mm) wide. It is a four shaft engine with two counter shafts between the crankshaft and the rear axle (Figure 33). The engine is provided with a third road speed.

3.4.5 Wheels

The rear wheels are 7' 0" (2134mm) diameter x 2' 0" (610mm) wide (Figure 36) which were 1' 0" (305mm) bigger in diameter and 6" (152mm) wider than a general purpose B6 traction engine. Similarly the front wheels were 4' 7½" (1410mm) diameter by 9" (229mm) wide which were 9" larger in diameter than the wheels used on a general purpose engine.

3.4.6 Rear axle

In recognition of its expected duty hauling heavy wagons, the rear axle specification was altered from the standard material to increase its strength by using of nickel steel instead. Nickel alloy steels have higher strength properties, and the use of this material was unique to these two engines supplied by Fowler to Australia. The axle diameter was also increased from the usual 5¼" (133mm) to 6" (152mm).

3.4.7 General

The engine was fitted with a spring drawbar rather than a rigid one. A hand brake was fitted to the rear wheels, and dust covers were specified for the motion gear. It was fitted with a geared boiler water feed pump, and a winding forward drum which could hold 100 yards (91.4m) of cable whereas the usual drum only held 75 yards (68.6m) of cable. Many of the components used different designs than for general purpose engines. Their later design was reflected by the higher drawing numbers cited in the engine specification.

There was no mention in the Fowler specification of the finish of the engine. Road locomotives were highly finished as standard practice. According to oral history this engine was apparently finished to a higher show finish to reflect its use at the British Empire exhibition. This included wheel caps and piston covers. Much of the pipework was also polished. This level of finish can only be verified upon closer inspection, and by comparison with engine no.16162 which was apparently not finished to as higher a level.

3.4.8 John Fowler & Co specification sheets

As noted at Chapter 2, Welch, Perrin & Co was the Victorian agent for John Fowler & Co, and was one of the most successful agents of any brand in Australia during the era of the traction engine. The company was supplied by Fowlers with copies of the build specification sheets for engines sold by them, and also for some engines sold through John Fowler & Co's Sydney office. These specification sheets describe almost every feature of an engine (except paint colour and other finishes) and list the drawing numbers for the components. They were used at the time by the agent for ordering spare parts from John Fowler & Co. When sufficient sheets had been gathered the agent had them bound into a volume. Fortunately these volumes were saved when the agents closed. They now form a valuable reference which can greatly assist with restoration of an engine. Many of the drawings survive at the Museum of English Rural Life, but with different versions of similar components for different sizes of engines on file, these engine specifications identify the specific drawings used to build a particular engine.

Figure 36 View of Fowler road locomotive no.16161
Source: Rohan Lamb, December 2013

Figure 37 Flywheel side of Fowler road locomotive no.16161
Source: Rohan Lamb, December 2013

Figure 38 Rear view showing rear tender, hand brake, and canopy
Source: Rohan Lamb, December 2013

Figure 39 View from the footplate showing the driving levers and engine
Source: Rohan Lamb, December 2013

Even though engine nos. 16161 and 16162 were ordered through Fowler & Co's Sydney office, a copy of their specification was supplied to Welch, Perrin & Co. This may have been done as the contract was handled by the Melbourne office of the Department of Works and Railways.

To save duplicating common features in a specification Fowler & Co would often refer to an earlier engine if it was similar, and then record only the variations for the later engine. This was the case with the specification sheet for engines no. 16161/2, which show all the unique variations, and refers to an earlier specification for engine no. 16104 for all the other features. Engine no.16104 was a B6 compound traction engine without spring suspension (rigid) which was supplied to the Werribee Shire Council, Victoria in September 1924.

The specifications sheets for engines engine nos. 16161 and 16162 are reproduced at Appendix C.

3.5 Condition

The condition of the road locomotive is mechanically excellent, which was confirmed during the overhaul of the engine where only minor repairs were required. The repainting of the road locomotive during its overhaul has returned its appearance to near that of when it first left the Fowler workshops.

The maintenance and conservations works undertaken on the engine have been performed by K & H Ainsworth Engineering at their workshops at Goulburn. The works were completed by March 2016 when the road locomotive was operated at a heritage festival at Lanyon Homestead. It has since been stored in a corrugated iron shed on the property. This arrangement is sub-optimal, as observed by Ken Ainsworth following in his Condition Report on April 2020:

> The external upper surfaces of the engine were covered in a heavy layer of dust, bird droppings and spider webs. The canvas covers over the crankshaft area, motionwork and roof have provided some protection to these areas. However a considerable amount of dust and grit has infiltrated under the covers particularly around the motionwork.
>
> Rain is leaking through the building roof onto the engine in the cylinder and smokebox area in reasonable volume. It appears to be coming in around the vent pipe above the chimney and slightly towards the rear of the engine from this.
>
> Surface corrosion was developing on the polished iron hub caps and the steel cylinder covers. The top surface of the flywheel was considerably covered with fine rust.
>
> There is no developing corrosion in the outer areas of the boiler and from what could be observed through the boiler hand hole the internal area of the boiler was completely dry. There were bird droppings in the smokebox with some minor corrosion but no sign of water ingress from the leaking roof.[94]

3.5.1 Boiler

The most critical part of recommissioning the engine was the servicing and inspection of the boiler in accordance with Australian Standards. Fittings were removed from the boiler and an independent inspector engaged to go over the boiler (refer to report Appendix D). This inspection concluded the boiler was safe for operation. For the purposes of monitoring the boiler condition over time, various points of the steel barrel were measured for their thickness. Asbestos, used in various gaskets was removed, and modern safe materials substituted. This applied to the man hole, hand holes, and gauge glass packings. The fusible plug was removed, found to be in good condition, and refitted to the boiler.

The ashpan was painted and fitted with new wedges as the original wedges were missing. The firebars were found to be in near new condition.

The metal cladding and timber lagging of the barrel required removal to allow inspection of the external surface for corrosion. The cladding was not original and had been partially replaced, and the timber lagging underneath had largely burnt away. These were all replaced with new materials after the boiler inspection was completed. No external corrosion of the boiler barrel was identified.

3.5.2 Engine Motion Gear

The motion gear was cleaned and adjusted as required. All lubricators were cleaned and checked to be functioning. All working surfaces were cleaned and lubricated. The condition of the motion gear was found to be excellent showing minimal wear. All steel surfaces which were originally bright were polished and preservative applied. The crankshaft was found to be in good condition with a new bolt required for the low-pressure big end bearing, and repairs to the wedge, due to signs of previous damage. The flywheel was inspected visually for cracks, none were found, so the flywheel was deemed to be sound. The key holding the flywheel to the crankshaft was sound, and the screws holding the covering cap were replaced. All the gland packings of the valve and piston rods were asbestos, so these were replaced with PTFE material.

3.5.3 Front (Belly) Water Tank

The belly tank was removed to allow replacement of the cladding, it was found to be in good condition with the inside of the tank protected from corrosion with bituminous paint. The tank had been incorrectly mounted, and when reinstalled, this was corrected with new spacers.

3.5.4 Wheels

The most apparent visual change during the recommissioning was the addition of rubber to the front and rear wheels. This was a practical consideration which allowed the road locomotive to be driven on asphalt surfaces, as the metal wheels easily damage asphalt roadways.

As the rubber is bonded to the original surface, it is a reversible change.

3.5.5 Painting

The road locomotive was repainted during the overhaul, and pin striping to Fowler's original design added.

3.5.6 Ongoing Maintenance

Following the initial run of the engine in 2016, it has not been operated since and has only had periodic inspection and cleaning.

The last inspection of the boiler was in December 2019.[95] The inspection interval is normally based on either an annual basis, or hours operated. The boiler has not been used since 2016, and as long as good long-term storage practices have been implemented there should be no deterioration of the boiler.

Periodic cleaning of the road locomotive has been undertaken on an informal basis since the engine was placed at Lanyon Homestead.

3.6 Intactness

The road locomotive is very largely intact as built. The following is a list of known physical changes. These generally date from its period in private ownership (since 1947). Changes during its working life are unknown.

- Boiler tubes: second hand tubes fitted (Bob McLeod)
- Fire bars: replaced (Bob McLeod)

- Canopy: rebuilt with new timber on correct size angle iron frame, covered with canvas (Doug Wallis)
- Rear brake: new screw shaft copied from engine no.16162; brake shoe broken and repaired (Doug Wallis)
- Ashpan: replaced (Doug Wallis)
- Chimney: replaced with new riveted barrel to original design, chimney top cap reused (Doug Wallis)
- Runner board: replaced, not to the original design
- Spud pan: heavy corrosion repaired, straightened and new countersunk bolts fitted (Doug Wallis)
- Front water tank: bottom plate replaced (Doug Wallis)
- Smokebox: lower section repaired with new plate welded inside (Doug Wallis)
- Spark arrestor (smokebox): replaced (Doug Wallis)
- Paintwork: repainted (Bob McLeod/Doug Wallis)
- Wheels: removed and fitted with rubber, hub caps polished, new shims fitted to LH rear and RH front wheel (K&H Ainsworth Engineering Pty Ltd)
- Ashpan: painted and fitted with new wedges (K&H Ainsworth Engineering Pty Ltd)
- Boiler lagging: lagging timber and steel cladding replaced with new materials (K&H Ainsworth Engineering Pty Ltd)
- Belly tank: remounted with new spacers (K&H Ainsworth Engineering Pty Ltd)
- LP Big End: repaired wedge and replaced adjusting bolt (K&H Ainsworth Engineering Pty Ltd)
- Gland packing: asbestos removed and replaced with PTFE (K&H Ainsworth Engineering Pty Ltd)
- Manhole/Hand holes: asbestos gaskets replaced with Topog-E rubber gaskets (K&H Ainsworth Engineering Pty Ltd)
- Removal of the nameplate for storage by Ken Ainsworth, as noted above (Section 3.2)

4.0 ASSESSMENT OF SIGNIFICANCE

4.1 Approach

This section assesses the John Fowler Road Locomotive no. 16161 (Engine no. 16161) for significance against the ACT criteria (s.10 ACT Heritage Act 2004). It has regard for ACT Heritage Council's *Heritage Assessment Policy* (March 2018).

Given that the road locomotive is a moveable object, the assessment also has regard for the process articulated at Part 4 of *Significance 2.0 - a guide to assessing the significance of collections* (2009), prepared by the Collections Council of Australia Ltd.[96]

The approach builds on the historical and physical evidence presented in the two preceding chapters. It briefly describes National and ACT historic context and the technical context of mobile steam plant. It then considers the road locomotive no. 16161 against the ACT heritage criteria. A statement of significance is at Section 4.5.

4.2 Contextual analysis

4.2.1 Historic context

National context

- Traction engines, and to a lesser extent road locomotives, were supplied in significant numbers to the Australian market from the 1880s to World War I (with a dip during the recession of 1893-98). The heyday for traction engine sales was between 1898 and 1914 when over 80 per cent of all engines imported into Australia from Britain and the USA were sold, amounting to approximately 900 engines.
- Mobile steam plant had an appreciable and positive impact on the economy by saving manual labour and obviating the need to maintain teams of horses or bullocks. It also influenced patterns of development in Australia's early agricultural, mining, road transport and sawmilling industries from the late-1870s until the 1940s. Arguably the greatest impact of mobile steam plant was in agriculture, where traction engines were used to drive machinery such as chaff cutters and threshers. They were also used to power sawmills, drive rock crushing plants for road building, power mine stamping batteries and drive irrigation pumps.
- Traction engines and road locomotives were the first self-propelled land-based machines free of rails intended for bulk haulage; they changed how goods were transported, with larger loads moved over longer distances. Wheat and wool were hauled on wagons to ports and railways; timber was pulled from forests; and sawn timber transported from sawmills to market. Firewood, coal, ore and machinery were transported for the mines.
- By the 1920s traction engines and road locomotives had generally been superseded by internal combustion engine-powered vehicles as tractors and trucks became cheaper and more reliable. Many engines continued in use on farms until the 1940s.
- Today, a number of traction engines and road locomotives survive in preservation with some in museums and others owned by private collectors. Collectively, they have significant historic value for their association with the early generations of settlers in the Australian colonies, and their pioneering use of mechanisation.
- Engines no. 16161 and 16162. represent the end of the steam era. They were among the last road locomotives/traction engines exported from Britain to Australia.

Canberra context

- In 1908, when the 'limestone plains' was selected as the location for the federal capital, the area lacked sealed roads and a rail connection. Steam power was critical to the construction of the federal capital, in the form of both mobile steam plant and light rail/trams. The Department of Home Affairs (and subsequently the Department of Works & Railways and Federal Capital Commission) maintained a fleet of traction engines and road locomotives in Canberra, along with steam rollers, a steam wagon, steam shovels and portable steam engines. Over 30 items of mobile steam plant were used during early construction phase of the national capital (1911-1927).
- The mechanical plant was stored, serviced, and repaired at the Kingston Power House complex from the 1910s to the 1940s. The Power House precinct emerged as Canberra's industrial and government services centre. The Fitters' Workshop, to the south-east of the Power House was built in 1916 to service Government-owned construction plant and equipment. The Fitters' Workshop is included in the ACT Heritage Register as part of the Kingston Power House Historic Precinct (Section 8, Blocks 8, 11, 14 and 24).
- Canberra's 'establishment phase' (1911-1927) was the period during which steam power was superseded by the internal combustion engine. In the mid-1920s, when the two road locomotives were specified, steam-powered road locomotives were the most powerful machines available. By the end of the decade they had been superseded by heavily-built internal combustion powered machinery.
- Engines no. 16161 and no. 16162 were among the most powerful examples of road locomotives ever built. They were tailored by the manufacturer for Canberra conditions and to meet the requirements of the tender, including a large firebox (or 'long box boiler') to accommodate low grade coal and/or timber, and altering the type of steel used in the rear axle for increased strength.
- Engines no. 16161 and 16162 were the only traction engines or road locomotives that were acquired new for the construction of Canberra; all others were acquired second-hand. They were acquired to assist in the major phase of construction leading up to the relocation of parliament from Melbourne to Canberra in 1927.
- The Fowler engines were used for a brief period in Canberra. Their operation in the city can be divided into two phases: 1925 to c. 1927, the 'construction phase', where its tasks included haulage, pile driving and towing an elevating grader; and c. 1927 to c. 1940, when they were used for at least two stationary applications, including driving a rock crushing plant at the Black Mountain quarry, and Canberra abattoir. The engines saw very little use in the years prior to their sale by the Government (1947/48). At this time, they were the last two items of mobile steam plant in Government ownership.
- There are other items of steam plant with a longer association with the construction of the national capital, including the Austral Otis steam roller (referenced in Chapter 2) and Fowler road locomotive no.12608, acquired by the Government in 1913 and believed to have been sold in the late-1930s (Section 4.3).

4.2.2 Technical context

- Mobile steam plant emerged in the 1840s. The design of traction engines had standardised by the 1870s. Road locomotives emerged in the 1880s as a refinement of the traction engine. The

term described a robust engine suited to prolonged operation over roads while undertaking heavy haulage duties.

- Road locomotive's heavy construction and additional features (as compared to traction engines, see Chapter 2) meant that they were the most expensive type of engine available. As a consequence the vast majority of road locomotives were sold to government customers, including shire councils and government departments.
- The design and technology of road locomotives essentially date to the nineteenth century. Refinements in the twentieth century included the use of higher quality materials.
- The Fowler B6 road locomotives supplied to Canberra in 1925 were the most powerful engines of their type available at the time and represented the zenith of their class.

4.3 Comparisons

Apart from John Fowler road locomotive no. 16161, the comparative analysis undertaken for this CMP has identified three other Fowler road locomotives of the B6/B7 class in Australia. There are at least four other smaller Fowler road locomotives in Australia; these are not considered directly comparable. There are a small number of road locomotives by other manufacturers surviving in Australia. Due to their different design they are also not considered directly comparable. Also excluded are Fowler B6 general purpose traction engines, and B6 stump puller engines.

4.3.1 John Fowler & Co (Leeds) Ltd, Class B7 Road Locomotive, no.12608

Fowler engine no.12608, is a 1910, class B7 three speed compound road locomotive originally purchased by the Wingadee Shire Council, New South Wales (Figure 40). The plant proved to be unsatisfactory in the black soil country, so it was sold to the FCC in 1913.[97] It was used for hauling materials to the Cotter dam construction site, and other tasks. This engine is thought to have been sold by the FCC in the 1930s.[98]

Its earlier construction date allows comparison of the design evolution of Fowler's road locomotives. The engine is privately owned, and it is in worn condition.

4.3.2 John Fowler & Co (Leeds) Ltd, Class B7 Road Locomotive, no.12619

Fowler engine no.12619 is a 1911 class B7 three speed compound road locomotive. It is the only example of a B6/B7 road locomotive in Australia to have been purchased by an individual rather than a government body – Mr W C.H Roberts, owner of Currawong station near Harden, New South Wales. The engine was used for hauling wool and wheat, and was noted for setting a record in 1912 when it hauled 63½ tons carried by four wagons from Mr B Kendall's farm Dulworth, Benmore to the Murrumburrah mill (Figure 41).[99]

The engine is privately owned. It was extensively restored in 2014/2015.

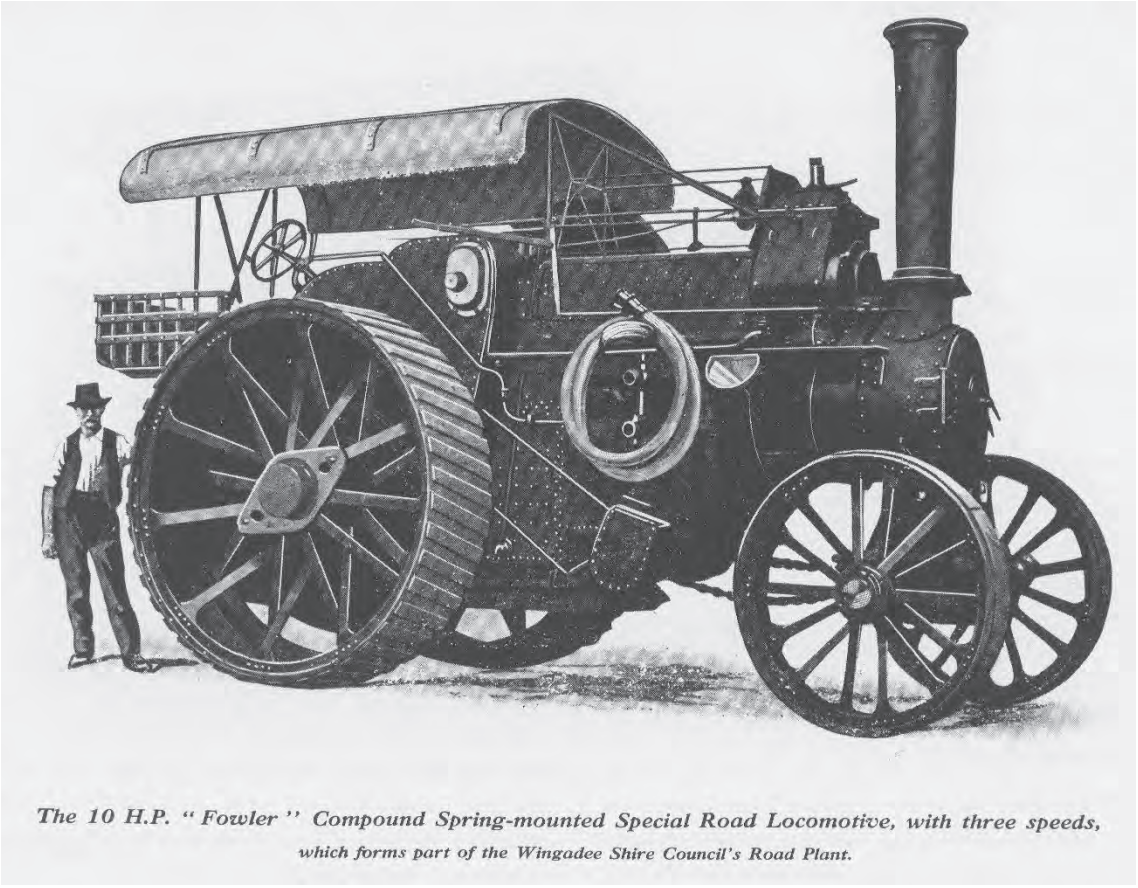


Figure 40 Fowler road locomotive no.12608
Source: Clyde Engineering Co Ltd, 1911

Figure 41 Fowler no. 12619 photographed with a record haul of wheat in 1912
Source: Harden-Murrumburrah Historical Society

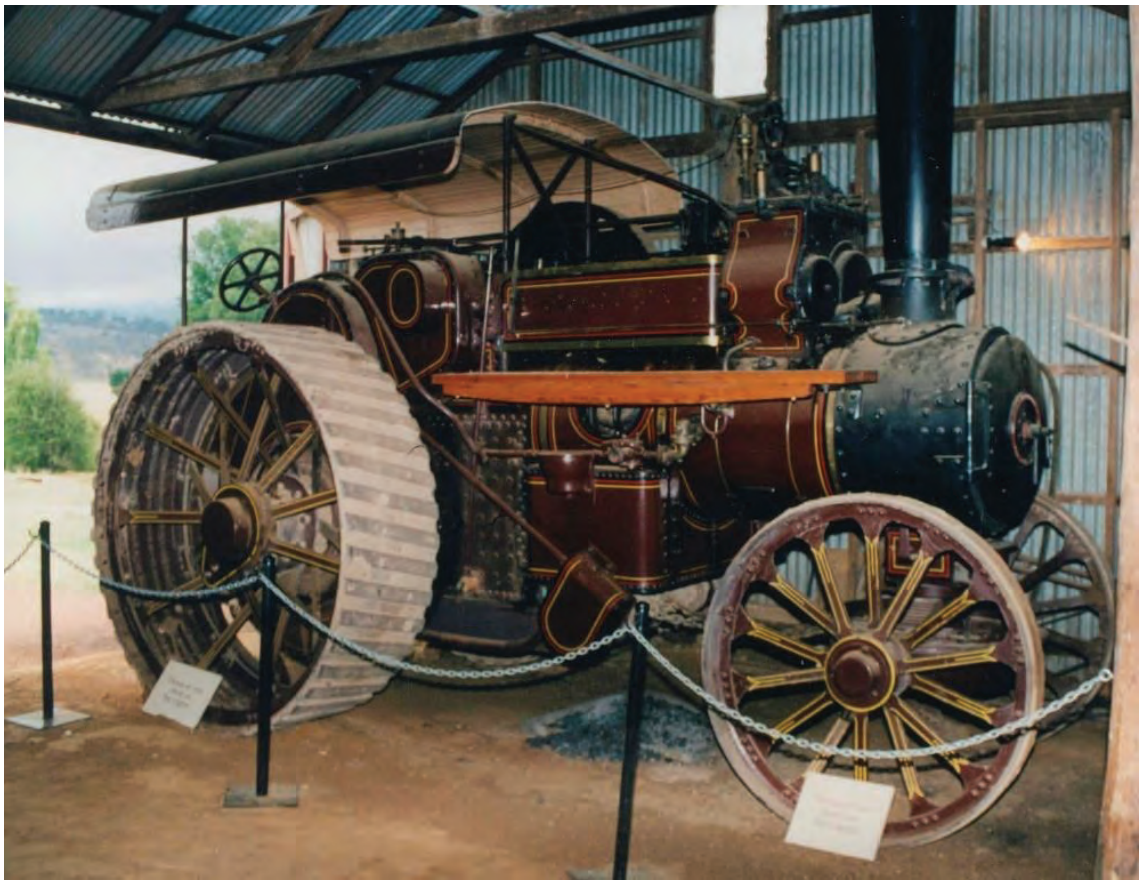


Figure 42 Fowler no.16162 at Lanyon Homestead, January 2003
Source: Rohan Lamb

Figure 43 Fowler no.16163 in Fowler's yard, Leeds with the 40' (12.2m) draft beam in place
Source: Museum of English Rural Life

4.3.3 John Fowler & Co (Leeds) Ltd, Class B6 Road Locomotive, no.16162

Engine no. 16162 is of the same specification as no.16161. It was despatched from Fowler's works one month after no.16161, in February 1925. The engine is in a public collection and is owned by the National Museum of Australia (NMA).

The engine was sold by the Government in 1948 to sawmillers L Donoghue & Hopkins, Queanbeyan. It is not certain how long they owned the engine. An early preservationist, Bruce Macdonald, purchased the engine in 1958 from sawmiller Les Cant of Medlow Bath, New South Wales. In 1962 Don Collins of Auburn purchased a half share in the engine, and in 1979 the engine was sold to Alan Marr for inclusion in a proposed museum at the Canberra brickworks. This project fell through, and the NMA purchased the engine in 1980.

At the time of writing it is understood that the engine was in a non-operational condition with repairs required to the boiler. It is not on display and is kept at the NMA's Mitchell Store.

4.3.4 John Fowler & Co (Leeds) Ltd, Class B6 Road Locomotive, no.16163

Engine no.16163 is a 1925 class B6 compound rigid road locomotive. It differs greatly in its specification when compared with no.16161 as it only has two speeds, and it is rigid mounted (i.e. no springs). It was originally purchased by the Timbrebongie Shire Council, Narromine, New South Wales, and despatched from Fowlers works on 1 August 1925. This engine was the last road locomotive supplied by Fowlers to Australia.

The engine is significant for a unique modification requested by the council. It was supplied with a 40 foot (12.2m) wide drawbar intended for towing road graders (Figure 43). By using the bar it was possible to grade a wider section of road with one pass. It is not known if this experiment was successful.

In 1926 the engine was used for six months on the building of the Great Western Road through the Shire.[100] Council sold the engine in 1939 to E M Hamblin & Sons, Woodstock.[101] It was donated by the Hamblin family back to the Narromine Shire Council in 1974. The engine is in unrestored condition, and the draft beam is no longer present.

4.3.5 John Fowler & Co. (Leeds) Ltd, Class R3 Road Locomotive, no.13037

This Fowler road locomotive is owned by the Wellington Shire Council, New South Wales. It is a three-speed road locomotive, but it is a seven nominal horsepower, class R3 engine, so it not as powerful as a class B6 engine.

It was originally purchased by Macquarie Council in 1912 from the New South Wales agent W Noakes, Sydney. It was used to transport coal to the gas works and the water pumping station, and for hauling crushed rock from the quarry for road construction. It was sold in 1922 to Jacob Offner who used it for general agricultural tasks including threshing wheat, chaff cutting, pumping water, and land clearing.

Eventually the engine passed into preservation, and was auctioned in 1994, when it was acquired by Wellington Council. The engine has since been restored and is operational. The council also has two restored wagons to tow behind the engine.

The engine is included in the NSW State Heritage Register, under the NSW *Heritage Act*.

4.3.6 Comment

Each of the engines that can be considered directly comparable with engine no. 16161 has its own distinguishing features. Engine no. 12608 has a longer association with Canberra and is an earlier engine of a different class but is not in as good condition. Engine no.16163 is a different specification with only

two speeds and no springs, and this coupled with its unique specification by the council make it significant in its own right, but it is in much poorer condition. Engine no.13037 is a smaller class of road locomotive, so is not directly comparable. In recent times it has had a new boiler made for it, so it is not as intact as engine no. 16161. Engine no.16162 is directly comparable with no.16161 and shares a common history. The appearance of no.16162 is different to no.16161 as it has been repainted and pinstriped. Without closer inspection it is difficult to say if no.16162 is better mechanically in relation to the gears and engine. It is understood that it requires boiler repairs and has been non-operational for some time.[102] Engine no. 16161 is intact, and holds a current inspection certificate for its boiler rated to the original working pressure, so could be considered to be in better condition.

4.4 Assessment against criteria

In the following section John Fowler road locomotive no. 16161 is assessed against the criteria at s 10 of the *Heritage Act 2004* (ACT). It refers to guidance in the ACT Heritage Council's *Heritage Assessment Policy* (March 2018).[103]

4.4.1 Criterion A: importance to the course or pattern of the ACT's cultural or natural history

The Heritage Assessment Policy indicates that the basic test for Criterion A is that the object 'has a clear association with an event, phase, period, process, function, tradition, land use, movement, custom, way of life…in the ACT's history' and that this is evident in the physical fabric, documentary resources or oral history. It will meet the threshold test if this is an important contribution, including 'having made a strong, noticeable or influential contribution', including that it is representative, distinctive, intact or rare.[104]

Road Locomotive no. 16161 meets this criterion.

Analysis

Association with construction of Canberra

Fowler engine no.16161 has a strong and demonstrated association with the construction of Australia's capital city, Canberra. The engine was built in response to John Fowler & Co, of Leeds, England, being awarded a tender for the supply of two engines to Canberra by the Department of Works & Railways in 1924. This is the reason the engine was created; it was not an engine in stock and was constructed specifically for this contract.

Fowler engine no.16161 was one of a pair supplied, the other being serial no 16162. This was unusual; the considerable expense of the engines meant that most customers ordered a single road locomotive. The three-speed, fully-sprung, class B6 compound road locomotives were the most expensive and powerful engines available at the time, reflecting the Australian Government's commitment to the construction of the national capital in the mid-1920s.

The Fowler engines were used for a brief period in Canberra. Its operation in the city can be divided into two phases: 1925 to c. 1927, the 'construction phase', where its tasks included haulage, pile driving and towing an elevating grader; and c. 1927 to c. 1940, when they were used for at least two stationary applications, including providing power to rock crushing plant and the Canberra abattoir. The engines saw very little use in the years prior to their sale by the Government (1947/48), at which time they were the last two items of mobile steam plant in Government ownership.

Fowler engine no. 16161 provides an understanding of the physical challenges and processes of constructing a major city in an inland area with few sealed roads and no rail connection in the 1910-20s.

Association with the use of steam plant in Canberra

Steam plant, as well as horse power, was critical to the construction of Canberra. The internal combustion engine, despite advances during World War I, was not powerful enough for the work. However, this had changed by the end of the decade. The 1920s was the final era of steam powered plant. Road Locomotives no. 16161 and no. 161612 were among the last road locomotives/traction engines exported from Britain to Australia.

The Government's fleet at Canberra included traction engines, steam shovels, steam rollers, steam wagons, and portable engines driving plant such as rock crushers. They were stored in the grounds of the Kingston Power House, an area that emerged as Canberra's government services and industrial precinct from the 1910s. The Fitters' Workshop, to the south-east of the Power House itself, was built in 1916 to service Government-owned construction plant and equipment.

Road Locomotives no. 16161 and no. 161612 were the only traction engines or road locomotives that were acquired new for the construction of Canberra. All others were acquired second-hand. However, there are other items of steam plant with a longer association with the construction of the national capital, including an Austral Otis steam roller and Fowler road locomotive no.12608, acquired by the Government in 1913.

These associations are evident in the physical fabric as a steam engine and in documentary and oral history evidence as outlined in Chapter 3. The national significance of establishing the federal capital resulted in a more extensive record of its construction being made than would typically occur. The Mildenhall photographic collection in particular has recorded many of the items of steam plant in operation during the 1920s.

Association with the period of steam plant use in Australia

More generally, steam plant had an appreciable and positive impact on the Australian economy 1870s to the 1940s. Steam plant reduced manual labour and obviated the need to maintain teams of horses or bullocks. It also influenced patterns of development in Australia's early agricultural, mining, road transport and sawmilling industries.

Arguably the greatest impact of mobile steam plant was in agriculture, where traction engines were used to drive machinery such as chaff cutters and threshers. They were also used to power sawmills, drive rock crushing plants for road building, power mine stamping batteries and drive irrigation pumps.

Traction engines and road locomotives were the first self-propelled land-based machines free of rails intended for bulk haulage; they changed how goods were transported, with larger loads moved over longer distances.

Threshold test

As described above, the road locomotive has a clear association with the construction of Canberra and with the historic use of steam power for civic construction in Canberra and in Australia more generally. These are both important phases in ACT history, and the object itself is representative, distinctive and intact.

Road Locomotive no. 16161 is distinctive in that it was a major purchase by the Australian government, made to order to local conditions and with the express intention of contributing to the construction of Canberra. Its use during the phase of 1925 to 1927 made a significant contribution to civic construction, and the decline in use after 1927 reflects the coming of the end of the steam era. It is a representative example of the final form of road locomotive design and is among the most powerful ever built. It is very largely intact and has high integrity. Some components have been replaced with wear in the

normal course of operation or to remove asbestos—they have been replaced with parts consistent with the original. It holds a current inspection certificate for its boiler rated to the original working pressure.

For these reasons, Road Locomotive no. 16161 meets Criterion A.

4.4.2 Criterion B: uncommon, rare or endangered aspects of the ACT's cultural or natural history

According to the ACT Heritage Council, Criterion B mirrors the test in Criterion A—that the object must have a clear association with an aspect of ACT history, that the association is evident in physical fabric, documentary resources or oral history, and that this aspect of history made a strong, noticeable or influential contribution to the ACT's society or environment. The threshold test is contained in the criteria, in that 'the aspects for which the place or object has association are uncommon, rare or endangered within the ACT'. Additional threshold indicators include that the object is intact, unique, distinctive, exceptional or extensive. [105]

Analysis

Engine no. 16161 meets this criterion because, as a rare surviving example of a road locomotive, it has a clear association with the construction of Canberra and with the use of steam power for civic construction.

Engine no.16161 meets the basic test for this criterion, as described in Section 4.4.1. In addition, Engine no. 16161 is a rare surviving example of a fully sprung three speed road locomotive—and represents the pinnacle of road locomotive design. Engine no.16161 is uncommon or rare as it is one of only two road locomotives purchased by the Australian Government's Department of Works & Railways. This was the only occasion Fowlers supplied two road locomotives to an Australian customer. Engine no. 16161 and 16162 were built to specifications in response to the intended use in the construction of Canberra. Engine no. 16161 is in better working condition than Engine no. 161612.

There are other items of steam plant with a longer association with the construction of the national capital or with the use of steam plant in Australia more broadly. However, as described in section 4.3, these engines are either of different specifications, not as intact or in not as good condition as Engine no. 16161.

Engine no.16161 is a representative example of the final form of road locomotive design. It was built by John Fowler & Co, a company with a high reputation associated with road locomotive construction. It is a very complete example of a Fowler road locomotive.

This class of road locomotive is rare with only four known surviving Fowler B6/B7 road locomotives in Australia.

As such, it is evidence of an uncommon or rare aspect of ACT history, and meets Criterion B.

4.4.3 Criterion C: potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history

This criterion applies if there is a reasonable likelihood that the 'object contains substantial physical evidence of archaeological or other defined research interest and the suspected physical evidence is not currently visible and the evidence is of a likely integrity and/or condition to yield information'. There must be a strong presumption of research potential. In addition, there is a threshold test that the information that might be obtained is 'likely to provide a substantial contribution to an understanding of an important aspect' of ACT history.[106] Exclusion guidelines include that the potential information is not particularly significant or valuable, that it is a further example of a well-studied type or that the information is readily available from other sources.[107]

Analysis

It is unlikely that Engine no. 16161 contains substantial additional physical evidence that is not currently visible. Details of the origins, original design specification, use and ownership of Fowler engine no.16161 are extensive. As noted, there is a detailed photographic record of the engine (and its twin), both during its period of operation in Canberra, and in private ownership. There are very few gaps in the documented history of the object. Likewise, the history of the manufacturer, John Fowler & Co Ltd, is extremely well-documented. It should also be noted that steam technology is an intensively studied field and is well understood. Therefore, it is not considered that Fowler engine no.16161 meets this criterion.

4.4.4 Criterion D: importance in demonstrating the principal characteristics of a class of cultural or natural places or objects

Criterion D has three basic components in that:

- the object must be readily identified as belonging to a 'class'
- the principal characteristics of the class of objects must be evident in the physical fabric, and
- the class of objects must be important in the ACT's history, having made a strong, noticeable or influential contribution.

The threshold test includes that it is a 'particularly fine or pivotal example which is beyond the ordinary'.[108]

Analysis

Engine no. 16161 meets this criterion as a particularly fine example of a road locomotive, that was pivotal in the development of Canberra.

Engine no. 16161 belongs to a class of objects known as road locomotives. Road locomotives were developed as a refinement of the traction engine. The term describes engines suited to prolonged operation over roads while undertaking heavy haulage. Characteristics common to all manufactures include:

- robust construction—larger diameter spring-mounted axles, wider gears and enlarged bearings to cope with heavy loads
- a third road gear—including a faster gear for road travel (beyond the two typical for traction engines)
- front and rear water tanks for additional travelling range
- disc-type flywheel
- side motion covers
- larger wheels

John Fowler & Co (Leeds) was one of the major manufacturers of road locomotives. It supplied over 450 steam traction engines and road locomotives to the Australian market. Engine no. 16161 was built to the specifications of the Department of Works and Railways and includes the following features:

- heavy duty construction
- a B6 class 'long box' boiler suited to burning timber (as was common in Australia)
- Compound engine—increasing efficiency
- Front and rear springs—intended for use over long distances
- A third road-gear

Road locomotives were important during the construction phase of Canberra, as described in section 4.4.1.

In addition, Engine no. 16161 is a particularly fine and pivotal example of a road locomotive and represents the final form of road locomotive design. It was among the most powerful road locomotives built. It was built by John Fowler & Co, a company with a high reputation associated with road locomotive construction. It has a strong and distinctive association with Canberra, as it was a major purchase by the Australian government, made to order to local conditions and with the express intention of contributing to the construction of Canberra. It is largely intact and in good condition.

As a result, Criterion D does apply.

4.4.5 Criterion E: importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT

According to the *Heritage Assessment Policy*, the basic test for this criterion is that particular aesthetic characteristics are evident in the physical fabric of the object. Aesthetic characteristics include artistic excellence and aesthetic qualities in all sensory forms. This includes objects that inspire, emotionally move or evoke a strong human response, or that invite judgement against 'ideals of beauty, picturesqueness, evocativeness, expressiveness, grotesqueness, sublimeness and other descriptors of aesthetic judgment'. This includes the 'form, scale, setting, unity, contrast, colour, texture and material of the fabric of a place or object'.[109] The question of value to a community or cultural group is considered as part of the threshold test.

This criterion is not considered to apply to Engine no.16161.

Analysis

The road locomotive does provoke enthusiasm and interest and provides some appealing visual details. However, there is little in its design that relates to ideals of beauty or aesthetics. The appearance, features and technical operation of road locomotives had standardised by the 1880s and changed little after this date. Improvement and variations to road locomotive design from the early twentieth century related largely to the use of higher quality materials. The Engine does not appear to be 'important' in demonstrating these characteristics.

As a result, it does not meet the test for Criterion E.

4.4.6 Criterion F: importance in demonstrating a high degree of creative or technical achievement for a particular period

The basic test for this criterion is that the object 'contains visible physical evidence that clearly demonstrates creative or technical achievement for the period in which it was created.' The threshold test is that this achievement is important, represents a high degree beyond the ordinary, with a high degree of integrity.[110] The inclusion guidelines include that the object demonstrates a solution to a technical problem, a new technology, a breakthrough, an extension to the limits of existing technology or an adaptation of technology in a creative manner.[111]

Analysis

This criterion is not considered to apply to Engine No. 16161. While the basic test appears to be satisfied, there is little convincing evidence that it would meet the threshold test.

Engine No. 16161 does contain some visible physical evidence of technical achievement for the period. This includes the application of the powerful B6 boiler type and the adaptation of the road locomotive to Australian conditions. It is among the most powerful road locomotives made and represents the pinnacle of road locomotive achievement.

However, is difficult to say that this road locomotive is important for its achievement or that it relates to a high degree of achievement, beyond the ordinary. This was not a breakthrough technology, a notable example of ingenuity or an innovative departure from the norm. Rather it represents the incremental evolution of a technology that, even at the time of purchase, was quickly becoming obsolete. As a result, Criterion F does not apply to this object.

4.4.7 Criterion G: has a strong or special association with the ACT community or a cultural group within the ACT for social, cultural or spiritual reasons

There is a two-fold basic test for this criterion—there must be a clear evidence of an association between the place or object and the ACT community or a cultural group in the ACT and the association is for social, cultural or spiritual reasons. The threshold test is evidence that this association is strong or special, looking at, for instance, distinctiveness, extensiveness and length of time of the association. The guidelines indicate that it applies to places or objects that provide 'the broad ACT community or a cultural group with a shared sense of place and/or a sense of identity/story through collective experience or history'. A cultural group is defined as shared ethnic or cultural background or way of living, and the guidelines specify that a shared professional or special interest is not enough to constitute a 'cultural group'.[112]

Analysis

Research to establish or quantify whether such an attachment exists for Fowler engine no. 16161 has not been undertaken for this report. There is some public support or sentiment supported by press coverage relating to the anticipated return of Fowler engine no. 16161 to Canberra. In June 2014, the *Canberra Times* reported:

> Rejoice Canberra! This 19-tonne juggernaut, a Fowler 16161 road locomotive used in Canberra between 1925 and 1927 in the building of the infant city, is coming home at last, to live here ...
>
> ... Thursday's announcement by Senator George Brandis, the federal Minister for the Arts, of some funding for ACT matters from the National Cultural Heritage Account, included $180,000 to the Canberra Museum and Gallery towards the purchase of this beautiful monster of huge Canberran significance ... [113]

In addition to the ACT and Canberra community at large, Fowler engine no.16161 is valued by the vintage machinery community at a national level, by whom the object is recognised as one of a limited number of road locomotives to remain in Australia.

However, it is considered that Fowler engine no. 16161 does not satisfy this criterion. The road locomotive may have provoked interest from the broad ACT community, but there is no clear evidence of a social, cultural or spiritual association with the engine. While the engine may have particular interest to the vintage machinery community, this community is not regarded as a 'cultural group' under the *Heritage Act 2004.* Therefore, this criterion does not apply.

4.4.8 Criterion H: has a special association with the life or work of a person, or people, important to the history of the ACT.

The basic test is that the object:

> Has an association with a person or people whose life or work has made a contribution to the ACT's history, and
>
> The association is evident in the physical fabric (including archaeological fabric) of the place or object and/or in documentary resources and/or oral history, and

> The association directly relates to achievements of the person or people relating to the place or object.[114]

To meet the threshold test, this association must be special or out of the ordinary and 'must normally be enduring and/or demonstrate close interaction between the place/object and the person/people'[115]

Analysis

The road locomotive could be associated with the Department of Works and Railways, which ordered these engines new for the construction of Canberra, or the Federal Capital Commission which oversaw works. However, there is no evidence of this being a special association which could be regarded as above the ordinary. The road locomotive was one purchase of many, made in the ordinary course of business. Therefore, this criteria does not apply.

4.5 Statement of significance

4.5.1 What is significant?

The three-speed, fully-sprung, class B6 compound road locomotive (serial no.16161) was manufactured by John Fowler & Co (Leeds) Ltd, England. It was transported from England to Canberra, via Sydney, in 1925.

4.5.2 How is it significant?

John Fowler road locomotive no. 16161 is of historical significance to Canberra and the Australian Capital Territory.

4.5.3 Why is it significant?

John Fowler road locomotive no. 16161 is historically significant for its association with the construction of Canberra between 1925 and c.1927. It was one of a pair of almost identical road locomotives specified for use in the construction of the national capital in the period leading up the transfer of parliament from Melbourne to Canberra in 1927. They were ordered by the Department of Works & Railways in 1924, and were the only traction engines or road locomotives that were acquired new for the construction of Canberra. Both engine no. 16161 and 16162 survive in relatively good condition. Engine no. 16162 is owned by the National Museum of Australia.

Engine nos. 16161 and 16162 were used primarily for road haulage work and towed up to seven wagons laden with crushed rock, bricks, pipes, or other construction materials. They were also used for earthmoving works such as towing an elevating grader. The Government mobile steam fleet was housed at the Kingston Power House precinct, and serviced from the Fitters' Workshop (built 1916).

Fowler engine no. 16161 is of technical interest, as a representative example of the final form of road locomotives. The design and technology of road locomotives essentially date to the nineteenth century. Refinements in the twentieth century included the use of higher quality materials. Engine nos. 16161 and 16162 were specified for Australian conditions. They were among the most powerful and expensive road locomotives ever constructed. Engine no. 16161 has been returned to an operational condition.

More generally, Fowler engine no. 16161 is representative of the final era of mobile steam plant, which exerted an appreciable and positive impact on the Australian economy and patterns of development from the 1870s to the 1940s. Traction engines and (later) road locomotives provided an ability to save manual labour, obviating the need to maintain teams of horses or bullocks, and exerted a significant influence on Australia's early agricultural, mining, road transport and sawmilling industries. Traction engines and road locomotives were also the first self-propelled land-based machines free of rails

intended for bulk haulage; they changed how goods were transported, with larger loads moved over longer distances.

4.6 Features intrinsic to the significance of Fowler engine no. 16161

- Historic fabric including metal and timber components. This does not include 'consumables', such as gaskets and gland packings.
- Features allowing the object to be understood as characteristic of a road locomotive (see Section 4.4.4)
- The potential for the road locomotive to be operated.

5.0 CONSTRAINTS AND OPPORTUNITIES

5.1 Implications arising from significance

The statement of significance at Section 4.5 confirms that the three-speed, fully-sprung, class B6 compound road locomotive (serial no. 16161), manufactured by John Fowler & Co (Leeds) Ltd, England is historically significant for its association with the construction of Canberra between 1925 and c. 1927 and as a rare and representative example of a 'B6' road locomotive.

The key implications arising from this assessment are that the road locomotive should be:

- conserved and maintained; and
- stored at a location that enhances an appreciation and understanding of its heritage values.

5.2 Statutory obligations

The owner of the road locomotive is subject to the provisions of the following legislation:

- *Heritage Act (2004) (ACT)*
- *Protection of Moveable Cultural Heritage Act 1986 (Cth)*
- *Work Health and Safety Regulation 2011 (Cth)*

5.2.1 Heritage Act 2004

The ACT Heritage Council found that the road locomotive had heritage significance when assessed against criteria a, b and d under section 10 of the Act. This recognised that the road locomotive has importance to the course of the ACT's cultural history, represents a rare aspect of the ACT's cultural history and demonstrates the principal characteristics of a class of cultural objects (refer to Appendix D).

The Act provides for the registration and conservation of places and objects of natural and cultural heritage significance within the ACT. The Act allows the ACT Heritage Council to publish guidelines on the conservation of registered objects and approve conservation management plans. The Act also sets out a process for approval of activity that may have an impact on the heritage significance of registered objects. The advice of the Heritage Council is considered through the development application process.

In September 2016, the ACT Heritage Council included the road locomotive under section 40 of the Act in the Australian Capital Territory Heritage Register as a registered object. The registration includes a conservation objective and for the road locomotive, this is as follows:

> The guiding conservation objective is that the John Fowler Road Locomotive 16161 shall be conserved and appropriately managed in a manner respecting its heritage significance.

5.2.2 Protection of Moveable Cultural Heritage Act 1986

The road locomotive has been found to be an item of moveable cultural heritage that is of considerable significance to Australia, and has been denied an export licence. As such it is included in the National Cultural Heritage Control List (Control List) established at Schedule 1 of the *Protection of Moveable Cultural Heritage Regulations* 1987, as a Class B object. The primary intent of the *Protection of Moveable Cultural Heritage Act* 1986 is to ensure that objects identified as having a level of significance to Australia should be prevented from leaving the country.

As noted at Section 1.2.2, the road locomotive was denied an export permit in February 2014 by the delegate of the Minister of the Ministry of the Arts under the *Protection of Moveable Cultural Heritage Act* 1986. The obligation on the owner of the road locomotive is to not export the object from Australia

on a permanent basis. In the event of the owner selling the road locomotive, this requirement should be made clear to any potential purchasers.

5.2.3 Work Health and Safety Regulation 2011

The owner of the road locomotive, the ACT Government, intends to operate the object on a regular (at least annual) basis. As such, in accordance with the ACT *Work Health and Safety Regulations 2011*, the ACT Government must ensure that the operator of the road locomotive holds both a Standard or Advanced Boiler Operation and a Reciprocating Steam Engine Licence to Perform High Risk Work.

The boiler is an item of high-risk plant and as such must be managed in accordance with established industry practices. The boiler requires registration with ACT Worksafe in accordance with the *ACT Work Health and Safety Regulations 2011*. The boiler has a current *Certificate of Plant Item Registration* that will expire on 21 March 2021 (Appendix E).

5.3 Condition of the road locomotive

As part of the preparation of this report an updated conditions assessment has been prepared by Rohan Lamb, based on photographs supplied by the LDA of March 2020. A physical inspection was not possible. The conditions assessment concluded that the overall condition of the road locomotive is good to excellent and included recommendations for its ongoing maintenance and conservation. This report is included at Appendix A.

At 4.0 Condition, the report describes the road locomotive as follows:

> The overall condition of this road locomotive is excellent. All mechanical parts were checked, cleaned, and lubricated as required. The boiler has been inspected and certified for operation with no repairs being required. The most noticeable visual changes has been the addition of rubber tyres to the front wheels and rubber lugs to the rear wheels. This is a reversible change as the rubber is bonded to the existing steel surface, and a practical change to allow the use of the road locomotive on asphalt surfaces without damaging them.

Storage of the road locomotive in a shed at the Lanyon Homestead is resulting in damage by moisture (rainwater ingress) and bird droppings. This is causing the paintwork and metal components to deteriorate at a faster than normal rate.

In recent years, the engine has been operated once, during the ACT Heritage Festival in 2016. Future operation of the engine would be a positive factor from a heritage perspective, and would assist in the interpretation of the object (Policy 19, Chapter 6, Section 6.5). However, it does raise considerations of management, including in relation to the specialist skills required for operation and maintenance (see Policy 5 'Expert advice and skills, Chapter 6) and Work Health and Safety. See also Section 5.4 (below).

5.4 Owner aspirations and requirements

5.4.1 Location of the road locomotive

It is understood that the intention is for the road locomotive to be on public display at an appropriate location within the proposed new development at the Kingston Power House Precinct (Figure 44). The site is bounded to the north and east by Eastlake Parade, to the south by new development on Giles Street and to the west by Wentworth Avenue. The proposed development will include a mix of residential and commercial uses, including arts, retail and cultural uses. Historic buildings including the Kingston Power House, Fitter's Workshop, former Transport Depot and former switch room will be retained and framed within the precinct by new buildings and street alignments.[116]

Figure 44 Proposed Kingston Arts Precinct master plan
Source: Suburban Land Authority and Geocon, 2019

Theproposed relocation of the road locomotive, if pursued, wouldcreate opportunities for improved interpretation and conservation (see also Policy 18, Chapter 6, Section 6.5). The management of corrosion and finishes in general will be a significant area to address, particularly when the road locomotive is on static display (see Policy 16 'Storage of the road locomotive', Chapter 6).

Operation of the boiler

The intent is also that the road locomotive will be used for special occasions. This creates opportunities for interpretation and public engagement. Use of the road locomotive will result in some wear of components over time. However, given that the operational hours are likely to be contained to a few days a year, there will be only limited wear. Requirements of the owner arising from the desire to maintain the road locomotive in an operational condition are detailed below (see also Policy 20 'Operation of the road locomotive', Chapter 6).

Inspection and operation of the boiler

The management of the boiler should follow the requirements as defined in Australian Standard *AS/NZS 3788:2006 Pressure Equipment: In-Service Inspection* so as to maintain the boiler in optimum condition. This standard relates to the minimum requirements for the inspection, repair and alteration of in-service boilers. The owner is responsible for ensuring the extent and frequency of inspections is appropriate and adequate for the continued safe operation of the pressure equipment. The owner is responsible to maintain documentation relating to the boiler in accordance with the standard.

In accordance with *AS4343:2005 Pressure Equipment – Hazard Levels*, the boiler is rated as hazard level B.

Annual inspection

The boiler will require an annual inspection by a competent person as defined by the ACT *Work Health and Safety Regulation 2011*. The boiler must not be operated without a current certificate of inspection. The certificate must be kept on site with the boiler.

The boiler has been inspected to AS/NZS 3788 :2006 (see 0) and assessed as safe to be operated at its original working pressure in February 2016 and February 2017 (Appendix D).

Registration – Road Operation

In the event the road locomotive is used on public roads it will require registration, or a permit. The operator will need to hold the appropriate licence to drive on public roads which can be advised by the ACT Road Transport Authority.

Movement of the road locomotive

The road locomotive is approximately 2,800mm wide, and as such will require an over dimension permit when moved by truck on public roads. A permit from the ACT Road Transport Authority may also be required in instances of moving the road locomotive from the trailer to its display location if this requires movement on public roads.

6.0 CONSERVATION POLICIES & MANAGEMENT GUIDELINES

The conservation policies and management guidelines provided below are based on the assessment of the cultural significance of the John Fowler Road Locomotive at Chapter 4. The policies have been developed with an understanding of the cultural heritage values of the object; and constraints and opportunities arising from cultural heritage significance, owner aspirations, statutory requirements and the condition and integrity of the object (Chapter 5).

The objective of the conservation policies is to provide direction and guidance on the conservation and management of the road locomotive, and to inform consideration of future conservation, management (including operation) and physical change.

6.1 Definitions

The terminology used in this chapter is of a specific nature. It employs the definitions contained in the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013* (Article 1), as endorsed by all statutory and national heritage bodies (Appendix E).

6.2 General policies

Policy 1 Significance as the basis for future conservation and management

The statement of significance included in this CMP should provide the principal basis for future management and conservation of the road locomotive.

Policy 2 Adoption of the Burra Charter

The conservation and management of the road locomotive should be carried out in accordance with the principles of the Burra Charter.

Policy 3 Adoption of conservation policies

The policies included in this CMP should be endorsed and adopted by the present and future owners of the road locomotive, and should form the primary guide for its management.

Policy 4 Heritage legislation

As the road locomotive is included in the ACT's Heritage Register, as a registered object, it should be conserved and managed in a manner that respects its heritage significance. Management should have regard to the features and attributes identified in its entry to the Heritage Register as being intrinsic to its heritage significance.

Policy 5 Expert advice and skills

Individuals and companies with relevant skills and experience should be engaged to undertake maintenance and conservation works to the road locomotive.

Comment

The road locomotive is an item of historic steam plant. It is largely intact as supplied in 1925 and has the potential to be returned to an operational condition. As is the case here, heritage steam equipment typically includes features not present on modern equipment, such as riveting and slide valves in the steam engine. These valves require specialist knowledge to set correctly, and bearings on heritage equipment often use different running clearances to modern equipment and feature journal bearings.

To minimise the potential to damage the object, or diminish its intactness, advice in relation to its management and conservation should be sought from people and companies with the appropriate qualifications, skills and demonstrated experience.

Implementation

- Engineers and/or engineering firms with previous experience with heritage steam equipment, the repair and certification of pressure vessels, machining and general fitting should be used for on-going management and maintenance of the road locomotive.
- The inspector of the boiler should be familiar with riveted boiler construction and the issues around heritage boiler operation.

For comment regarding the skills and qualifications of operators, see Policy 20 Operation of the road locomotive.

Policy 6 Review of the CMP

Consistent with best practice, this CMP should desirably be reviewed and updated every five years, and no longer than every ten years.

Comment

Typical triggers for the review of CMPs include: where significant works or alterations to an object/place are proposed or carried out; where major change occurs as a result of an accident or misadventure (i.e. vandalism or fire); and where a CMP is found to be out of date with regard to significance.

6.3 Conservation

Policy 7 Original fabric

As much of the original fabric as possible should be retained.

Comment

The road locomotive is largely intact as supplied by the manufacture, with more lightly constructed parts such as the tubes, the ash pan and chimney barrel having been replaced (a list of all known modifications is at Section 3.7). A priority in the future management of the road locomotive should be the retention of as much original fabric as possible.

In preference, the original nameplate held in storage by Ken Ainsworth, of K & H Ainsworth Engineering (Goulburn) should be reaffixed to the road locomotive.

Policy 8 Historic records

Future conservation, maintenance and physical works to the road locomotive should be guided by the detailed historical records relating to the object.

Comment

Detailed documentary records of the road locomotive survive. These records should be referenced where there is a requirement to introduce remove or disturb fabric or introduce new fabric.

Implementation

To facilitate this objective the owner of the road locomotive should prepare a check-list of reference material for use by operators and consultants. The check-list should include, but not be limited to:

- *Fowler specification sheets* (Appendix C): The build specification sheets detail all the components used on the engine. They include dimensions of parts, and references to drawings. Some of these drawings have survived and are in the Museum of English & Rural Life collection. If the exact drawing does not survive, often a drawing for a similar part from another engine type can be used as a guide.
- *Historic photographs:* The Mildenhall collection photographs of road locomotives working in Canberra are an excellent reference for the appearance of the engines when relatively new.
- *Fowler engine no. 16162:* The survival of the other road locomotive from the same order at the National Museum of Australia allows for direct comparison of features. Verification of the originality of the item being compared will be required.
- *Other Fowler traction engines and road locomotives:* Some components were common to a number of classes of Fowler engines and they may be present on a similar engine for reference.

Policy 9 Removal of fabric

If, for functional or operational reasons, it is necessary to replace an original item or element, it should be photographed, and the original fabric retained, labelled and stored.

Implementation

- In the event of removal, the original item should be labelled and retained.
- In the case of the original motion dust covers, remnants of the original material (thought to be canvas) should be retained and stored for future reference. The metal components should preferably be re-used and timber components should be assessed for potential re-use (or labelling and storage if re-use is not possible for operational reasons).

Policy 10 Disturbance of fabric

Disturbance of original fabric should be kept to the minimum required.

Comment

In the main, alterations to and disturbance of original fabric should be avoided. It is noted that the road locomotive is designed to be assembled and disassembled with a variety of fasteners holding most components together. The significance of the road locomotive will not be affected through disassembly, if it is reassembled correctly.

Implementation

- Prior to disassembly a photographic record of the engine should be prepared.
- It is recommended that any settings or clearances of critical components be recorded before disassembly.

Note

When the engine was shipped to Australia, it is likely that it was partially disassembled with the wheels removed. Bob McLeod recalls seeing painted markings on the inner faces of the rear wheels with the weight of each wheel and the name of the ship the engine it came out on when he was working on the engine during the 1960s.[117] It is possible these markings are still present. The rear wheels should be examined to see if these markings are still present.

Policy 11 New fabric

Where new fabric is introduced, it should be as close as possible to the original fabric in detail, materiality and form.

Comment

The detailed documentary records of the road locomotive should be referenced where there is a requirement to introduce new fabric, to ensure that the new fabric is close as possible to the original in detail, materiality and form.

Implementation

- The work of replacing a component should be recorded and retained on file, and the component marked discretely into its surface with its date of replacement – i.e. 5/2014 (see also Policy 14). This will distinguish between original components and replaced parts.
- In the event of a requirement to replace a riveted component, the new component should, where possible, also be of riveted construction.
- Items such as gaskets and gland packings have been changed numerous times in the life of the road locomotive, including during the 2015 works when several asbestos components were replaced with modern materials (see Condition Report at Appendix A). Gaskets and like components are considered to be consumables, subject to wear and tear and replacement over the life of the engine. For items such as gaskets, which originally contained asbestos, these should be replaced using materials consistent with the original functional requirements where possible. Given the non-visual nature of gaskets and similar items, replacement does not diminish the cultural significance of the road locomotive as related to presentation and enables the safe and ongoing operation of the locomotive.

Policy 12 Periodic maintenance

A periodic maintenance plan should be prepared to address mechanical aspects of the road locomotive, as well as its general condition.

Implementation

The periodic maintenance plan should include, but not be limited to the following:

- The boiler will require an annual inspection, unless an alternative time interval is agreed with the boiler inspector. Inspection intervals should be documented to ensure the boiler registration is maintained.
- Regular condition monitoring of the engine while on static display is recommended. The engine should be regularly monitored for its condition, particularly in relation to surface corrosion. The intervals for this cannot be firmly specified without knowing the quality of the storage environment. Particularly over the first year after relocation, the condition should be more frequently monitored to see there are no unforeseen effects, and to verify the periodic maintenance periods are suitable. It may be necessary, for instance, to increase the frequency of reapplying corrosion inhibitors, or undertaking cleaning to remove built-up dust and the like.
- Other maintenance required on the engine is likely to be identified during its operation, and if these do not require an immediate shut down of the road locomotive, then they should be recorded in the operating log book, and attended to before the next operating time.

6.4 Specific policies

Policy 13 Cleaning, paintwork and polishing

Establish a regular cleaning and inspection programme focussing on the condition of finishes to metal, timber and other surfaces/materials.

Comment

The engine was repainted during the 2015 overhaul with pin striping added to Fowler's original standard. Most surfaces which were originally polished have not been painted over. The exception to this is some of the pipework which was apparently originally polished and when replaced was painted.

The current storage conditions have resulted in a thick layer of dust, grime and animal droppings on the engine and rust to bright metal (brass and steel) surfaces. Policy 17 makes recommendations on storage conditions for the road locomotive.

A regular cleaning programme should be established to clean surfaces of oil stains, dust and animal droppings. Where identified, preservative should be applied to bright (unfinished) metal surfaces to ensure these are protected from corrosion and tarnishing. Inspect timber elements to ensure that painted surfaces are sound, and canvas is in good condition. The frequency of cleaning required will depend on storage conditions.

The road locomotive should be thoroughly cleaned after public access/use to remove unwanted contaminants and, where required, new preservatives applied to protect bright metal surfaces.

Policy 14 Boiler

Maintenance of the boiler, the main structural component of the road locomotive, should be prioritised. Periodic inspections to ensure safety and compliance with Australian Standards AS3788 should be undertaken.

Comment

The boiler is the most critical part of the road locomotive. It is the main structural item of the road locomotive; all other parts are mounted on it. It is also the part of the road locomotive subject to the most stresses and wear and tear. It is important to maintain the boiler in as good as condition as practicable. The replacement of a boiler is a substantial and expensive exercise, so appropriate management of the existing boiler should ensure a long operational life.

Implementation

- Repairs should be made consistent with original practices. Welding is an acceptable method of repair. In visual areas this should be ground flush where possible.
- Ideally the fully riveted construction of the boiler should be maintained.
- The boiler has not been used since 2016, and as long as good long-term storage practices have been implemented there should be no deterioration of the boiler. Procedures around the storage of the boiler should be developed, and inspection intervals documented to ensure the boiler registration is maintained.

Policy 15 Head lamps and spuds (cleats)

Consideration should be given to sourcing elements known to have been removed from the road locomotive, including the head lamps and spud (cleats) and installation if feasible.

Comment

Two notable items are no longer present on the road locomotive, specifically the head lamps mounted on each side of the smoke box, and the spuds for the rear wheels. Both items are non-essential in the present context of the road locomotive, but could be recreated, or original lamps sourced, for a full representation of the features of the road locomotive from its 1920s working period. Refitting these items would enhance the completeness of the engine.

6.5 Management guidelines

Policy 16 Record keeping

The owner of the road locomotive should maintain records of changes, alterations and maintenance regimes for the road locomotive

Implementation

The owner of the road locomotive should maintain the following:

- Operational logbook to record the operator, hours worked, water treatment used, boiler water test results, any items requiring repair on the day, or maintenance required later
- Pressure vessel inspection records
- Operational procedures
- Material safety data sheets for materials used in the operation and cleaning of the road locomotive
- Any weld procedure specifications, inspection test plans, test results
- Records of repairs including photographs and drawings

Policy 17 Storage of the road locomotive

Storage of the road locomotive should promote and facilitate conservation and interpretation of the road locomotive.

Comment

The road locomotive is proposed to be maintained and presented as a public exhibit. It is anticipated that it will be operated intermittently – perhaps up to three times a year.

At the time of writing it was understood that the SLA proposed to relocate the road locomotive from the Lanyon Homestead to the Kingston Arts Precinct, Kingston.

Implementation

To promote and facilitate conservation of the road locomotive it should be stored under cover in a secure climate and humidity-controlled environment. A minimum requirement for storage should be a secure enclosed building with a concrete floor where the temperature does not fall below zero degrees.

- Temperature: The temperature and humidity of the space where the road locomotive is stored should be controlled to avoid condensation. The room/space should be insulated, and possibly heated to maintain a consistent temperature and humidity levels. The room temperature should not be allowed to fall below zero degrees as the road locomotive is likely to still have water in some of the pipes and fittings. If the pipes are able to freeze it has the potential to cause damage by cracking cast parts or pipes.

- Humidity: Humidity should be monitored and controlled to avoid condensation. Ideally humidity should be maintained below 50 per cent. This level will ensure residues on the internal surfaces of the boiler do not absorb moisture. It is also suitable for timber items on the road locomotive.
- Consideration should be given to using a data logger to monitor the environment.
- Floor: The floor should be a stable, hard-stand material such as concrete. Materials such as gravel and compacted dirt should be avoided for their dusty nature and ability to retain and wick moisture.
- Lighting: No special controls are envisaged in terms of light exposure. Long term exposure to direct sunlight should be avoided to minimise deterioration of painted surfaces from the effects of UV light.
- A workshop capability should be provided near the road locomotive: As the road locomotive will be operational, a basic workshop area should be provided to facilitate ease of maintenance. This area should have a workbench, and a range of tools to perform annual inspections, basic maintenance and small repair tasks on the road locomotive. There should be storage facilities appropriate for tools, fuel, lubricants, water treatment, and shelving for parts removed for inspection etc. An area near the road locomotive is required for working on parts, and laying out components removed during annual inspections. A secure storage area for items removed from the road locomotive deemed to be significant which are to be retained should be provided. Washroom facilities for operators should be provided in this area as well.
- Viewing access: Clear access should be provided around the road locomotive to allow viewing from all sides. Consideration should be given to providing access to the space via an internal door, rather than opening doors to the outside which will affect controlling the interior environment/temperature and allow dust in.
- Visitor separation: Visitors should be separated from the road locomotive by a fence or barrier. This will remove the potential for visitors to climb on the road locomotive, and aid security by reducing access and minimising the potential for the theft of parts from the road locomotive and damage.
- Security: The road locomotive should be in an area which can be supervised and/or monitored by security cameras. It is vulnerable to small parts such as nameplates, drain cocks and the like being stolen.
- Pests: Provision should be made for the prevention of damage by birds, rats, possums or termites (for timber elements).
- Operation: To enable the potential for operating the boiler while parked inside, consideration could be given to the installation of an exhaust hood directly above the funnel (connecting the interior to the exterior via the roof) and a temporary chimney to attach to the funnel to direct smoke to the outside of the building. This would allow a fire to be raised without having to move the engine outside (thus negating the need for an ability to tow it outside cold) and mange smoke within the interior of the building. Any exhaust hood should be fitted with a damper to ensure no intake of outside air.

Policy 18 Location of the road locomotive

To enhance an understanding and appreciation of its historic and social significance, the road locomotive should desirably be stored at a location in Canberra with which it has a demonstrated historic connection.

Comment

The current proposal to locate the road locomotive at the Kingston Arts Precinct is appropriate for the long-term storage and interpretation of the heritage object. The road locomotive has a strong historic connection with this area, because as part of the Government fleet of mobile steam plant, Fowler engine no. 16161 was stored and serviced at this precinct. This area emerged as Canberra's industrial and government services suburb during the 1910s. In 1916, a permanent Fitter's Workshop was built that stored and serviced government plant, including traction engines. This was where the road locomotive was housed from 1925 to 1947.

As discussed in Section 2.3.2, from around 1921 to 1929, the Fitter's Workshop played a key role in storing, maintaining and repairing government-owned construction equipment, including traction engines. The anticipated use of traction engines may have played a role in the original design of the Fitter's Workshop. The key period of activity at the Fitter's Workshop coincides with the peak of activity of the road locomotive.

Implementation

- The entry for the road locomotive in the ACT Register does not require it to be in any specific location. As stated in the register entry: 'The guiding conservation objective is that John Fowler Road Locomotive 16161 shall be conserved and appropriately managed in a manner respecting its heritage significance'.
- To promote a contextual understanding of both Fowler engine no. 16161, and the origins of the Fitters' Workshop, it would be appropriate for the road locomotive to be relocated to the Kingston Power House precinct. Other locations might also be contemplated.

Policy 19 Interpretation

A comprehensive interpretation program should be prepared and implemented for the road locomotive.

Comment

An interpretation program is required to explore and explain the historic significance of the road locomotive.

Implementation

- The owner of the road locomotive should commission a suitably qualified person or company to explore opportunities for the interpretation of the road locomotive.
- The interpretation program should emphasise the power of the machine, as well as its diversity of uses, particularly in the Canberra context. It should also make use of the rich photographic record of the road locomotive.
- It would be appropriate to include an audio-visual display and or film. Such a film could incorporate footage of early Canberra, as well as new footage of the restored road locomotive operating so visitors can relate to object when it is on static display. A selection of images of traction engines could be sourced from the National Archives of Australia's extensive collection of photography.

- The interpretation of the object would be enhanced by the presence of items originally associated with the road locomotive, such as a heavy duty wagon as towed by the engine. A wagon could potentially be suitable to carry passengers, and be used to offer rides at open days.

Policy 20 Operation of the road locomotive

A strategy to support the operation of the road locomotive should be prepared and implemented.

Comment

The road locomotive has been returned to an operational state. The operation of the engine would be a positive factor from a heritage perspective and would assist considerably in the interpretation of the object. The following provides practical conservation and management guidelines to support the operation of the road locomotive.

Implementation

Operator qualifications

- The operator of the road locomotive should hold the appropriate Licences to Perform High Risk Work. These are Standard or Advanced Boiler Operation, and Reciprocating Steam Road Locomotive Operation.
- The boiler is deemed a fully attended boiler as it not fitted with any modern controls allowing automatic operation. According to the ACT Work Health and Safety Regulations 2011 the operator of a heritage boiler does not need to hold a licence to perform high risk work (Section 82 (5)). However, it is strongly recommended that the boiler should hold such a qualification (Schedule 3, Table 3.1, item 29). It should also be established that the operator is familiar with the operation of a heritage boiler, and they undergo suitable training with an existing operator before operating the boiler unsupervised.

Volunteers

- Volunteer assistance is often an important aspect of the management of historic steam plant. If volunteers are to be involved in the management and conservation of the road locomotive they need to be trained and supervised closely. Volunteers could undertake minor maintenance tasks like cleaning and condition monitoring. The annual boiler inspection and other more involved maintenance tasks will require the services of a skilled engineering contractor.

Operating area

- Consideration should be given to the proposed operation area of the road locomotive. Rubber has been fitted to the wheels to allow operation on hard-stand surfaces. However, as the axle load (or weight-per-axle) for the road locomotive is high, it is still capable of damaging asphalted surfaces and care should be taken, especially in hot weather. The road locomotive could also be operated on concrete or gravel surfaces provided they are designed to take this loading. The road locomotive should not be operated on wet or boggy areas. A permit from the ACT Road Transport Authority would be required to operate the road locomotive on public roads.
- The area the road locomotive is to operate in should be generous. The roadway should provide a long circuit preferably in a long loop. The turning circle of the road locomotive should be considered with generous radii on corners to avoid sharp turns.
- It is difficult for the driver to have a full view in front of the road locomotive from the footplate. The public should be separated from the road locomotive by a fence when it is operating.

Operating during summer

- The road locomotive can produce sparks from the ashpan and chimney. It must not be operated on days of total fire ban. If operation during summer is envisaged the conditions should be assessed at the time. It may also require a permit from the local fire brigade.

Movement of the road locomotive in cold conditions

- If a hood is not to be included in the design of the storage location (see Policy 18), consideration will be required for a method of moving the road locomotive when cold to a location where steam can be raised. At a minimum the chimney will need to be outside. Provide an alternative method of relocating/moving the road locomotive when not driven under its own power.
- Personnel required to oversee operation
- The road locomotive should be operated only by qualified and competent persons. At least two qualified operators should be present to run the road locomotive, one to drive, and the other to tend the boiler.
- It is likely to take a day before running the road locomotive for preparing the engine and to start warming the boiler, a day for the operation of the road locomotive, and a day for cleaning and preparing for storage. An experienced operator will already be familiar with the following recommendations:
    - Gradual heating and cooling of the boiler to minimise stresses
    - Use only hardwood timber or black coal
    - Use clean water
    - Always treat the feed water with an appropriate boiler water treatment
    - Undertake boiler water testing to monitor and record the pH, p-alkalinity, and total dissolved solids (TDS)
    - Maintain a log book
    - Use suitable lubricants on the engine and gears
    - Operator to be in full attendance of the boiler at all times and to monitor critical items
    - Identify any items requiring repair or maintenance which are only apparent during operation

Preparation for storage after operation

- It is critical that the road locomotive is thoroughly prepared for storage. Failure to prepare the engine properly will lead to damage from corrosion of metal components.
- The following maintenance tasks should be performed as soon as possible after the road locomotive has been used. Some of these tasks should be completed while the boiler is still warm, and other tasks completed the next day. Ashes should not be left anywhere in the road locomotive, they are acidic, and absorb moisture. In the long term, if allowed to build up, they will cause significant corrosion to any surface they are in contact with resulting in loss of plate thickness.
    - Boiler to be drained of water (blow down boiler while still holding pressure at the end of the operating day)

- Water tanks to be drained and dried
- Open boiler to allow air flow, manhole and hand holes (preferably while boiler is still warm)
- Clean ash from firebox, ash pan, grate, smoke box, chimney
- Clean ash from the top of the canopy
- Apply corrosion inhibitor to bright steel surfaces
- Wipe down painted surfaces with soft clean cloth, if mud is present rinse cloth regularly.
- Do not use a high pressure water cleaner for cleaning
- In the event the road locomotive has been used in the rain, then extra care should be taken to ensure the road locomotive is dry and corrosion inhibitor applied to bright surfaces

Policy 21 Public safety

Prior to the implementation of any strategy for the operation of the road locomotive, a safety plan should be prepared to identify any potential risk to workers, volunteers and the general public and include strategies for mitigating and managing risk. This plan should address the relevant *Work Health and Safety Regulation 2011* and other legislation as appropriate, be adopted by the road locomotive's owners/managers and adhered to by anyone involved in its operation. The safety plan should be made publicly available, and any person coming into contact with the locomotive should be advised of the implications of the plan. Update the safety plan in response to legislative changes and other relevant policies and procedures.

Policy 22 Emergency management

Where possible, risks of damage to the road locomotive by natural disaster should be minimised through choice of location and storage environment. An emergency management plan should set out when, how and where the road locomotive would be relocated in case of threat.

Comment

In January 2020, the current storage location (Lanyon Homestead) was threatened by bushfire. While a change in location may mitigate this risk, it is still advisable to have a clear policy on how future risks will be managed. This should preferably include the inclusion of fire suppression equipment, such a sprinklers, extinguishers and the like to the proposed storage area.

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APPENDIX A CONDITION REPORT

A.1 Rohan Lamb, Condition Assessment of John Fowler & Co. (Leeds) Ltd., Road Locomotive, no.16161, 10 April 2020.

Fowler 16161 road locomotive at Regional Heritage Festival, Lanyon Homestead, March 2016 (unknown photographer)

Condition Assessment of
John Fowler & Co. (Leeds) Ltd., Road Locomotive, no.16161

10 April 2020

Rohan Lamb MIEAust

Contents

1.0 Introduction

This report has been prepared at the request of the Land Development Agency (LDA) to provide an updated assessment of the condition of a John Fowler & Co. (Leeds) Ltd., three-speed fully-sprung compound road locomotive, no.16161. The original assessment was undertaken in January 2014, and since then the engine has been overhauled and returned to operating condition.

Units of Measure

The original imperial units of measure are used throughout with metric equivalents shown in parenthesis.

Photographs

All photographs in this report are by the author unless otherwise indicated.

2.0 Inspection Process

The assessment of the engine was based on photographs supplied by the LDA taken in March 2020, and from additional documents supplied referring to works completed during its return to operational condition by K & H. Ainsworth Engineering Pty Ltd. Physical assessment by the author was not possible due to the closure of the Lanyon Homestead in January 2020 at the time of the planned inspection. The photographs of specific aspects of the engine have not been updated, and therefore reflect the condition of the engine in 2014. The road locomotive is presently stored in a corrugated iron building at the Lanyon Homestead. Its location in the building parked next to a wall of the building prevented access to, and photography of the flywheel side of the road locomotive. Easily removed items such as the nameplate and smokebox door nameplate ring have been removed for safe storage.

Figure 1 Road locomotive stored at the Lanyon Homestead, March 2020 (Grant Rootes)

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Figure 2 Flywheel side of the road locomotive, December 2013

Figure 3 Rear view of the road locomotive, December 2013

4.0 Condition

The overall condition of this road locomotive is excellent. All mechanical parts were checked, cleaned, and lubricated as required. The boiler has been inspected and certified for operation with no repairs being required. The most noticeable visual change has been the addition of rubber tyres to the front wheels and rubber lugs to the rear wheels. This is a reversible change as the rubber is bonded to the existing steel surface, and a practical change to allow the use of the road locomotive on asphalt surfaces without damaging them.

The road locomotive is exposed to dust and bird droppings on the road locomotive during storage, and there is mild rust on bright steel surfaces. Periodic cleaning of engine has been undertaken.

4.2 Engine Condition – Detailed Assessment (Visual)

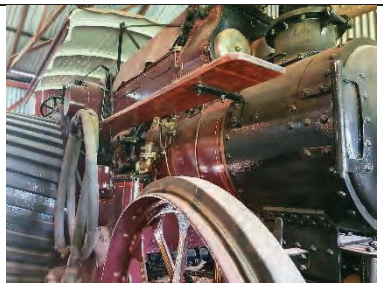
The detailed summary is broken down into major components of the engine. These are:

- Boiler – Pressure Vessel Components;
- Boiler – Non-Pressurised Components;
- Engine & Motion Gear;
- Water Storage & Boiler Feedwater Supply;
- Driving Gears, Driving Shafts, Axles & Wheels;
- Miscellaneous;
- Nameplates;
- Timberwork; and
- Cosmetic/Paintwork.

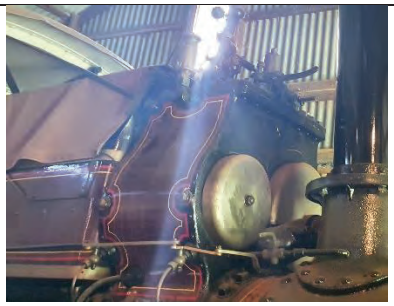
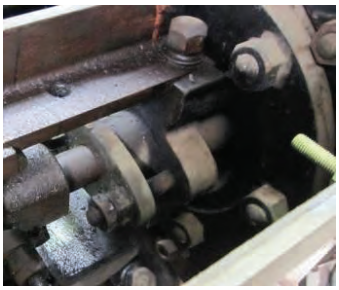
4.2 1 Boiler – Pressure Vessel Components

Item/Area	Originality	Condition	Actions
Boiler - Overall	The boiler, with the exception of the tubes is original. It is rated for its original full working pressure of 180 psi (1241 kPa). Various old gaskets made from asbestos have been replaced with modern safe alternatives.	The boiler has been confirmed as being in excellent condition and is certified for operation. The fusible plug was removed, cleaned and found to be in as new condition, so it was refitted. The Klinger gauge glass mountings had asbestos in the sight glass mounts. The asbestos was removed and rubber seals substituted. The original asbestos gaskets were removed and replaced for the man hole and hand hole openings.	Maintain regular inspections of the boiler to AS3788. Ensure boiler is stored correctly prepared for long term storage after use.

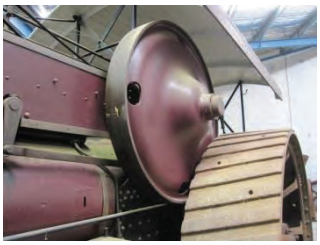
4.2.2 Boiler – Non Pressurised Components

Item/Area	Originality	Condition	Actions
Cladding - Barrel  *Grant Rootes, March 2020*	The cladding was replaced with like for like materials during the overhaul.	During the overhaul of the engine it was found some of the original cladding had been replaced, and the much of timber lagging underneath had deteriorated. All the cladding and timber lagging was replaced with new materials.	Clean oil stains at end of operating period, clean dust from surfaces periodically
Lagging	The timber lagging was replaced with like for like materials during the overhaul.	During the overhaul of the engine it was found much of timber lagging underneath had deteriorated being burnt to charcoal. All of the timber lagging was replaced with new materials.	No further action

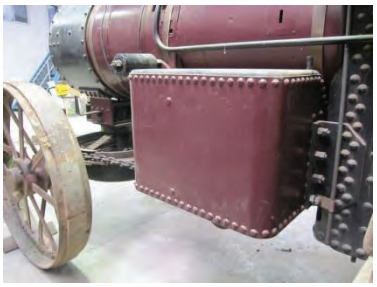
4.2.3 Engine & Motion Gear

Item/Area	Originality	Condition	Actions
Engine & Motion Gear  *Grant Rootes, March 2020*	The engine and motion gear are all original components.	The engine and motion gear were all cleaned and serviced during the overhaul. The cylinder covers were polished to bright steel	Maintain preservative coating on bright motion gear to minimise surface rust. Turn engine periodically to ensure it does not sieze.
Packing Glands 	Valve rod and piston rod packing glands brasses are original. Gland packings have been replaced.	During the overhaul all asbestos gland packings were removed and replaced with PTFE materials.	Inspect and maintain gland packing during operation. Ensure engine is turned and left in different positions to minimise potential of pitting of valve and piston rods.
Crankshaft 	Original crankshaft fitted.	The crankshaft bearings were inspected during the overhaul. The low pressure big end had been damaged at some time to the wedge and adjusting bolt. As this is a critical component, a new bolt was made and the wedge repaired. All oil galleries were cleaned and new wicks fitted.	No further action

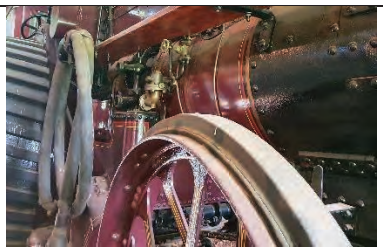
4.2.3 Engine & Motion Gear (continued)

Item/Area	Originality	Condition	Actions
Flywheel 	Original flywheel fitted.	Flywheel was visually inspected for cracks during the overhaul and found to be sound. The centre cap was removed and retaining key checked.	Maintain preservative coating on bright centre cap to minimise surface rust.
Governor 	Original Pickering type governor fitted.	During the overhaul of the engine it was identified some components of the governor are missing, and the governor had been locked in the open position. This does not affect road operation, but the engine should not be used for stationary belt work.	Replace the missing components of the governor. Do not use the engine for belt work until governor is repaired.
Motion Dust Covers 	Timber boards which seal along the bottom of the motion covers present. Metalwork for canvas covers present. Limited canvas cover material present. They all appear to be the original parts.	The motion dust covers are in poor condition with most of the canvas missing, and the metal work, and timber items presently not fitted to the engine. It is remarkable for these items to survive, as they were generally removed in service. Re-instatement of the original dust covers was not undertaken as part of the overhaul. A canvas cover has been provided to keep dust out of the motion gear while stored.	Replace canvas on dust covers & retain original remnants. Assess if timbers can be reused. Due to operational reasons it may be decided to not refit these to the engine as they restrict access for lubricating the motion gear.

4.2.4 Water Storage & Boiler Feedwater Supply

Item/Area	Originality	Condition	Actions
Front Tank 	Top and sides are original. The bottom plate has been replaced with a plate welded in as this a structural area where the steering chain shaft is mounted.	To allow the timber lagging to be replaced, the front tank was removed. It was inspected and found to be in good condition with the interior painted with bituminous paint. The mounting was incorrect, so spacers were made and the tank remounted in its correct position.	Ensure tank is dry when stored for long periods
Rear Tank 	Original tank.	Tank inspected and found to be in good condition.	Ensure tank is dry when stored for long periods
Mechanical Feed Pump & Injector 	Original mechanical pump & injector.	Pump and injector confirmed to be in working condition during operation.	No further action

4.2.5 Driving Gears, Driving Shafts, Axles & Wheels

Item/Area	Originality	Condition	Actions
Driving Gears 	Original driving gears fitted.	All gears cleaned and lubricated during overhaul. They are all in very good condition.	Clean and lubricate as required.
Front Wheels & Axle  *Grant Rootes, March 2020*	Front wheels are original.	The front wheels were fitted with rubber to allow use on asphalt roads. They were repainted to Fowler's original specification.	No further action.
Rear Wheels & Axle  *Grant Rootes, March 2020*	Wheels are original. Driving pins are present.	The rear wheels were fitted with rubber to allow use on asphalt roads. They were repainted to Fowler's original specification.	No further action.

4.2.7 Nameplates

Item/Area	Originality	Condition	Actions
Builder's Serial No. Nameplate 	Original nameplate present.	In good condition. Removed from the engine for safe keeping offsite.	Reinstate on road locomotive once secure display is possible.
Smokebox Ring Nameplate 	Original nameplate present.	In good condition. Removed from the engine for safe keeping offsite.	Reinstate on road locomotive once secure display is possible.

4.2.8 Timberwork

Item/Area	Originality	Condition	Actions
Canopy 	The canopy timberwork has been replaced with new boards, and canvas covering.	In good condition. The top of this has been covered during storage to minimise dust and bird dropping building up on roof.	Continue to remove dust periodically

4.2.9 Cosmetic/Paintwork

Item/Area	Originality	Condition	Actions
Paintwork 	The engine has been repainted. The colour and pin striping require confirmation.	The engine was repainted during the overhaul with pin striping added to Fowler's original standard.	Clean surfaces periodically of any oil stains, dust and animal droppings.
Polishing - Metalwork	Most surfaces which were originally polished have not been painted over. The exception to this is some of the pipework which was apparently originally polished and when replaced was painted instead.	Brass - All bright surfaces tarnished. Steel – All bright surfaces exhibit light surface rust	Ensure regular cleaning program and use of preservative on bright surfaces.

5.0 Scope of Maintenance & Conservation Works

The Fowler road locomotive has the potential to be operated, and therefore maintenance and conservation works should be performed on the basis of ensuring the ongoing operational potential of the object.

The most critical part of the road locomotive in terms of safety and compliance with Australian Standards is the boiler. Therefore its periodic inspection in accordance with AS3788 should be maintained. This will require elements of the boiler to be removed to allow internal inspection such as the man hole, and other items mounted on the boiler. This will allow for their servicing, and as a result of the inspection process there will be a record of the condition of the boiler.

Maintenance of the road locomotive will fall into two categories, activities to prepare and maintain the engine for operation, and activities around storing the road locomotive between operational events.

Preparations for operation are largely around cleaning, lubrication, and verifying readiness for use. For experienced trained operators this is relatively straight forward tasks. A checklist should be used which is retained as part of the log book for the object.

Similarly, preparations for long terms storage will focus on drying out the boiler, lubricating the engine, re-applying preservative to bright surfaces, and cleaning off any oil or dust after an operational event. Then, during storage, tasks will include periodic cleaning of any dust or animal droppings from the engine, checking for any active corrosion in the boiler or bright surfaces, and turning the engine to ensure it is not seized. These activities should be recorded in the log book as well. The frequency of some of these tasks will be determined by the storage environment of the engine, and may require increased frequency to address any site specific conditions (e.g. higher moisture levels, or dust ingress).

APPENDIX B HERITAGE CITATIONS

B.1 ACT Heritage Council, Australian Capital Territory Heritage Register, Heritage Council Registration 22 September 2016

Australian Capital Territory

Heritage (Decision about Registration of the John Fowler Road Locomotive 16161) Notice 2016

Notifiable Instrument NI2016—546

made under the

Heritage Act 2004, s40 (Decision about registration)

1 Name of instrument

This instrument is the *Heritage (Decision about Registration of the John Fowler Road Locomotive 16161) Notice 2016*.

2 Decision about registration

On 22 September 2016, the ACT Heritage Council (the **Heritage Council**) decided to register the John Fowler Road Locomotive 16161 (the **Object**).

3 Registration details of the Object

The registration details of the Object are in the schedule.

4 Reasons for the decision

The Heritage Council decided to register the Object because it has heritage significance as it meets one or more of the heritage significance criteria in section 10 of the *Heritage Act 2004*, as set out in the schedule.

5 Date registration takes effect

The registration of the Object takes effect on the day after this notice is notified.

6 Revocation

The *Heritage (Decision about Provisional Registration of the John Fowler Road Locomotive 16161) Notice 2016* NI2016—274 is revoked.

Fiona Moore
A/g Secretary (as delegate for)
ACT Heritage Council
22 September 2016

ACT Heritage Council

AUSTRALIAN CAPITAL TERRITORY

HERITAGE REGISTER

(Registration)

For the purposes of s. 40 of the *Heritage Act 2004*, an entry to the heritage register has been prepared by the ACT Heritage Council for the following object:

John Fowler Road Locomotive 16161

Lanyon Homestead, (part) Block 1669 Tuggeranong

DATE OF REGISTRATION

22 September 2016 Notifiable Instrument: 2016–

Copies of the Register Entry are available for inspection at ACT Heritage. For further information please contact:

The Secretary
ACT Heritage Council
GPO Box 158
CANBERRA ACT 2601
Telephone 13 22 81

This statement refers to the location of the object as required in s.12 (b) of the *Heritage Act 2004*.

LOCATION OF THE OBJECT

John Fowler Road Locomotive 16161 is located in the Lanyon Homestead complex, part Block 1669 Tuggeranong, at the time of Registration. As it is a movable object, the current location of the John Fowler Road Locomotive 16161 should be confirmed with ACT Heritage.

This section refers to the description of the object as required in s.12(c) of the *Heritage Act 2004*. The attributes described in this section form part of the heritage significance of the object.

DESCRIPTION OF THE OBJECT

John Fowler & Co (Leeds) Ltd three-speed road locomotive, with steam powered traction engine, consisting of:

- Class 'B6' boiler with long box design, steel plate construction;
- front axle leaf spring;
- rear axle leaf spring;
- high pressure cylinder with original cover;
- low pressure cylinder with original cover;
- flywheel with centre cap;
- builder's serial number name plate with number '16161.'

This statement refers to the heritage significance of the object as required in s.12(d) of the *Heritage Act 2004*.

STATEMENT OF HERITAGE SIGNIFICANCE

John Fowler Locomotive 16161 has a special association with the development of Canberra between the years 1925 and 1927. It is one of only two 'B6' class road locomotives custom-built for the Federal Capital Territory (FCT) to facilitate civil construction of the burgeoning city. John Fowler Locomotive 16161 belonged to a class of the most powerful road locomotives ever built. It was capable of immense haulage, more so than any plant in possession of the FCT. The engine has survived largely unaltered, is an excellent example of its type, and with minor servicing has been brought up to operational standards *[criteria (a) (b) (d)]*.

CONSERVATION OBJECTIVE

The guiding conservation objective is that John Fowler Road Locomotive 16161 shall be conserved and appropriately managed in a manner respecting its heritage significance.

The ACT Heritage Council may adopt heritage guidelines applicable to the object under s.25 of the *Heritage Act 2004*.

For further information on guidelines applicable to the place, or for advice on proposed works or development, please contact ACT Heritage on 13 22 81.

REASON FOR REGISTRATION

John Fowler Road Locomotive 16161 has been assessed against the heritage significance criteria and been found to have heritage significance when assessed against criteria [a, b, d] under s.10 of the *Heritage Act 2004*.

ASSESSMENT AGAINST THE HERITAGE SIGNIFICANCE CRITERIA

The Council's assessment against the criteria specified in s.10 of the *Heritage Act 2004* is as follows.

In assessing the heritage significance of John Fowler Road Locomotive 16161 the Council considered:

- the original nomination and documentary evidence supplied by the nominator;
- the Council's *Heritage Assessment Policy* (February 2015);
- information provided by a site inspection on 22 April 2016 by ACT Heritage; and
- the report by ACT Heritage titled, *Background Information John Fowler Road Locomotive 16161* September 2016 containing photographs and information on history, description, condition and integrity.

Pursuant to s.10 of the *Heritage Act 2004*, a place or object has heritage significance if it satisfies one or more of the following criteria. Future research may alter the findings of this assessment.

(a) importance to the course or pattern of the ACT's cultural or natural history;

John Fowler Road Locomotive 16161 meets this criterion.

John Fowler Road Locomotive 16161 is important to the course of the cultural history of the ACT owing to its association with the development and construction period of the Federal Capital Territory (FCT). Between 1925 and 1927 the locomotive was responsible for towing machinery, parts, and quarried material to early infrastructure sites of the FCT, aiding in the development of roads and suburbs. Where internal combustion engines and steam plant owned by the Department of Works & Railways proved not up to the task of intense haulage, John Fowler Locomotive 16161 created construction efficiencies and was more than capable of fulfilling its assigned duties as one of a class of the most powerful road locomotives ever built.

The makeup of John Fowler Road Locomotive 16161 demonstrates its association with the development of the ACT, as it was custom built to suit local conditions. For example, it has spring mounts which were installed to aid with travelling the long distances separating sites in the FCT, and a 'B6' boiler engine, reinforced with steel plate construction, capable of producing additional power required for immense haulage. It also features wider driving gears and larger wheels than standard John Fowler & Co road locomotives, again to account for haulage and distance, and a rear axle of nickel steel which offered more strength than standard models.

(b) has uncommon, rare or endangered aspects of the ACT's cultural or natural history;

John Fowler Road Locomotive 16161 meets this criterion.

John Fowler Road Locomotive 16161 represents a rare aspect of the ACT's cultural history. It is one of only two B6 class road locomotives purchased new by the Commonwealth Government

during the construction phase of the FCT, thus bearing a direct association with the development of Canberra. In addition to John Fowler Road Locomotive 16161, there is one locomotive on the ACT Heritage Register, which is Locomotive No. 1210. However this is not a comparable example, as it is a passenger rail locomotive of different engine design and brand.

Further, as noted in criterion (a), the John Fowler Locomotive 16161 was custom made for the conditions in the ACT. As such, it is not a typical model, and for this reason can also be considered rare.

There are only three other John Fowler & Co road locomotives of the B6 (and its variant, B7) class in Australia, two of these are privately owned, with one in poor condition. The third is engine 16162, which is held by the National Museum of Australia, which is in poor condition, not operational, and requires significant repairs to the boiler. Therefore, John Fowler Road Locomotive 16161, which is largely in its original condition and is in full working order, can also be considered as an endangered aspect of the ACT's cultural history.

(c) potential to yield important information that will contribute to an understanding of the ACT's cultural or natural history;

John Fowler Road Locomotive 16161 does not meet this criterion.

As the locomotive is in good condition, with most of its original heritage fabric in-tact and evident, there is unlikely to be any physical evidence pertaining to a particular research topic that is not currently visible on the locomotive. The object has already yielded all the information it is likely to and as such, it does not meet this criterion.

(d) importance in demonstrating the principal characteristics of a class of cultural or natural places or objects;

John Fowler Road Locomotive 16161 meets this criterion.

The object demonstrates the principal characteristics of a 'B6' Class John Fowler & Co road locomotive, which was one of the most powerful engines available amongst road locomotives. John Fowler Road Locomotive 16161 has survived mostly intact as built by the manufacturer, subject only to minor modifications while in private ownership from the late 1940s, most of which were repairs to original parts or replacement of deteriorated minor elements. Restoration works completed in 2014 were needed only to bring the engine up to safety and operational standards, and remove asbestos parts. The engine is still drivable and is able to take on haulage. The object retains characteristic external elements such as its flywheel, front tank, and larger road wheels, as well as its engine, consisting of a high pressure and low pressure cylinder mounted on top of a characteristic 'B6' long box design with barrel and firebox.

(e) importance in exhibiting particular aesthetic characteristics valued by the ACT community or a cultural group in the ACT;

John Fowler Road Locomotive 16161 does not meet this criterion.

While the Council acknowledges the aesthetic qualities demonstrated by John Fowler Locomotive 16161, there is no evidence to suggest these qualities are valued by the ACT Community or a cultural group within the ACT. Steam engine interest groups may take an interest in the locomotive, however, as these groups do not encompass the broad community of the ACT, they

do not constitute the ACT Community under this criterion. Further, interest groups do not constitute a cultural group, as they do not share an ethnic or cultural background, or represent a group of people connected through the same way of living.

(f) importance in demonstrating a high degree of creative or technical achievement for a particular period;

John Fowler Road Locomotive 16161 does not meet this criterion.

While John Fowler Road Locomotive 16161 is an example of one of the most powerful road locomotives available at the time, it represents the evolution of steam and locomotive technology, as opposed to the invention of these forms of technology, which were already well established by the late 1920s. There is no evidence before the Council indicating John Fowler Road Locomotive is regarded as exceptionally important for its creative or technical achievement.

(g) has a strong or special association with the ACT community, or a cultural group in the ACT for social, cultural or spiritual reasons;

John Fowler Road Locomotive 16161 does not meet this criterion.

There is no evidence before the Council suggesting a strong or special association between John Fowler Locomotive 16161 and the ACT Community or a cultural group in the ACT. Steam engine interest groups may take an interest in the locomotive, however, as these groups do not encompass the broad community of the ACT, they do not constitute the ACT Community under this criterion. Further, interest groups do not constitute a cultural group, as they do not share an ethnic or cultural background, or represent a group of people connected through the same way of living

(h) has a special association with the life or work of a person, or people, important to the history of the ACT.

John Fowler Road Locomotive 16161 does not meet this criterion.

There is no evidence before the Council suggesting an association, above the ordinary, between John Fowler Locomotive and a person, or people, instrumental to the history of the ACT. While it could be argued the engine has an association with the Federal Capital Commission who commissioned its construction, there is no evidence before the Council suggesting the association is special or above the ordinary, as the commissioning of John Fowler Locomotive 16161 can be viewed as a decision made in the normal course of business.

APPENDIX C JOHN FOWLER & CO SPECIFICATION SHEETS FOR ENGINE NOS. 16161 & 16162

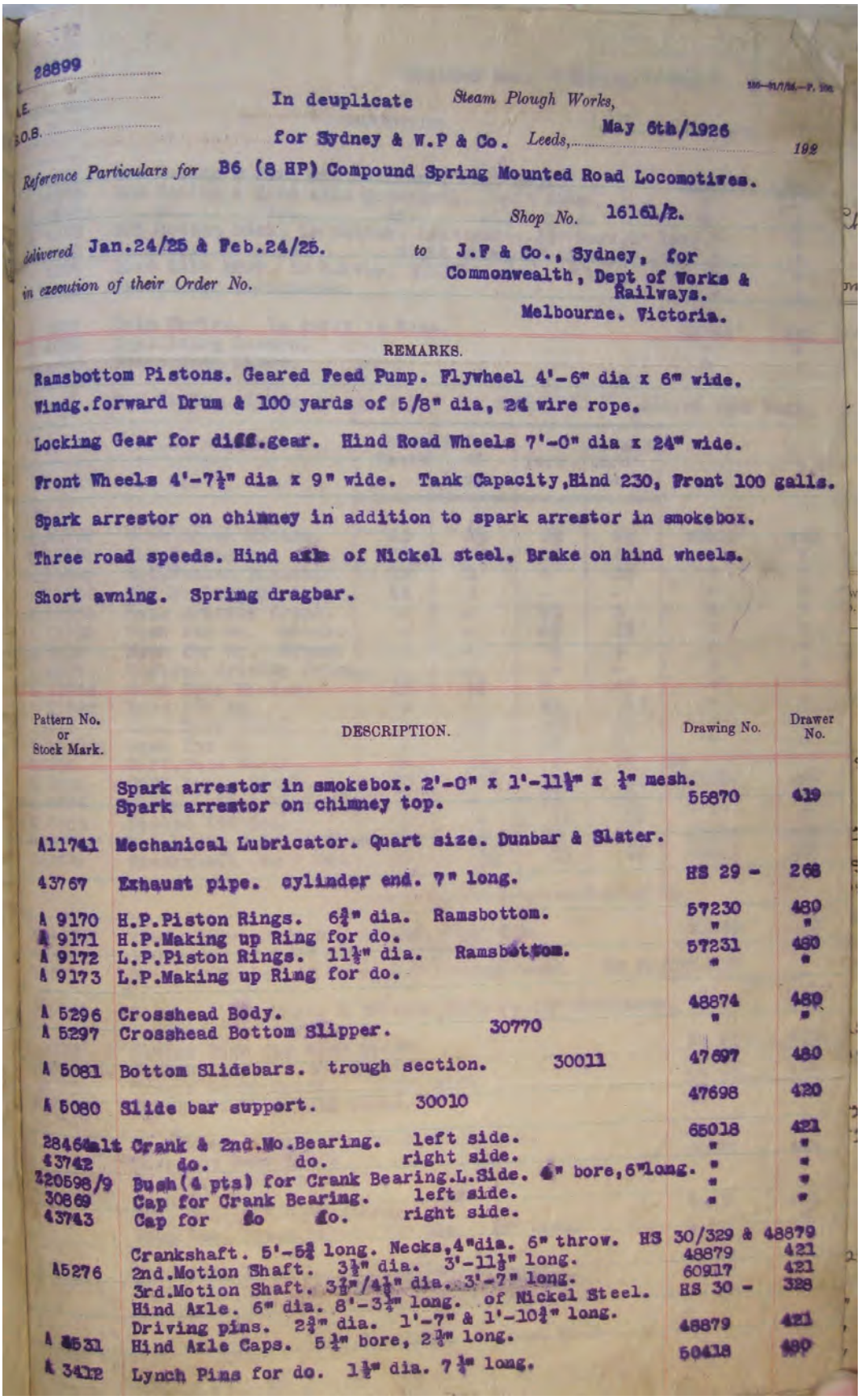
JOHN Fowler & CO Specification Sheets FOR ENGINE NOS. 16161 & 16162

Welch, Perrin & Co was the Victorian agent for John Fowler & Co, and was one of the most successful agents of any brand in Australia during the era of the traction engine. Welch, Perrin & Co was supplied by Fowlers with copies of the build specification sheets for engines sold by them, and also for some engines sold through John Fowler & Co's Sydney office. These specification sheets describe almost every feature of an engine (except paint colour and other finishes), and list the drawing numbers for the components. They were used at the time by the agent for ordering spare parts from John Fowler & Co. When sufficient sheets had been gathered the agent had them bound into a volume. Fortunately these volumes were saved when the agents closed. They now form a valuable reference which can greatly assist with restoration of an engine. Many of the drawings survive at the Museum of English Rural Life, but with different versions of similar components for different sizes of engines on file, these engine specifications identify the specific drawings used to build a particular engine.

Even though engines no.16161/2 were ordered through Fowler & Co's Sydney office, a copy of their specification was supplied to Welch, Perrin & Co. This may have been done as the contract was handled by the Melbourne office of the Department of Works and Railways.

To save duplicating common features in a specification Fowler & Co would often refer to an earlier engine if it was similar, and then record only the variations for the later engine. This was the case with the specification sheet for engines no.16161/2, which show all the unique variations, and refers to an earlier specification for engine no.16104 for all the other features. Engine no.16104 was a B6 compound traction engine without spring suspension (rigid) which was supplied to the Werribee Shire Council, Victoria in September 1924.

These specification sheet s for engine no.16161/2 are reproduced on the following pages. The originals are held in the archives of the Melbourne Steam Traction Engine Club Inc.



28899

In deuplicate Steam Plough Works,

for Sydney & W.P & Co. Leeds, May 6th/1926 192

Reference Particulars for B6 (8 HP) Compound Spring Mounted Road Locomotives.

Shop No. 16161/2.

Delivered Jan.24/25 & Feb.24/25. to J.F & Co., Sydney, for Commonwealth, Dept of Works & Railways. Melbourne. Victoria.

in execution of their Order No.

REMARKS.

Ramsbottom Pistons. Geared Feed Pump. Flywheel 4'-6" dia x 6" wide. Windg.forward Drum & 100 yards of 5/8" dia, 24 wire rope. Locking Gear for diff.gear. Hind Road Wheels 7'-0" dia x 24" wide. Front Wheels 4'-7½" dia x 9" wide. Tank Capacity,Hind 230, Front 100 galls. Spark arrestor on chimney in addition to spark arrestor in smokebox. Three road speeds. Hind axle of Nickel steel. Brake on hind wheels. Short awning. Spring dragbar.

Pattern No. or Stock Mark.	DESCRIPTION.	Drawing No.	Drawer No.
	Spark arrestor in smokebox. 2'-0" x 1'-11½" x ¼" mesh. Spark arrestor on chimney top.	55870	419
A11741	Mechanical Lubricator. Quart size. Dunbar & Slater.		
43767	Exhaust pipe. cylinder end. 7" long.	HS 29 -	268
A 9170	H.P.Piston Rings. 6¾" dia. Ramsbottom.	57230	480
A 9171	H.P.Making up Ring for do.	"	"
A 9172	L.P.Piston Rings. 11½" dia. Ramsbottom.	57231	480
A 9173	L.P.Making up Ring for do.	"	"
A 5296	Crosshead Body.	48874	480
A 5297	Crosshead Bottom Slipper. 30770	"	"
A 5081	Bottom Slidebars. trough section. 30011	47697	480
A 5080	Slide bar support. 30010	47698	420
28464alt	Crank & 2nd.Mo.Bearing. left side.	65018	421
43742	do. do. right side.	"	"
220598/9	Bush(4 pts) for Crank Bearing.L.Side. 6" bore,6"long.	"	"
30869	Cap for Crank Bearing. left side.	"	"
43743	Cap for do do. right side.	"	"
A5276	Crankshaft. 5'-5¾ long. Necks,4"dia. 6" throw.	HS 30/329 & 48879	
	2nd.Motion Shaft. 3½" dia. 3'-11⅛" long.	48879	421
	3rd.Motion Shaft. 3⅞"/4⅛" dia. 3'-7" long.	60917	421
	Hind Axle. 6" dia. 8'-3½" long. of Nickel Steel.	HS 30 -	328
	Driving pins. 2¾" dia. 1'-7" & 1'-10¾" long.	48879	421
A 3531	Hind Axle Caps. 5½" bore, 2⅞" long.	50418	480
A 3412	Lynch Pins for do. 1½" dia. 7½" long.		

Engines Nos. 16161/2. (2)

Pattern Mark or Stock No.	DESCRIPTION.	Drawing No.	Drawer No.
F. 106—24/7/28.			
A 4571	3rd Motion & Hind axle Bearings. R&L Hand.	48935	421
A 4570	3rd Motion & Hind axle Hornblock. left side.	"	"
A 4569	do. do. do. right side.	"	"
A 4659	3rd Motion Bush, in halves, left side, 3⅞" bore, 4" long.	"	"
A 4660	do. do. right side, 4" bore, 8½" long.	"	"
A 4657	Hind Axle Bush, in halves, 6.1/32" bore, 9" long.	"	"
A 5088	Guards for hornblocks.	"	"
A 4589	Twin Spring. to carry 16 Tons.	45306	421
A 4622	Equalizing Levers.	"	"
A 4623	Suspending Links.	"	"

F.S.Pinion with keyways as per drg 65018/421 for geared pump Engs.

		No.of Teeth	Width of Teeth	Bore.	Length thro' boss.		
A 11762	Slow Speed Pinion.	13	2½	3⅝	5⅝	60912	422
A 11768	2nd.Mo.Wheel.	30	2½	3½	4⅝	"	"
A 11769	2nd.Motion Pinion.	17	3	6	3⅝	"	"
A 11763	3rd Mo.Ring of Gear.	44	3	-	-	"	"
A 11764	Back driving frame.	-	-	9½	3	"	"
A 11765	Bush for do. steel.	-	-	8⅝	3⅜	"	"
A 3939	Bush for do. brass.	-	-	7¾	4	"	"
A 9957	Central driving frame.	-	-	-	-	"	"
A 11766	Road Spur Pinion.	12	3¾	7	4⅜	"	"
A 11767	Boss for do.	-	-	4½	5¼	"	"
32616	Road Spur Wheel.	56	3¾	10⅜	6⅝	52350	422
Z 16622a	Bush for do.	-	-	10	7	"	"
32704	Diff.Boss Wheel.	39	3⅞	6	9⅛	HS 22/337 &	" "
A 4565	Diff.Plate Wheel.	39	3⅞	11	1¾	52350	422
A 6274	Differential Pinions.	8	4	2½	5¾	"	"
A 3984	Bushes for do.	-	-	1¾	5¾	"	"
A 4991	2nd.Shaft 3rd Spd.Wheel.	21	2⅛	3½	3½	48936	422
26227a	Crankshaft do do.	22	2⅛	3½	4⅜	65018	421

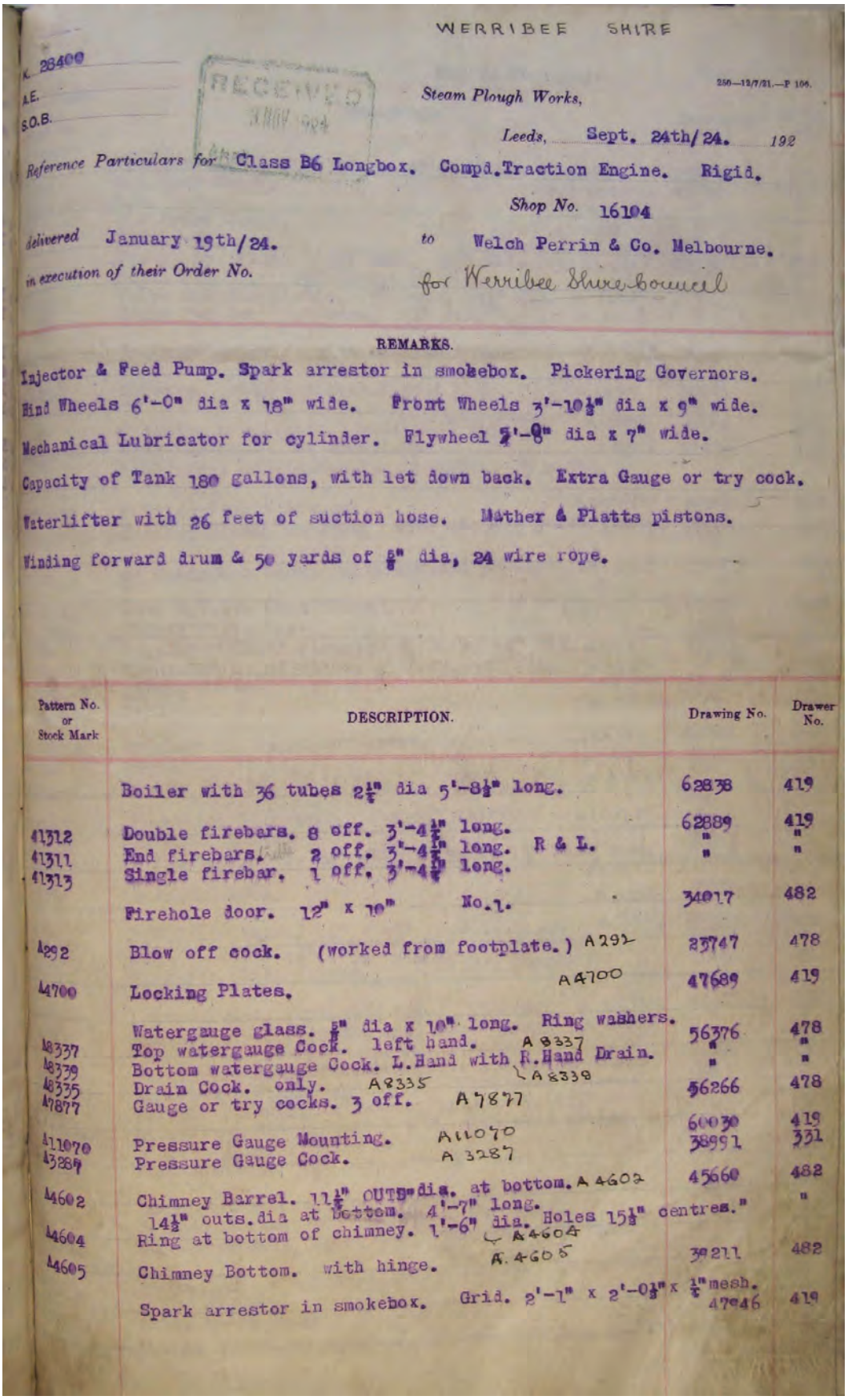
A 4631	Windg.forward drum. Flange 3'-0" dia. 100 yards of 5/8" dia, 24 wire rope.	47166	422
28378	Driving Plate. 6" bore, 8½" through boss.	HS 22/337 & "	"
A 5294	Flywheel 4'-6" dia x 6" wide, 3½" bore, 6½" thro'boss.	48449	442
39199	Clutch Fork for slow speed.	HS 23 -	433
A 5060	Clutch Fork for 3rd Speed.	49445	422
39198	Clutch Lever Guard. right side.	HS 23 -	433
A 3884	Bracket for locking piece.	49445	422
	Pinion on Crankshaft for Driving pump.	65019	422
	Wheel on Pump Shaft.	64292	442
42821	Bearing for pump Shaft.	"	"
Z 20221	Bush for do.	"	"
	Pump Rod. 3'-0⅝" centres.	65019	422
	Pump Ram. brass lined. 2½" dia. 11⅛" long.	"	"
42828	Feed Pump Barrel. 2½" bore,	64299	444
Z 20224	Gland for do. 2½" bore, 2¾" dia, 2½" long.	"	"

continued on sheet No.3.

Engines Nos. 16161/2. (3)

Pattern Mark or Stock No.	DESCRIPTION.	Drawing No.	Drawer No.
	Hind Road Wheels. 7'-0" dia x 2'-0" wide.	47724	423
27849	Bushes for do. 6" bore, 1'6¾" L.Side. 1'9" R.Side.	"	"
A 3806	Sand Caps for hind wheels.	"	"
	Front Road Wheels 4'-7½" dia x 9" wide.	47403	423
	Hind Tank 230 gallons capacity.	60097	424
	Tankside Toolbox. wrought iron.	50071	481
A 10872	Steam Valves for Waterlifter & Injector, in place of steam cocks.	60151	419
31486	Two way Delivery Valve for Waterlifter.	50337	483
	Brake on hind wheels.	66160	425
39381	Brake shaft bracket.	"	"
A 3902	Bracket on hind tank for brake screw.	47218	425
28755	Brake block brackets. right & left hand.	"	"
A 520	Brake hand Wheel.	"	"
	Front Tank 100 gallons capacity.	62887	425
A 10816	Cock for Equalizing pipe.	61331	445
A 10817	Bend for Equalizing pipe.	"	"
A 10818	Gland for do.	"	"
A 10826	Steerage Bracket. right side.	60175	445
A 10827	do. left side.	"	"
A 2774	Spring dragbar. 1½" dia.	39288	481

In other respects these engines are same as Engine No. 16104.
Leeds Copy Book Agencies 30/ 47 : 51.



WERRIBEE SHIRE

K. 28400
A.E.
S.O.B.

RECEIVED 3 NOV 1924

250—12/7/21.—F 106.

Steam Plough Works,

Leeds, Sept. 24th/24. 192

Reference Particulars for Class B6 Longbox. Compd. Traction Engine. Rigid.

Shop No. 16104

delivered January 19th/24. to Welch Perrin & Co. Melbourne.

in execution of their Order No. for Werribee Shire Council

REMARKS.

Injector & Feed Pump. Spark arrestor in smokebox. Pickering Governors.
Hind Wheels 6'-0" dia x 18" wide. Front Wheels 3'-10½" dia x 9" wide.
Mechanical Lubricator for cylinder. Flywheel 5'-0" dia x 7" wide.
Capacity of Tank 180 gallons, with let down back. Extra Gauge or try cock.
Waterlifter with 26 feet of suction hose. Mather & Platts pistons.
Winding forward drum & 50 yards of ⅝" dia, 24 wire rope.

Pattern No. or Stock Mark	DESCRIPTION.	Drawing No.	Drawer No.
	Boiler with 36 tubes 2¼" dia 5'-8½" long.	62838	419
41312	Double firebars. 8 off. 3'-4⅛" long.	62889	419
41311	End firebars. 2 off. 3'-4⅛" long. R & L.	"	"
41313	Single firebar. 1 off. 3'-4⅛" long.	"	"
	Firehole door. 12" x 10" No.1.	34017	482
4292	Blow off cock. (worked from footplate.) A292	23747	478
4700	Locking Plates. A4700	47689	419
48337	Watergauge glass. ⅝" dia x 10" long. Ring washers.	56376	478
48339	Top watergauge Cock. left hand. A8337	"	"
48335	Bottom watergauge Cock. L.Hand with R.Hand Drain. A8339	"	"
47877	Drain Cock. only. A8335	56266	478
	Gauge or try cocks. 3 off. A7877	60030	419
411070	Pressure Gauge Mounting. A11070	38991	331
43287	Pressure Gauge Cock. A3287		
4602	Chimney Barrel. 11½" outs. dia. at bottom. A4602	45660	482
	14½" outs. dia at bottom. 4'-7" long.		"
4604	Ring at bottom of chimney. 1'-6" dia. Holes 15½" centres." A4604		
4605	Chimney Bottom. with hinge. A.4605	39211	482
	Spark arrestor in smokebox. Grid. 2'-1" x 2'-0½" x ½" mesh.	47946	419

Figure 1 Fowler specification sheet for engine no.16104 (Melbourne Steam Traction Engine Club Inc. Archives)

Engine No 16104. No. 2.

Pattern Mark or Stock No.	DESCRIPTION.		Drawing No.	Drawer No.
A3548	Cylinder 6¾" & 11½" dia x 12" stroke.	A 3548	55745	420
A3909	H.P.Back Cover.	A 3909	41031	420
A3910	L.P. do.	A 3910	"	"
A3611	H.P.Front Cover.	A 3611	"	"
A3613	L.P. do.	A 3613	"	"
A1225	Piston Rod Gland. 1⅜" bore, 2½" dia.	A 1225	15937	479
A1226	Seats for do. 1⅜" bore, 2" dia.	A 1226	"	"
A1325	Valve Spindle Glands. 1" bore, 1⅝" dia.	A 1325	"	"
A1326	Seats for do. 1" bore, 1⅜" dia.	A 1326	"	"
A4079	Cylinder Cocks. with screwed ends.	A 4079	26555	286
A1477	Whistle. with horizontal pull.	A 1477	37429	478
A6426	Cylinder Lubricator. half pint size.	A 6426	51189	478
A8418	Bend for do. of wrot.iron.	A 8418	57226	478
	Mechanical Lubricator for cylinder. 3 pints.			
A2750/1	Filling Plug & Flange.	A 2750/1	37429	478
A11677/8	Filling Flange on dome. with conical joint.	A 11677/8	57145	662
A1177	⅜" Steam Jet Cock. with screwed connections.	A 1177	38293	478
A11676	Dome & Valve Chest Cover.	A 11676	63187	480
A11679	Safety Valve Cover.	A 11679	63211	478
A778	Regulator Gland (front) ⅜" bore, 1½" dia.	A 778	15937	479
A779	Regulator Gland (back) ⅝" bore, 1½" dia.	A 779	"	"
A8049	Safety Valves, 1⅞" dia.	A 8049	55139	478
A8050	Seats for do.	A 8050	"	"
31566	Bracket for regulator lever.	31566	54145	420
A3341	Regulator Valve.	A 3341	38627	298
A3342	Buckle for do.	A 3342	"	"
A11675	Pickering Governors. for 1⅜" valve.	A 11675	61132	470
A11685	Governor Valve.	A 11685	63225	480
A11680	Governor Pulley. 3⅛" dia, ⅝" bore, 1⅜" thro'boss.	A 11680	"	"
A3504	Starting Cock.	A 3504	39958	331
A790	H.P.Slide Valve. 6" x 5⅛"	A 790	51202	420
A3530	L.P. do. 9⅜" x 5⅞"	A 3530	"	"
A791	Nuts for slide valves.	A 791	"	"
A4610	Exhaust pipe. cylinder end. 7" long.	A 4610	41242	332
A4611	Exhaust pipe. nozzle end. 9" long.	A 4611	"	"
A3417	H.P.Piston Body. in halves. wrot.iron. 6¾" dia.		45367	342
A3419	H.P.Piston Rings. 6¾" M & P. with coil spring.		"	"
A3808	L.P.Piston Body, in halves, wrot.iron. 11½" dia.		"	"
A 3420	L.P.Piston Rings. 11½" M & P. with coil spring.			
A3422	Piston Rings. 1⅜" dia. 2'-1⅜" long.		38698	480
A3965	Crosshead Bodies. wrot.iron.		46429	480
A3196	Crosshead Slippers. 2½" wide. 7" long.		"	"
A1379	Crosshead Bush, in halves, 1¾" bore, 2½" wide.		"	"
A3551	Slidebars. R & L Hand. Top & Bottom. Angle bars.		38706	480
A5072	Slide Bar Support.		49433	420
A4908	Bushes for valve spindle. 1⅛" bore, 2" dia, 6⅛" long.		49327	569

Engine No. 16104 No.3.

Pattern Mark or Stock No.	DESCRIPTION.	Drawing No.	Drawer No.
A5050	Connecting Rods. 3'-10" centres.	47699	420
A5051	Large end Brasses. 4" bore, 2¾" wide.	"	"
A5082	Valve Eccentric Tumbler. 4" bore, 7⅞" dia, 7½" long.	50536	420
A6291	Valve Eccentric straps. 1⅝" wide.	"	"
A4083	Radius Link. 1½" thick.	48389	440
A4085	Radius Die. 1⅜" x 1½" x 1½" ⅜" hole.	47701	420
A4743	Valve Spindle. 3'-2¾" long. screwed ⅞",14 threads for 7¾" up."	"	"
	Reversing Lever & Guard.	45665	420
A5016	Crank & 2nd.Motion Bearing. left side.	49436	421
A5017	Crank & 2nd.Mo.Bearing. right side.	"	"
A4653	Bushes for crank bearings.L.Side.3⅛" bore,6"long.	"	"
A4654	Bushes for do. R.Side. 3⅛" bore, 5⅛" long.	"	"
A3276	Bushes for 2nd.Mo.Shaft. 3⅛" bore, 5⅛" long.	"	"
A3858	Cap for crank bearing. left side.	"	"
A 4982	Cap for do. right side.	"	"
A4984	Cap for 2nd.Mo.Bearing. left side.	"	"
A3861	Cap for do. right side.	"	"
27696	3rd Motion Bearing & Hind Axle Bearing. R.Side.	49442	421
27696alt.	do. do. do. L.Side.	"	"
Z12571	Bush for 3rd.Mo.Bearing.R.Side. 4" bore, 7⅜"long.	"	"
Z12571alt.	do. do. L.Side. 3⅞" bore, 6⅜" long.	"	"
A4656	Bushes for H.A.Bearings. 5½" &1/32"bore. 9" long.	"	"
A5117	Crankshaft. 4'-10⅝" long. Necks 4" dia. Throw 6"	48879	421
A5275	Second Motion Shaft. 3⅛" dia. 3'-7⅞" long.	"	"
A5227	Third Motion Shaft. 3⅞" & 4" dia. 3'-5½" long.	"	"
A5279	Hind Axle. 5½" dia. 6'-11½" long.	"	"
A6485	Hind Axle Caps. 5" bore, 2½" long.	"	"
A8327	Lynch Pins for do. 1⅛" dia. 6⅛" long.	50814	484
A838	Driving Pin. 2⅛" dia. 1'-1⅛" long.	56203	484
A2264	Driving Pin. 2½" dia. 1'-5" long.	"	"

	Road Spur Gearing.	No.of Teeth.	Width of Teeth	Bore.	Length through boss.	63225/480	
19922	Fast Speed Pinion.	17	2½"	4½"	6½"	49443	422 &
A6470	Slow Speed Pinion.	13	2½"	3⅜"	5⅛"	49443	422
A4548	2nd.Mo.F.S.Wheel.	26	2½"	3⅜"	7	"	"
A4549	2nd.Mo.Double Wheel.	14	2⅛	3½"	4¾"	"	"
		30	2½			"	"
A4551	3rd Mo.Ring of Gear.	47	2⅛	-	-	"	"
A4553	Road Spur Pinion.	18	3½"	4"	6½"	57210	422
	Road Spur Wheel.	50	3½"	10"	6⅞"	"	"
28384alt	Bush for do.			9½"	7 7"	49443	422
A7850				5½"		"	"
A4556	Differential Boss Wheel.	31	3⅛"	11"	1⅜"		
26043	Differential Plate Wheel.	31	3⅛"	2⅝"	4⅝"	57210	422
26042alt	Differential Pinions.	8	3½"	2⅛"	5"	"	"
Z17589	Bushes for do.						
A3832	Winding forward drum. flange. 2'-10" dia.					45288	422
	50 yards of ⅝" dia, 24 wire rope.					"	"
A3825	Driving Plate. 4 5½" bore. 9" through boss.						
A4683	Flywheel 5'-0" dia x 7" wide. 3⅛" bore.					41258	332

Engine No. 16104 No.4.

Pattern Mark or Stock No.	DESCRIPTION.	Drawing No.	Drawer No.
45058	Clutch Fork. slow speed.	49445	422
45059	Clutch Fork. fast speed.	"	"
45114	Clutch Lever Guard. left side.	"	"
45115	do. right side.	"	"
43882	Bracket for locking piece.	"	"
45307	Pump Eccentric Tumbler. 2⅝" wide. 4½" bore, 8⅛" dia.	50814	422
46360	Pump Eccentric Strap. 2" wide.	50203	442
43940	Pump Eccentric Rod. 2'-3⅜" long.	45670	343
43941	Pump Plunger. 2" dia. 1'-3½" long.	"	"
43943	Bush for pump plunger. 2"/2½" bore, 3" long.	"	"
45298	Feed Pump Barrel.	49367	422
43891	Feed Pump Gland. 2" bore, 2⅛" dia, 2½" long.	"	"
45299	Feed Pump Clackbox.	"	"
Z13481	Valves for do. 1⅜" dia. Stem type.	"	"
Z16809	Boiler Clackbox for pump. top half.) A8149.	55868	479
Z16813	Boiler Clackbox for pump. bottom half.)	"	"
Z13481	Valves for do. 1⅜" dia. stem type.)	"	"
A13484	Screwed Cap for clackbox.)	"	"
28748	Hind Road Wheels 6'-0" dia x 1'-6" wide.	45675	423
43235	Bushes for do. 5½" bore, L.Side 12⅜", R.Sides 14⅛" long.	"	"
	Sand Caps. 11⅞" dia. holes 10⅜" centres.	"	"
44029	Front Road Wheels 3'-10½" dia x 9" wide.	47403	423
43238	Bushes for do. 3⅜" bore. 4" long.	"	"
	Sand Caps. 9⅛" dia of flange. holes 8" centres.	"	"
44585	Front Axle. Total length 6'-5" Arms 3⅛" paralle.	49462	423
48754	Front axle caps. 3⅛" bore.	55982	484
44573	Forecarriage fork.	49462	423
44613	Bracket for fork.	"	"
44616	Packing for fork.	"	"
	Pushing bracket o f wrot iron.	62201	423
	Ashpan 4'-0" x 2'-3⅛" x 10" deep.	49136	424
	Hind Tank 180 gall. capacity. with let down back.	62886	424
35767	Top Bracket for rope guide rollers.	56809	481
35768	Bottom bracket for do.	"	"
46947	Side Rollers. 5" dia. 12" long.	52858	444
46948	Top & Bottom Rollers 4" dia x 6" long.	"	"
44190	Cast iron tankside toolbox.	36679	481
	Injector. No.4 Vertical Restarting.	47438	478
44039	⅜" Steam Cock for do.	47438	478
44690	Steam Pipe Bracket for injector & waterlifter.	48572	425
Z16963	Boiler Clackbox for Injector. top half.) A8381	56312	479
Z16964	Boiler Clackbox for Injector. bottom half.)	"	"
Z14621	Stem Valves for do. 1⅜" dia.	49145	690
Z14619	Screwed Cap for clackbox.	"	"
A10155	Waterlifter with screwed connection.	61647	483
44039	⅜" Steam Cock for do.	47438	478
	Waterlifter suction hose. 1⅜" dia. 26ft long.	41279	481
43589	Hose Pipe Carrier. on footboard.	"	"

Engine No. 16104 No. 57

Pattern Mark or Stock No.	DESCRIPTION.	Drawing No.	Drawer No.
A5099	Brake Drum on road spur wheel. 2'-8" dia.	49460	425
A5093	Bracket for brake screw.	"	"
A3894	Steerage Bracket. right side.	49455	425
A3895	do. do. left side. 23426	"	"
A9	Steerage Worm. 4" dia, 1½" bore, 5" long.	48161	465
A845	Steerage worm wheel. 30 teeth. 4" bore, 4" thro" boss.	"	"
A4597	Steerage shaft. 3⅝" & 4" dia. 4'-0⅞" long.	49455	425
A520	Steerage hand wheel. 1'-5½" dia. 1" sq. hole.	"	"
A2309	Rigid Dragbar. 1½" dia.	37902	481

→ wide flywheel 12·875 dia 4" bore

APPENDIX D BOILER CERTIFICATES

D.1 M. R. Maskell & Associates Pty Ltd, *Certification of Inspection*, 22 February 2016.

D.2 M. R. Maskell & Associates Pty Ltd, *Certification of Inspection*, 22 February 2017.

M. R. Maskell & Associates Pty Ltd
ABN 36 062 542 009
PO Box 159
Epping NSW 1710

Phone: (02) 9869 0636
Mobile: 0428 226 103
Email: michael@mrmaskell.com.au

CERTIFICATE OF INSPECTION

CLIENT: LAND DEVELOPMENT AGENCY
ADDRESS: 4/29-31 DUNDAS COURT
WODEN ACT 2606

REGISTERED No: 9.B.265
VESSEL TYPE: JOHN FOWLER ROAD LOCOMOTIVE BOILER
HAZARD LEVEL: B

DESIGN PRESSURE: SHELL: 180 PSI JACKET: TUBES:
CAPACITY: 16
INSPECTION DATE: 22/02/2016

INTERNAL/EXTERNAL INSPECTION:
NEXT INSPECTION DATE: 22/02/2017

INSPECTION TO AS3788

Item No	Inspection Section	Pass	Fail	N/A	Item No	Inspection Section	Pass	Fail	N/A
1	Shell external	X			15	Feedwater stop/check	X		
2	Shell internal	X			16	Blow down valve(s)	X		
3	Tube plate(s)	X			17	Drain valve(s)	X		
4	Tubes/stays	X			18	Condition of joint(s)	X		
5	Furnace area(s)	X			19	Explosion door(s)			X
6	Inspection opening(s)	X			20	Low water control(s)			X
7	Refactory/Brickwork			X	21	Feedwater system	X		
8	Mountings	X			22	Blow down system	X		
9	Gauge glasses	X			23	Burner control system			X
10	Safety valves	X			24	Damper operation	X		
11	Flanges	X			25	Manual reset			X
12	Bolts/studs	X			26	Quick acting closure(s)			X
13	Pressure gauge	X			27				
14	Steam stop/non-return valve			X	28				

COMMENT:

THIS EQUIPMENT CONTAINS LONGITUDINAL LAP RIVETTED JOINTS-CRACK DETECTION GROOVES TO BE MONITORED DURING OPERATION FOR ANY LEAKAGE. THIS BOILER HAS MANUAL CONTROLS AND REQUIRES CONTINUAL SUPERVISION BY A QUALIFIED BOILER ATTENDANT. OWNER/OPERATOR TO TEST SAFETY VALUE SET PRESSURE & OPERATION ON START-UP, DETAILS SHOULD BE ROBUSTLY ATTACHED TO SAFETY VALUE.

INSPECTOR'S SIGNATURE M. R. Maskell DATE: 22/02/2016

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CERTIFICATE OF INSPECTION

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HAZARD LEVEL: B
ESIGN PRESSURE: SHELL: 180 PSI JACKET: TUBES:
APACITY: 16
SPECTION DATE: 22/02/2017
INTERNAL/EXTERNAL INSPECTION:
NEXT INSPECTION DATE: 22/02/2018

INSPECTION TO AS3788

em Io	Inspection Section	Pass	Fail	N/A	Item No	Inspection Section	Pass	Fail	N/A
	Shell external	X			15	Feedwater stop/check	X		
	Shell internal	X			16	Blow down valve(s)	X		
	Tube plate(s)	X			17	Drain valve(s)	X		
	Tubes/stays	X			18	Condition of joint(s)	X		
	Furnace area(s)	X			19	Explosion door(s)			X
	Inspection opening(s)	X			20	Low water control(s)			X
	Refactory/Brickwork			X	21	Feedwater system	X		
	Mountings	X			22	Blow down system	X		
	Gauge glasses	X			23	Burner control system			X
	Safety valves	X			24	Damper operation	X		
	Flanges	X			25	Manual reset			X
	Bolts/studs	X			26	Quick acting closure(s)			X
	Pressure gauge	X			27				
	Steam stop/non-return valve			X	28				

MMENT:

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PECTOR'S SIGNATURE Maskell DATE: 22/02/2017
M. R. MASKELL

APPENDIX E BURRA CHARTER: THE AUSTRALIA ICOMOS CHARTER FOR PLACES OF CULTURAL SIGNIFICANCE, 2013

THE BURRA CHARTER

The Australia ICOMOS Charter for Places of Cultural Significance 2013

AUSTRALIA ICOMOS
International Council on Monuments and Sites

Australia ICOMOS Incorporated
International Council on Monuments and Sites

ICOMOS

ICOMOS (International Council on Monuments and Sites) is a non-governmental professional organisation formed in 1965, with headquarters in Paris. ICOMOS is primarily concerned with the philosophy, terminology, methodology and techniques of cultural heritage conservation. It is closely linked to UNESCO, particularly in its role under the World Heritage Convention 1972 as UNESCO's principal adviser on cultural matters related to World Heritage. The 11,000 members of ICOMOS include architects, town planners, demographers, archaeologists, geographers, historians, conservators, anthropologists, scientists, engineers and heritage administrators. Members in the 103 countries belonging to ICOMOS are formed into National Committees and participate in a range of conservation projects, research work, intercultural exchanges and cooperative activities. ICOMOS also has 27 International Scientific Committees that focus on particular aspects of the conservation field. ICOMOS members meet triennially in a General Assembly.

Australia ICOMOS

The Australian National Committee of ICOMOS (Australia ICOMOS) was formed in 1976. It elects an Executive Committee of 15 members, which is responsible for carrying out national programs and participating in decisions of ICOMOS as an international organisation. It provides expert advice as required by ICOMOS, especially in its relationship with the World Heritage Committee. Australia ICOMOS acts as a national and international link between public authorities, institutions and individuals involved in the study and conservation of all places of cultural significance. Australia ICOMOS members participate in a range of conservation activities including site visits, training, conferences and meetings.

Revision of the Burra Charter

The Burra Charter was first adopted in 1979 at the historic South Australian mining town of Burra. Minor revisions were made in 1981 and 1988, with more substantial changes in 1999.

Following a review this version was adopted by Australia ICOMOS in October 2013.

The review process included replacement of the 1988 Guidelines to the Burra Charter with Practice Notes which are available at: australia.icomos.org

Australia ICOMOS documents are periodically reviewed and we welcome any comments.

Citing the Burra Charter

The full reference is *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013*. Initial textual references should be in the form of the *Australia ICOMOS Burra Charter, 2013* and later references in the short form (*Burra Charter*).

Cover photograph by Ian Stapleton.

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http://australia.icomos.org/

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The Burra Charter

(The Australia ICOMOS Charter for Places of Cultural Significance, 2013)

Preamble

Considering the International Charter for the Conservation and Restoration of Monuments and Sites (Venice 1964), and the Resolutions of the 5th General Assembly of the International Council on Monuments and Sites (ICOMOS) (Moscow 1978), the Burra Charter was adopted by Australia ICOMOS (the Australian National Committee of ICOMOS) on 19 August 1979 at Burra, South Australia. Revisions were adopted on 23 February 1981, 23 April 1988, 26 November 1999 and 31 October 2013.

The Burra Charter provides guidance for the conservation and management of places of cultural significance (cultural heritage places), and is based on the knowledge and experience of Australia ICOMOS members.

Conservation is an integral part of the management of places of cultural significance and is an ongoing responsibility.

Who is the Charter for?

The Charter sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians.

Using the Charter

The Charter should be read as a whole. Many articles are interdependent.

The Charter consists of:

- Definitions — Article 1
- Conservation Principles — Articles 2–13
- Conservation Processes — Articles 14–25
- Conservation Practices — Articles 26–34
- The Burra Charter Process flow chart.

The key concepts are included in the Conservation Principles section and these are further developed in the Conservation Processes and Conservation Practice sections. The flow chart explains the Burra Charter Process (Article 6) and is an integral part of the Charter. Explanatory Notes also form part of the Charter.

The Charter is self-contained, but aspects of its use and application are further explained, in a series of Australia ICOMOS Practice Notes, in *The Illustrated Burra Charter*, and in other guiding documents available from the Australia ICOMOS web site: australia.icomos.org.

What places does the Charter apply to?

The Charter can be applied to all types of places of cultural significance including natural, Indigenous and historic places with cultural values.

The standards of other organisations may also be relevant. These include the *Australian Natural Heritage Charter*, *Ask First: a guide to respecting Indigenous heritage places and values* and *Significance 2.0: a guide to assessing the significance of collections*.

National and international charters and other doctrine may be relevant. See australia.icomos.org.

Why conserve?

Places of cultural significance enrich people's lives, often providing a deep and inspirational sense of connection to community and landscape, to the past and to lived experiences. They are historical records, that are important expressions of Australian identity and experience. Places of cultural significance reflect the diversity of our communities, telling us about who we are and the past that has formed us and the Australian landscape. They are irreplaceable and precious.

These places of cultural significance must be conserved for present and future generations in accordance with the principle of inter-generational equity.

The Burra Charter advocates a cautious approach to change: do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained.

Article 1. Definitions

For the purposes of this Charter:

1.1 *Place* means a geographically defined area. It may include elements, objects, spaces and views. Place may have tangible and intangible dimensions.

lace has a broad scope and includes natural and cultural features. Place can be large or small: for example, a memorial, a tree, an individual building or group of buildings, the location of an historical event, an urban area or town, a cultural landscape, a garden, an industrial plant, a shipwreck, a site with in situ remains, a stone arrangement, a road or travel route, a community meeting place, a site with spiritual or religious connections.

1.2 *Cultural significance* means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.

Cultural significance is embodied in the *place* itself, its *fabric*, *setting*, *use*, *associations*, *meanings*, records, *related places* and *related objects*.

Places may have a range of values for different individuals or groups.

The term cultural significance is synonymous with cultural heritage significance and cultural heritage value.

Cultural significance may change over time and with use.

Understanding of cultural significance may change as a result of new information.

1.3 *Fabric* means all the physical material of the *place* including elements, fixtures, contents and objects.

Fabric includes building interiors and sub-surface remains, as well as excavated material.

atural elements of a place may also constitute fabric. For example the rocks that signify a Dreaming place.

Fabric may define spaces and views and these may be part of the significance of the place.

1.4 *Conservation* means all the processes of looking after a *place* so as to retain its *cultural significance*.

See also Article 14.

1.5 *Maintenance* means the continuous protective care of a *place*, and its *setting*.

Maintenance is to be distinguished from repair which involves *restoration* or *reconstruction*.

Examples of protective care include:

- maintenance — regular inspection and cleaning of a place, e.g. mowing and pruning in a garden;
- repair involving restoration — returning dislodged or relocated fabric to its original location e.g. lo se ro f gutters on a building or displaced rocks in a stone bora ring;
- repair involving reconstruction — replacing decayed fabric with new fabric

1.6 *Preservation* means maintaining a *place* in its existing state and retarding deterioration.

It is recognised that all places and their elements change over time at varying rates.

1.7 *Restoration* means returning a *place* to a known earlier state by removing accretions or by reassembling existing elements without the introduction of new material.

1.8 *Reconstruction* means returning a *place* to a known earlier state and is distinguished from *restoration* by the introduction of new material.

ew material may include recycled material salvaged from other places. This should not be to the detriment of any place of cultural significance.

1.9 *Adaptation* means changing a *place* to suit the existing *use* or a proposed use.

1.10 *Use* means the functions of a *place*, including the activities and traditional and customary practices that may occur at the place or are dependent on the place.

Use includes for example cultural practices commonly associated with Indigenous peoples such as ceremonies, hunting and fishing, and fulfillment of traditional obligations. Exercising a right of access may be a use.

Articles

Explanatory Notes

1.11 *Compatible use* means a *use* which respects the *cultural significance* of a *place*. Such a use involves no, or minimal, impact on cultural significance.

1.12 *Setting* means the immediate and extended environment of a *place* that is part of or contributes to its *cultural significance* and distinctive character.

Setting may include: structures, spaces, land, water and sky; the visual setting including views to and from the place, and along a cultural route; and other sensory aspects of the setting such as smells and sounds. Setting may also include historical and contemporary relationships, such as use and activities, social and spiritual practices, and relationships with other places, both tangible and intangible.

1.13 *Related place* means a *place* that contributes to the *cultural significance* of another place.

1.14 *Related object* means an object that contributes to the *cultural significance* of a *place* but is not at the place.

Objects at a place are encompassed by the definition of place, and may or may not contribute to its cultural significance.

1.15 *Associations* mean the connections that exist between people and a *place*.

Associations may include social or spiritual values and cultural responsibilities for a place.

1.16 *Meanings* denote what a *place* signifies, indicates, evokes or expresses to people.

eanings generally relate to intangible dimensions such as symbolic qualities and memories.

1.17 *Interpretation* means all the ways of presenting the *cultural significance* of a *place*.

Interpretation may be a combination of the treatment of the fabric (e.g. maintenance, restoration, reconstruction); the use of and activities at the place; and the use of introduced explanatory material.

Conservation Principles

Article 2. Conservation and management

2.1 *Places* of *cultural significance* should be conserved.

2.2 The aim of *conservation* is to retain the *cultural significance* of a *place*.

2.3 *Conservation* is an integral part of good management of *places* of *cultural significance*.

2.4 *Places* of *cultural significance* should be safeguarded and not put at risk or left in a vulnerable state.

Article 3. Cautious approach

3.1 *Conservation* is based on a respect for the existing *fabric*, *use*, *associations* and *meanings*. It requires a cautious approach of changing as much as necessary but as little as possible.

The traces of additions, alterations and earlier treatments to the fabric of a place are evidence of its history and uses which may be part of its significance. Conservation action should assist and not impede their understanding.

3.2 Changes to a *place* should not distort the physical or other evidence it provides, nor be based on conjecture.

Article 4. Knowledge, skills and techniques

4.1 *Conservation* should make use of all the knowledge, skills and disciplines which can contribute to the study and care of the *place*.

Articles

Explanatory Notes

4.2 Traditional techniques and materials are preferred for the *conservation* of significant *fabric*. In some circumstances modern techniques and materials which offer substantial conservation benefits may be appropriate.

The use of modern materials and techniques must be supported by firm scientific evidence or by a body of experience.

Article 5. Values

5.1 *Conservation* of a *place* should identify and take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others.

Conservation of places with natural significance is explained in the Australian atural Heritage Charter. This Charter defines natural significance to mean the importance of ecosystems, biodiversity and geodiversity for their existence value or for present or future generations, in terms of their scientific, social, aesthetic and life-support value.

In some cultures, natural and cultural values are indivisible.

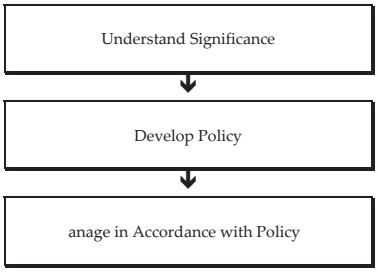
5.2 Relative degrees of *cultural significance* may lead to different *conservation* actions at a place.

A cautious approach is needed, as understanding of cultural significance may change. This article should not be used to justify actions which do not retain cultural significance.

Article 6. Burra Charter Process

6.1 The *cultural significance* of a *place* and other issues affecting its future are best understood by a sequence of collecting and analysing information before making decisions. Understanding cultural significance comes first, then development of policy and finally management of the place in accordance with the policy. This is the Burra Charter Process.

The Burra Charter Process, or sequence of investigations, decisions and actions, is illustrated below and in more detail in the accompanying flow chart which forms part of the Charter.



6.2 Policy for managing a *place* must be based on an understanding of its *cultural significance*.

6.3 Policy development should also include consideration of other factors affecting the future of a *place* such as the owner's needs, resources, external constraints and its physical condition.

6.4 In developing an effective policy, different ways to retain *cultural significance* and address other factors may need to be explored.

ptions considered may include a range of uses and changes (e.g. adaptation) to a place.

6.5 Changes in circumstances, or new information or perspectives, may require reiteration of part or all of the Burra Charter Process.

Article 7. Use

7.1 Where the *use* of a *place* is of *cultural significance* it should be retained.

7.2 A *place* should have a *compatible use*.

The policy should identify a use or combination of uses or constraints on uses that retain the cultural significance of the place. New use of a place should involve minimal change to significant fabric and use; should respect associations and meanings; and where appropriate should provide for continuation of activities and practices which contribute to the cultural significance of the place.

Article 8. Setting

Conservation requires the retention of an appropriate *setting*. This includes retention of the visual and sensory setting, as well as the retention of spiritual and other cultural relationships that contribute to the *cultural significance* of the *place*.

Setting is explained in Article 1.12.

New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate.

Article 9. Location

9.1 The physical location of a *place* is part of its *cultural significance*. A building, work or other element of a place should remain in its historical location. Relocation is generally unacceptable unless this is the sole practical means of ensuring its survival.

9.2 Some buildings, works or other elements of *places* were designed to be readily removable or already have a history of relocation. Provided such buildings, works or other elements do not have significant links with their present location, removal may be appropriate.

9.3 If any building, work or other element is moved, it should be moved to an appropriate location and given an appropriate *use*. Such action should not be to the detriment of any *place* of *cultural significance*.

Article 10. Contents

Contents, fixtures and objects which contribute to the *cultural significance* of a *place* should be retained at that place. Their removal is unacceptable unless it is: the sole means of ensuring their security and *preservation*; on a temporary basis for treatment or exhibition; for cultural reasons; for health and safety; or to protect the place. Such contents, fixtures and objects should be returned where circumstances permit and it is culturally appropriate.

For example, the repatriation (returning) of an object or element to a place may be important to Indigenous cultures, and may be essential to the retention of its cultural significance.

Article 28 covers the circumstances where significant fabric might be disturbed, for example, during archaeological excavation.

Article 33 deals with significant fabric that has been removed from a place.

Article 11. Related places and objects

The contribution which *related places* and *related objects* make to the *cultural significance* of the *place* should be retained.

Article 12. Participation

Conservation, interpretation and management of a *place* should provide for the participation of people for whom the place has significant *associations* and *meanings*, or who have social, spiritual or other cultural responsibilities for the place.

Article 13. Co-existence of cultural values

Co-existence of cultural values should always be recognised, respected and encouraged. This is especially important in cases where they conflict.

For some places, conflicting cultural values may affect policy development and management decisions. In Article 13, the term cultural values refers to those beliefs which are important to a cultural group, including but not limited to political, religious, spiritual and m ral beliefs. This is broader than values associated with cultural significance.

Conservation Processes

Article 14. Conservation processes

Conservation may, according to circumstance, include the processes of: retention or reintroduction of a *use*; retention of *associations* and *meanings*; *maintenance, preservation*, *restoration*, *reconstruction, adaptation* and *interpretation*; and will commonly include a combination of more than one of these. Conservation may also include retention of the contribution that *related places* and *related objects* make to the *cultural significance* of a *place*.

Conservation normally seeks to slow deterioration unless the significance of the place dictates otherwise. There may be circumstances where no action is required to achieve conservation.

Article 15. Change

15.1 Change may be necessary to retain *cultural significance*, but is undesirable where it reduces cultural significance. The amount of change to a *place* and its *use* should be guided by the *cultural significance* of the place and its appropriate *interpretation*.

When change is being considered, including for a temporary use, a range of options should be explored to seek the option which minimises any reduction to its cultural significance.

It may be appropriate to change a place where this reflects a change in cultural meanings or practices at the place, but the significance of the place should always be respected.

15.2 Changes which reduce *cultural significance* should be reversible, and be reversed when circumstances permit.

eversible changes should be considered temporary. Non-reversible change should only be used as a last resort and should not prevent future conservation action.

15.3 Demolition of significant *fabric* of a *place* is generally not acceptable. However, in some cases minor demolition may be appropriate as part of *conservation*. Removed significant fabric should be reinstated when circumstances permit.

15.4 The contributions of all aspects of *cultural significance* of a *place* should be respected. If a place includes *fabric*, *uses*, *associations* or *meanings* of different periods, or different aspects of cultural significance, emphasising or interpreting one period or aspect at the expense of another can only be justified when what is left out, removed or diminished is of slight cultural significance and that which is emphasised or interpreted is of much greater cultural significance.

Article 16. Maintenance

Maintenance is fundamental to *conservation.* Maintenance should be undertaken where *fabric* is of *cultural significance* and its maintenance is necessary to retain that *cultural significance*.

aintaining a place may be important to the fulfilment of traditional laws and customs in some Indigenous communities and other cultural groups.

Article 17. Preservation

Preservation is appropriate where the existing *fabric* or its condition constitutes evidence of *cultural significance,* or where insufficient evidence is available to allow other *conservation* processes to be carried out.

reservation protects fabric without obscuring evidence of its construction and use. The process should always be applied:

- where the evidence of the fabric is of such significance that it should not be altered; or
- where insufficient investigation has been carried out to permit policy decisions to be taken in accord with Articles 26 to 28.

ew work (e.g. stabilisation) may be carried out in association with preservation when its purpose is the physical protection of the fabric and when it is consistent with Article 22.

Article 18. Restoration and reconstruction

Restoration and *reconstruction* should reveal culturally significant aspects of the *place*.

Article 19. Restoration

Restoration is appropriate only if there is sufficient evidence of an earlier state of the *fabric*.

Article 20. Reconstruction

20.1 *Reconstruction* is appropriate only where a *place* is incomplete through damage or alteration, and only where there is sufficient evidence to reproduce an earlier state of the *fabric*. In some cases, reconstruction may also be appropriate as part of a *use* or practice that retains the *cultural significance* of the place.

Places with social or spiritual value may warrant reconstruction, even though very little may remain (e.g. only building footings or tree stumps following fire, flood or storm). The requirement for sufficient evidence to reproduce an earlier state still applies.

20.2 *Reconstruction* should be identifiable on close inspection or through additional *interpretation*.

Article 21. Adaptation

21.1 *Adaptation* is acceptable only where the adaptation has minimal impact on the *cultural significance* of the *place*.

Adaptation may involve additions to the place, the introduction of new services, or a new use, or changes to safeguard the place. Adaptation of a place for a new use is often referred to as 'adaptive re-use' and should be consistent with Article 7.2.

21.2 *Adaptation* should involve minimal change to significant *fabric*, achieved only after considering alternatives.

Article 22. New work

22.1 New work such as additions or other changes to the *place* may be acceptable where it respects and does not distort or obscure the *cultural significance* of the place, or detract from its *interpretation* and appreciation.

ew work should respect the significance of a place through consideration of its siting, bulk, form, scale, character, colour, texture and material. Imitation should generally be avoided.

22.2 New work should be readily identifiable as such, but must respect and have minimal impact on the *cultural significance* of the *place*.

ew work should be consistent with Articles 3, 5, 8, 15, 21 and 22.1.

Article 23. Retaining or reintroducing use

Retaining, modifying or reintroducing a significant *use* may be appropriate and preferred forms of *conservation*.

These may require changes to significant fabric but they should be minimised. In some cases, continuing a significant use, activity or practice may involve substantial new work.

Article 24. Retaining associations and meanings

24.1 Significant *associations* between people and a *place* should be respected, retained and not obscured. Opportunities for the *interpretation*, commemoration and celebration of these associations should be investigated and implemented.

For many places associations will be linked to aspects of use, including activities and practices.

Some associations and meanings may not be apparent and will require research.

24.2 Significant *meanings*, including spiritual values, of a *place* should be respected. Opportunities for the continuation or revival of these meanings should be investigated and implemented.

Article 25. Interpretation

The *cultural significance* of many *places* is not readily apparent, and should be explained by *interpretation*. Interpretation should enhance understanding and engagement, and be culturally appropriate.

In some circumstances any form of interpretation may be culturally inappropriate.

Conservation Practice

Article 26. Applying the Burra Charter Process

26.1 Work on a *place* should be preceded by studies to understand the place which should include analysis of physical, documentary, oral and other evidence, drawing on appropriate knowledge, skills and disciplines.

The results of studies should be kept up to date, regularly reviewed and revised as necessary.

26.2 Written statements of *cultural significance* and policy for the *place* should be prepared, justified and accompanied by supporting evidence. The statements of significance and policy should be incorporated into a management plan for the place.

Policy should address all relevant issues, e.g. use, interpretation, management and change.

A management plan is a useful document for recording the Burra Charter Process, i.e. the steps in planning for and managing a place of cultural significance (Article 6.1 and flow chart). Such plans are often called conservation management plans and sometimes have other names.

The management plan may deal with other matters related to the management of the place.

26.3 Groups and individuals with *associations* with the *place* as well as those involved in its management should be provided with opportunities to contribute to and participate in identifying and understanding the *cultural significance* of the place. Where appropriate they should also have opportunities to participate in its *conservation* and management.

26.4 Statements of *cultural significance* and policy for the *place* should be periodically reviewed, and actions and their consequences monitored to ensure continuing appropriateness and effectiveness.

nitor actions taken in case there are also unintended consequences.

Article 27. Managing change

27.1 The impact of proposed changes, including incremental changes, on the *cultural significance* of a *place* should be assessed with reference to the statement of significance and the policy for managing the place. It may be necessary to modify proposed changes to better retain cultural significance.

27.2 Existing *fabric, use, associations* and *meanings* should be adequately recorded before and after any changes are made to the *place*.

Article 28. Disturbance of fabric

28.1 Disturbance of significant *fabric* for study, or to obtain evidence, should be minimised. Study of a *place* by any disturbance of the fabric, including archaeological excavation, should only be undertaken to provide data essential for decisions on the *conservation* of the place, or to obtain important evidence about to be lost or made inaccessible.

28.2 Investigation of a *place* which requires disturbance of the *fabric*, apart from that necessary to make decisions, may be appropriate provided that it is consistent with the policy for the place. Such investigation should be based on important research questions which have potential to substantially add to knowledge, which cannot be answered in other ways and which minimises disturbance of significant fabric.

Article 29. Responsibility

The organisations and individuals responsible for management and decisions should be named and specific responsibility taken for each decision.

Article 30. Direction, supervision and implementation

Competent direction and supervision should be maintained at all stages, and any changes should be implemented by people with appropriate knowledge and skills.

Article 31. Keeping a log

New evidence may come to light while implementing policy or a plan for a *place*. Other factors may arise and require new decisions. A log of new evidence and additional decisions should be kept.

ew decisions should respect and have minimal impact on the cultural significance of the place.

Article 32. Records

32.1 The records associated with the *conservation* of a *place* should be placed in a permanent archive and made publicly available, subject to requirements of security and privacy, and where this is culturally appropriate.

32.2 Records about the history of a *place* should be protected and made publicly available, subject to requirements of security and privacy, and where this is culturally appropriate.

Article 33. Removed fabric

Significant *fabric* which has been removed from a *place* including contents, fixtures and objects, should be catalogued, and protected in accordance with its *cultural significance*.

Where possible and culturally appropriate, removed significant fabric including contents, fixtures and objects, should be kept at the place.

Article 34. Resources

Adequate resources should be provided for *conservation*.

The best conservation often involves the least work and can be inexpensive.

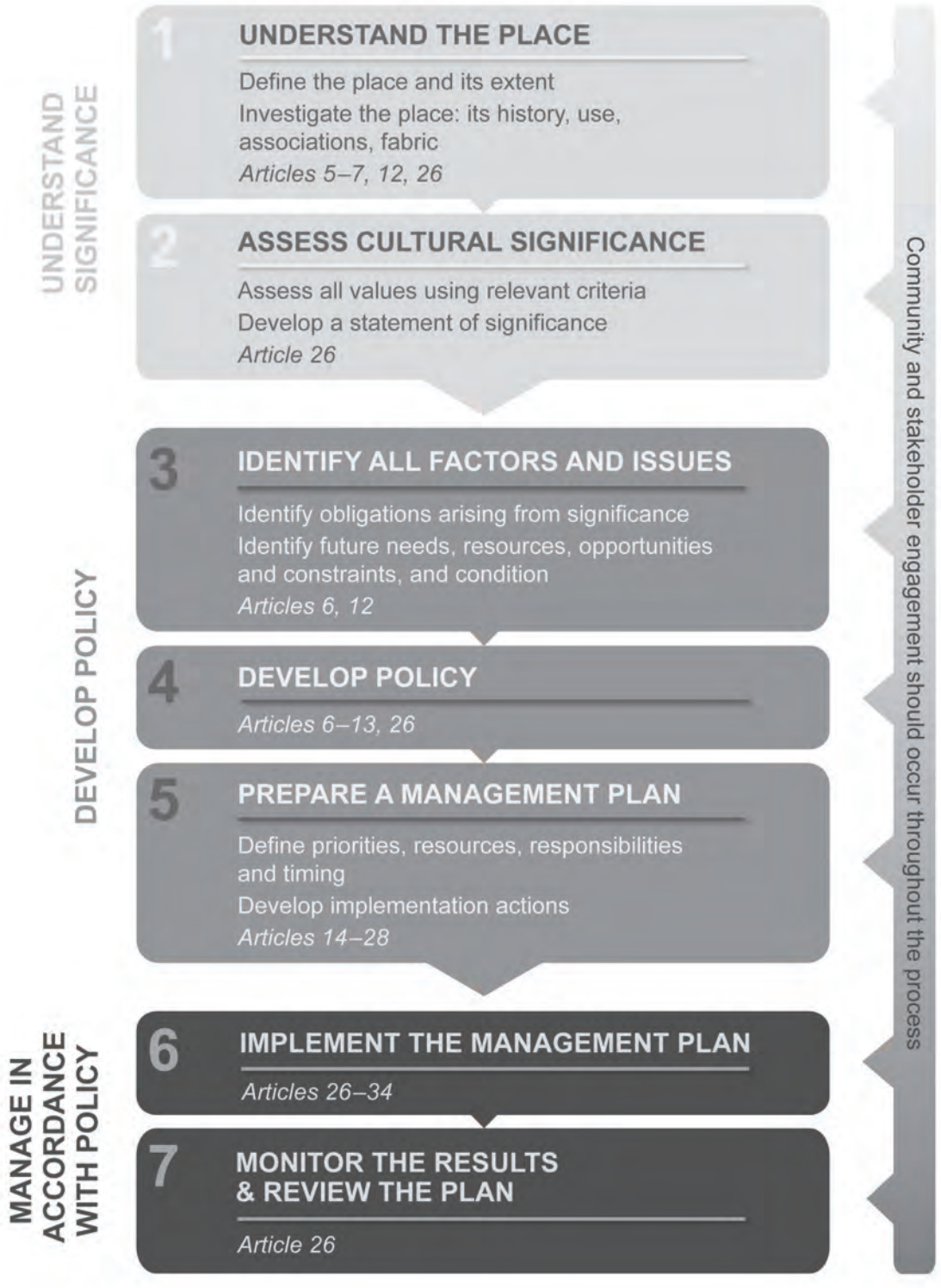
Words in italics are defined in Article 1.

The Burra Charter Process

Steps in planning for and managing a place of cultural significance

The Burra Charter should be read as a whole.

Key articles relevant to each step are shown in the boxes. Article 6 summarises the Burra Charter Process.



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