Abstract
Fences are neglected heritage components of railway corridors. They record the development of colonial railways, they often contain components typical of earlier technology, they are usually considerably more robust than farm fences of similar age, and finally, they can provide accurate records of environmental changes in the adjoining landscapes. Four examples show the rich range of heritage information in railway fences. Massive fences built by the South Australian Railways in the late 19th century reflected British technology and practice, quite at odds with local farming practice. Droppers patented by Arthur Gatenby in Tasmania in 1888 were widely adopted by farmers and railways in various states, and are the most widespread and abundant dropper in railway fences. In a vain attempt to stop the eastward advance of rabbits, the New South Wales government built 655km of rabbit-proof fence across the state in the 1880s, primarily by hanging netting on existing railway fences. Buried railway fences in northern South Australia record the history of failed northern expansion of cultivation beyond Goyder’s Line in the 1870s. Finally, the almost insuperable problems of conserving these fences are addressed, concluding that detailed recording is perhaps the only feasible approach.

Introduction: linear objects in the landscape
Railways and fences share many features: they are linear, they represent a range of technologies, they have complex social and legislative histories, they are symbolic of European dominion over the landscape, they are constantly repaired and replaced, and both contain a wealth of heritage. New South Wales colonial legislation initially required fencing of railways primarily to avoid damaging trains by hitting wandering livestock, but subsequent legislative amendments made fencing some lines optional (Longworth 2002). The types of fencing used varied widely both within and between colonies and state, reflecting both local farming practice, and more interestingly, British practice.

The heritage values of railway fences include recording the development of colonial railways, they often contain components typical of earlier technology, they are usually considerably more robust than farm fences of similar age, and finally, they can provide accurate records of environmental changes in the adjoining landscapes. Fences near railway stations and yards often incorporated design elements such as pickets more commonly associated with urban fences (RSA 2000). There are few studies of the heritage of railway fences, whether lineside, or around stations and goods yards. Notable exceptions are the preliminary study of New South Wales railway fences by Jim Longworth (2002) and his heritage fence guidelines for NSW (RSA 2000), and the unpublished study of Victorian railway fences by Arthur Brook of Daylesford Spa Country Railway.

In this paper I explore four aspects of railway fences to illustrate their rich range of heritage values. The stories raise as many questions as they answer, but they demonstrate that further study is necessary before we fully understand the heritage of railway fences. I end by considering some of the problems facing attempts to conserve fences along our railways.

South Australia: bigger is better
The late 19th century fences of the South Australian Railways (SAR) are unique among Australian railway fences. They are grossly over-engineered for the task: uniformly massive, with cast-iron straining posts, very heavy wire, large iron posts and over-sized droppers (Figure 1). Similar fences are extremely rare on farms, and are not found on railways in other states.

Figure 1. Typical example of SAR fence erected south of Hawker in the 1880s showing massive cast-iron straining pillar and winders, and Tee-post set into a cast-iron spear point. The bases of both posts are exposed by erosion.
Source: John Pickard, 10 October 2003.

The standard form of contract used by SAR in 1877 allowed for either wood or iron posts:

The fencing … will consist either of split gum posts and six wires, round pine posts and six wires, or wrought iron standards and six wires. … The fence will be three feet seven inches (3ft 7ft.) [sic] in height, … The posts shall be spaced (10) ten feet apart, …; and straining-posts, not less than [sic] (10) ten inches in diameter in the smallest place,
fitted with struts, ..., shall be fixed at intervals of not more
than (400) four hundred yards. Every post ... must be bored
with holes to receive the wire, which will consist of that kind
known as ‘Black annealed drawn fencing Wire’ No. (6) six
gauge, passed through the posts, properly strained, and
jointed to the satisfaction of the superintending officer, and
pegged at such intervals as may be directed. ...

When iron fencing is ordered to be used, standards, both
for straining and intermediate, are to be supplied and fixed
as shown on the drawings. The spear-points of the
intermediate posts are driven into the ground, and the (T)
tee iron uprights fixed thereto with keys. ... The iron
standards must be placed the same distance apart as the
timber posts, and the straining standards at intervals of not
more than (300) three hundred yards. (Mais 1877a: 29-30)

Unfortunately the drawings referred to have not yet been located.
Surviving straining pillars (Figures 1 and 2) vary in detail of
construction, probably being supplied by different contractors.
All are cast-iron, some in one piece, others in one or more
sections bolted together. The pillars extend over 1m below
ground as a massive stabilising base. The wires are tensioned
on small windlasses running transversely between the cheeks
of the strainers. Most strainers have one set of windlasses, so
wires from both directions are tensioned simultaneously. Others
have double windlasses, allowing each wire to be tensioned
individually. A removable lever fitted to a square extension or
a square socket protruding from one end of the windlass
operated the windlass. Tension is maintained by a ratchet and
pawl on the other end of each windlass. Tapered iron pegs of
crescentic cross-section locked wires into some line posts to
maintain tension between the strainers.

Tee-section line posts are
more uniform, but provided by
different makers. The tops of
the posts vary: cut square,
rounded or with a notch. The
base of each post is riveted
into a socket at the top of a
cast-iron spear point coated
with bitumen (Figure 3).
Further rigidity is provided by
a flat metal key hammered
into the socket. Contemporary
British fence catalogues
show a bewildering range of
‘foot structures’ on posts.

Figure 2. SAR straining post
used to decorate the Flinders
Ranges Caravan Park, Hawker.
Six winders with their ratchets and
paws are evident in the U-shaped
post. Paws are retained in the
rectangular bosses above each
ratchet on the left-hand face of
the post. The massive base has
four spreading webs, each 12mm
thick running more than 1m from
the ground-level plate to the
cruciform base-plate. The entire
post, weighing about 120kg, is a
one-piece casting to which the
winders are fitted and held with
split-pins.
Source: John Pickard, 11 December
2005.

Figure 3. Cast-iron spear point bases of Tee-posts. Left point made
by WP&Co (probably Welch, Perrin & Company of Melbourne) in 1883,
right point by AF Co (probably Adelaide Foundry) in 1879. There are
several differences in the points and mode of assembly into the posts:
location of SAR and maker’s name cast into the point; the flat steel key
locking the post into the base is against the stem of the Tee in the
WP&Co post but against the top of the Tee in the AF Co post which
has a slightly longer point; two through rivets holding the post into the
AF Co point, but one through and one blind rivet on the WP&Co point.
WP&Co post from near Hawker, AF Co post from near Terowie.
Numbers on scale indicate 10 cm divisions.
Source: John Pickard.

Apparently landowners did not trust the efficacy of simple
posts, so various underground struts were incorporated. Wires
were similarly mistrusted so the ‘wires’ were often rods up to
12mm diameter, or wire rope up to 10mm diameter (see
catalogues of Barnard, Bishops, & Barnards 1875, and Bayliss,
Jones & Bayliss Ltd 1881). Charles D. Young and Company
(c1898) illustrated the range of fences they provided specifically
for railways. The fences are heavily constructed, with iron posts
driven into large blocks of wood or stone for stability and
strength. One catalogue shows cast-iron spear points for posts
(Wm. Hayward & Sons Ltd, late 19th C: 18). The spear points
are 533mm long, about the same length as those used by the
SAR. Although steel or iron fence posts were well-known in
Australia by this time, farmers invariably hammered them into
the ground without spear points. Overall, the SAR fences show
greater similarity to fences in British catalogues than to
temporary practice in colonial Australia.
The massive construction of the SAR fences used four times more iron / steel than contemporary farm fences (Table 1). Economy would suggest that a fence typical of others in the particular area would have sufficed and met any legislative obligations. While there may have been some justification in 1867 he was appointed Engineer-in-Chief to the colony of South Australia and in January 1871, General-Manager of Railways, retaining his position as chief engineer. He voluntarily resigned in April 1888 after overseeing a period of great expansion of the South Australia Railway network (Serle 1949).

### Table 1. Comparison of South Australian Railways and farm / station fences of the late 19th century

<table>
<thead>
<tr>
<th>Component</th>
<th>South Australian Railways</th>
<th>Farm / station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strainer posts</td>
<td>Heavy cast-iron winder posts</td>
<td>Wood</td>
</tr>
<tr>
<td>Panel length</td>
<td>3.0m without droppers, 5.0m with 1 or 2 droppers, 12.0m with 7 droppers</td>
<td>3.0 – 5.0m without droppers, Highly variable with droppers</td>
</tr>
<tr>
<td>Line posts</td>
<td>Wood (variable sizes, but typically &gt; 160 x 80mm), T-post (50 x 38 x 7mm)*</td>
<td>Wood (variable diameter), Flat steel post (25 x 6, or 32 x 6mm), (most common), T-post (25 x 25 x 5mm)*</td>
</tr>
<tr>
<td>Spear points, rivets, keys</td>
<td>Yes, typically 550mm long, weighing 9.5 kg, coated with bitumen</td>
<td>No</td>
</tr>
<tr>
<td>Droppers (in pastoral areas)</td>
<td>Bains’ Lochrin (28 x 60 x 2mm)<strong>, V dropper (41 x 60 x 3mm)</strong></td>
<td>Bains’ Lochrin (18 x 36 x 1mm)<strong>, V dropper (21 x 30 x 2mm)</strong>, Numerous other types of droppers, especially split wood.</td>
</tr>
<tr>
<td>Number of wires</td>
<td>6</td>
<td>6 (but variable)</td>
</tr>
<tr>
<td>Wire***</td>
<td>6 BWG (5.2mm) or 6 SWG (4.9mm)</td>
<td>8 SWG (4.1mm) or 6 SWG (4.9mm)</td>
</tr>
<tr>
<td>Tapered crescentic locking pegs for wires</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Estimated mass (kg) of 1 km of materials ****</td>
<td>Wire (6km 6 SWG @ 146.6) 880 kg, Posts (330 @ 5.61) 1851, Spear points (330 @ 9.5) 3135, Strainers (5 @ 120) 600</td>
<td>Wire (6km 8 SWG @ 101.8) 610 kg, Posts (330 @ 2.3) 755</td>
</tr>
</tbody>
</table>

TOTAL

6465 kg

1365 kg

* width of top of T x length of stem of T x thickness (rounded to whole mm)
** distance from crown of fold to end of legs x width across legs x thickness (rounded to whole mm)
*** BWG: Birmingham Wire Gauge, SWG: Standard Wire Gauge
**** Assumptions: fence panels of 10 feet; flat steel posts in farm fences; 6 wires, 6 and 8 SWG; no droppers; strainers @ 300 yard intervals; SAR strainer post @ estimated 120kg each

Source: field measurements on numerous fences.

for the SAR specification in farming country, there was none in semi-arid pastoral land traversed north of Port Augusta, and especially by the Marree – Oodnadatta railway where stocking rates are probably less than one beast per 5 – 10 km². It is an interesting irony that some of the SAR fences on this line have outlasted the line itself, and are still perfectly stock-proof today. The background of Henry Coathupe Mais (1827-1916) (Figure 4), Engineer-in-Chief from 1867 to 1888 offers few clues to the fences. Mais worked for the Great Western Railway under Isambard Kingdom Brunel before migrating to Sydney where he worked for the Sydney Railway Company from 1851. After five years managing the Melbourne Suburban and Brighton railway,
why did the SAR insist on the heavy British-style fences? B. Boothby (1870), a private civil engineer, attacked Mais’ estimates for the Port Augusta railway. Although Mais (1870a) specifically stated that the line would not be fenced, Boothby used a newspaper account of a cost overrun on fencing the recently completed Burra line as an example of Mais’ extravagances. Mais (1870b) was livid at what he saw as implications of ‘corruption, dishonesty, and fraud’, but apparently he successfully defended his estimates, for he kept his job and kept building railways. Later specifications for supply of wire and droppers for SAR fences show little change after Mais’ resignation (Engineer-in-Chief’s Department 1890, 1892). The SAR fences are prima facie significant heritage as they occur over a wide area, show a range of variations in components, many kilometres are in good condition and they represent an unusual management strategy. Today the SAR fences are the best examples in Australia of such British technology, albeit misapplied in an expanding colony.

**Tasmania: the national legacy of Arthur Gatenby**

One widespread and abundant element of railway fences in several states are sawn wooden droppers fixed to the line wires with wire staples (Figure 6). (‘Staple’ is a generic term for any piece of bent wire holding line wires to posts or droppers, especially to wooden posts and droppers.) On 27 July 1888 Arthur Gatenby applied for a Tasmanian colonial patent for An improved dropper or stretcher for wire fencing:

> … a wooden bar pierced with holes and fasteners of wire attaching the fence wires to the bar. … The fasteners or contrivances for attaching the wires to the wooden bar are formed as follows: Stout wire … is cut in lengths of four or five inches. These lengths are bent double into a form resembling a staple and put through the wooden bar from the front being placed over the fence wires in such a manner as to grasp the wires and hold them in position. The free ends of the wire fasteners are secured by being turned back or clinched on the back of the wooden bar. (Gatenby 1888)

His claim for originality was ‘in droppers for wire fences the positioning of the wires to a wooden bar by means of wire fasteners in the form of a staple whereby free play is allowed to all the wires except those at the top and bottom’ (ibid.). Before Federation in 1901, each colony had its own patent jurisdiction and legislation, so Gatenby patented his dropper and staple in other colonies (e.g. Victorian patent 6212, 26 September 1888; and South Australian patent 2422, 30 June 1891). Gatenby marketed his droppers as ‘Simplex Dropper – Gatenby’s
patent’, advertising in The Pastoral Review from October 1891 to November 1893. But he probably made little money from his patent as both the droppers and staples are fairly mundane and easily home-made.

Gatenby droppers are ubiquitous on older NSW and Queensland railway fences. Even when the droppers have rotted off, or have been burnt in bushfires, the characteristic staples remain on the wires until the fence is replaced. Although he may not have made his fortune, Gatenby bequeathed us a heritage legacy because they were widely used on farms and railways for decades. NSW Department of Transport, Ways and Works Branch drawing no. F574 / ST55 (dated 7 June 1932) shows Gatenby Simplex droppers and staples (both un-named) and a proposed design for an additional staple to better reduce lateral movement of the dropper. The drawing was amended on 6 December 1940, suggesting that these droppers were still in use in the 1940s, and perhaps later.

New South Wales: rabbits and railways

The deliberate introduction of European rabbits into Australia and their subsequent escape from near Geelong in 1859 had profound impacts on the Australian environment, farming and pastoral industries, industrial development and fencing that continue until today. Before release of myxomatosis in the 1950s, rabbit control relied on trapping, poisoning, warren ripping, and various kinds of fences. None worked in the long-term, and today the Australian landscape is criss-crossed by tens of thousands of kilometres of rabbit-proof fences in various states of disrepair. Most Australians are familiar with the well-known Rabbit-proof Fences Numbers 1-3 of Western Australia totalling 3256 km, erected at enormous cost in futile attempts to prevent rabbits reaching the agricultural areas of Western Australia (McKnight 1969). Almost completely unknown is a 655 km barrier fence built across NSW from Barringun on the Queensland border to Bourke, and then along railways to the Victorian border at Corowa (Figure 7). The origin of this fence lies with recommendations from two conferences on rabbits in Sydney in October 1885 and May 1886 (Select Committee on Rabbit Nuisance Act 1887: 466).

By 1887 ‘the western side of the railway fence from Bourke to Narramine, 203 miles [327 km], has lately been made rabbit-proof, at a cost of £14,500 [i.e. at a 2005 cost of $955,450 or $2,922 / km]’ (Select Committee on Rabbit Nuisance Act 1887: 466). By 1893 Coghlan (p. 381) described rather poor progress with an extension to the Queensland border at Barringun, adding that it was proposed ‘to extend this fence from Narramine [sic], … to Corowa, the fences enclosing the railway being used to support the wire-netting. Tenders have been accepted for this work.’ Two years later, Joseph Carruthers, Minister for Lands, was able to report to the April 1895 conference on rabbits that the entire 655 km fence was complete (Anon 1895).

The cost of this rabbit fence (£82 / mile) was about 20 per cent cheaper than building rabbit-proof fences from scratch (typically around £100 / mile). Even so, the total cost was around $2.5 million in 2005 dollars. But the money was essentially wasted because the fence was too late to prevent the eastward spread of rabbits which were well past the fence by 1895 (Figure 7). The Minister should have been aware of this, but he chose not to mention it in his speech.

Today, most of this route is still fenced, but the 1895 rabbit fence is elusive, although traces of the original railway fences can be found. These show a wide variation in structures and components, indicating that a range of specifications and/or contractors were used. The remnants of this failed venture record a period when farmers and governments were trying desperately to control rabbits. Using railway fences as a basis for a rabbit-proof barrier was an excellent concept: the government owned the fences, the railways crossed the agricultural areas of the state and provided convenient transport, adding netting would save money, and the technology was available. Unfortunately, the timing was poor, and professional rabbiters were deliberately spreading rabbits to enhance their employment. Thus the fence, like all others before and since, failed. Over time, the fences fell into disrepair, and today the heritage of the fence is rather sad. Worse, remaining segments are frequently bulldozed as being inconvenient rubbish obstructing necessary maintenance on the lines that are still operating.

History recorded by railway fences: reading the library of a landscape

Expansion of the agricultural areas of South Australia after the 1850s was complex, and subject to a range of government regulation (Meinig 1988). One of the earliest restraints was ‘Goyder’s Line of Rainfall’ running irregularly across the colony north of Adelaide. In 1865, Surveyor-General George Woodroffe Goyder mapped ‘the line of demarcation between that portion of the country where the rainfall has extended, and that where the drought prevailed’. Subsequently as areas were released for agricultural expansion, Goyder hardened his views on the Line into a real boundary, maintaining that no agriculture should be permitted to its north. However the tide of expansion and the clamour for land forced the government to over-ride Goyder’s objections and pass the 1874 Waste Lands Amendment Act (SA), essentially opening all land in the colony to agriculture. The call of the time was ‘the rain follows the plough’.

As land was made available, new settlers successfully farmed wheat, and demanded railways for transporting their crops to ports such as Port Augusta. The line north from Port Augusta reached Hawker in June 1880, and Government Gums
(renamed ‘Farina’ in honour of its wheat potential) in 1882. The new farmers cultivated their land and reaped their crops, demonstrating to themselves that Goyder was wrong. However, declining rainfall leading to a severe drought in 1880-1882 brought a retreat from cultivation, abandonment of farms and vindication of Goyder. One legacy was drifting soil moved by wind and water which buried the railway and its parallel fences. Only continuing maintenance kept the lines free of the sand, but over time, many of the fences were buried (Figure 8).

The fences were built to uniform specifications and thus when they are part-buried, they provide an accurate measure of the depth of burial at each post, rigidly placed ten feet apart across the landscape. Buried SAR fences are common north of Hawker, and south across the Willochra Plain to Quorn. Measuring these fences would provide a wealth of data about changes in the landscape following the ill-advised movement of cultivation north of Goyder’s Line. Thus these fences, along now-abandoned lines, record not only the investment in the railway construction, but also the expansion and then failure of farming that preceded the railways and was one of the primary justifications for them.

The future: how do you conserve an object that is thousands of kilometres long and a few millimetres wide?

Every heritage group trying to maintain an old railway knows only too well the difficulties of conserving railway heritage. Most groups aspire to the principles of the Burra Charter (Walker & Marquis-Kyle 2004), but underlying all the decisions is the hard reality of insufficient money. Thus it is easy for railway fences to be neglected. This is exacerbated by the lack of appreciation of the fences as integral components of railway corridors, and lack of understanding of the heritage information contained in the fences.

But how do you conserve fences? While they may be cheaper to conserve than permanent ways, they only a few millimetres wide but kilometres long. The components may be unavailable except by scavenging/cannibalising other contemporary fences, and as the history of maintenance/replacement is almost certainly unknown, the original fence is a chimera. Groups contemplating restoring or reconstructing heritage fences along lines should consult the only published guidelines: those for NSW (RSA 2000). Seeking information on historic fence structures and components is difficult, time-consuming and frustrating. Locating records in archives may be difficult, although for the Victorian Railways, the research of Arthur Brook provides both a wealth of information that sets an almost impossible benchmark for other states.

All fences have a built-in use-by date, and although many last for decades longer, most succumb to the ravages of termites, bushfires, poor maintenance, accidents, and deliberate bulldozing. Where the fences bound private property, adjoining landholders may require a modern fence, and little thought is given to the heritage information that is being lost.

It is simply not possible to conserve all railway fences, even if the money were available. However, detailed recording of remnants provides some information on the type of fence used on a line at a particular time. Beyond this, it is possible to maintain some sections in close to original form and structure after careful examination of fences of similar age. Ironically, many railway fences survive even after disused lines are dismantled. Parallel fences marching across the landscape, bounding an empty and forlorn railway corridor, remind us of the role of railways in opening up Australia and of their heritage.

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An excellent source of 19th century fencing catalogues is the website of the Museum of English Rural Life which contains numerous scanned catalogues. URL: http://www.rdgl.ac.uk/rhc/the_collections/ad_search.html, viewed 16 May 2007.


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