

THE GREAT NORTH ROAD

NSW

NOMINATION FOR NATIONAL ENGINEERING LANDMARK

Engineering Heritage Committee

Newcastle Division

Institution of Engineers, Australia

May 2001

Introduction

The Newcastle Division's Engineering Heritage Committee has prepared this National Engineering Landmark plaque nomination submission for the total length of the Great North Road from Sydney to the Hunter Valley, NSW.

The Great North Road was constructed between 1826 and 1836 to connect Sydney to the rapidly developing Hunter Valley area. It was constructed using convict labour, the majority in chain gangs, under the supervision of colonial engineers, including Lieutenant Percy Simpson.

Arrangements have been made to hold the plaquing ceremony on the 13 October 2001 to coincide with the National Engineering Heritage Conference in Canberra the previous week. Her Excellency Professor Marie Bashir AC, Governor of New South Wales, has accepted our invitation to attend the plaquing ceremony as our principal guest. A copy of the Governor's letter of acceptance is attached.



*Old Great North Road
Devines Hill*



Clockwise from top left: general view downhill before pavement resurfacing; culvert outlet in buttness; buttnessed retaining wall; new entrance gates, and possible plaque position, at bottom of Devines Hill; typical culvert outlet in retaining wall.

Commemorative Plaque Nomination Form

To:

Commemorative Plaque Sub-Committee
The Institution of Engineers, Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Date: 22 May 2001
From: Newcastle Division
Engineering Heritage Committee
(Nominating Body)

The following work is nominated for a **National Engineering Landmark**

Name of work: **Great North Road, NSW**

Location: **From Sydney to the Hunter Valley via Wisemans Ferry and Wollombi
(over 240 km in length)**

Owner: **Numerous bodies including NSW Roads & Traffic Authority, NSW
National Parks & Wildlife Service (NPWS), local councils and private
landowners (proposed plaque site located on NPWS land).**


The owner has been advised of the nomination of the work and has indicated approval
(attach a copy of letter if available) **NPWS has agreed to participate in the
plaquing ceremony (letter dated 1 May 2001 attached).**

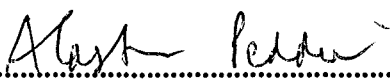
Access to site: **Devines Hill is open to the public. Due to carparking limitations
appropriate transport arrangements will be made.**

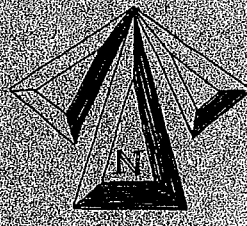
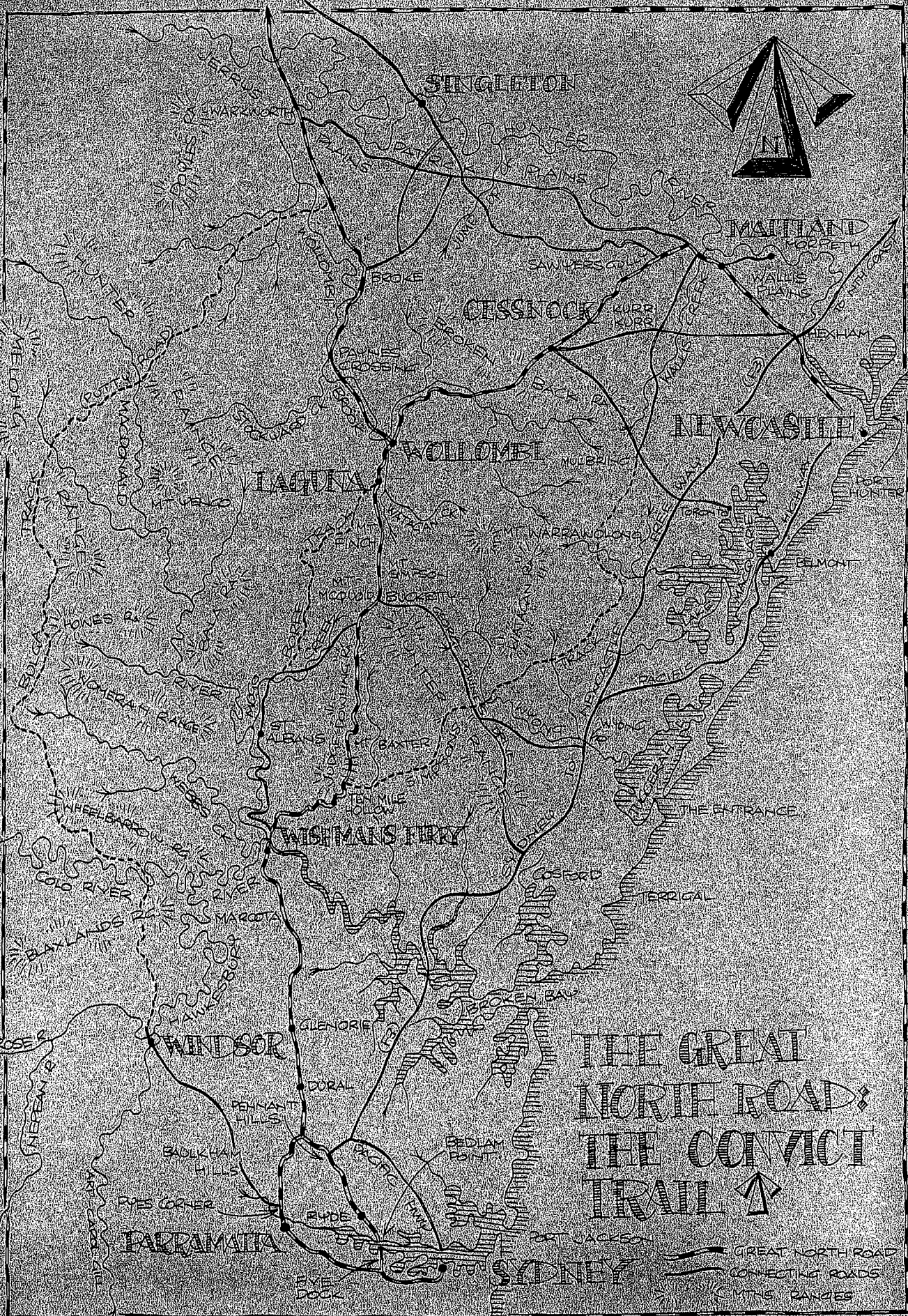
Future care and maintenance of the work: **A Conservation Plan has been prepared
for the road by the *Convict Trail Project* (a local interest group) in collaboration
with the owners and interested parties.**

Name of sponsor: **NPWS**

For a NEL, is an information plaque required? **Yes – A information plaque as
drafted is proposed for erection at Devines Hill.**


.....
Chairperson of Nominating Committee


.....
Chairperson of Division Heritage Committee



THE GREAT NORTH ROAD: THE CONVICT TRAIL

— GREAT NORTH ROAD
— CONNECTING ROADS
— THE RANGES

SINGLETON

MATTIAND

GESSNOCK

NEWCASTLE

ACCOLMEL

TARRYTOWN

WISMAN'S FURY

WINDSOR

PARRAMATTA

SYDNEY

SWAMPSCOTT

SAWDOES

WALLS

WARRANLONG

GLENORIE

DORAL

BAULKHAM HILLS

PYRE CORNER

RYDE

EVE DOCK

GREAT NORTH ROAD

CONNECTING ROADS

THE RANGES

Additional Supporting Information

Name of work: **Great North Road, NSW**

Year of construction: **1826 to 1836**

Period of operation: **Parts of the road, including bridges, are still in use.**

Physical condition: **Varies from very good (eg Devines Hill section) to poor.**

Engineering heritage significance:- **High**

Technological/Scientific value: **Application of revolutionary road building techniques, developed in Europe in the late 18th /early 19th century, to a rugged Australian environment.**

Historical value: **Major engineering contribution to Australia's early colonial settlement.**

Social value: **Connected Sydney to the rapidly developing farmlands of the Hunter Valley.**

Landscape or townscape value: **Integral part of the local landscape.**

Rarity: **Best remaining example of convict built roadworks (nomination for World Heritage listing on this basis is currently in progress).**

Representativeness: **Early 19th century Australian highway engineering.**

Contribution to the nation or region: **Infrastructure which helped open up the new colony.**

Contribution to engineering: **Helped establish road building techniques in rugged Australian conditions.**

Persons associated with the works: **Lieutenant Percy Simpson; Assistant Surveyor, Henage Finch; Lieutenant Jonathan Warner and over 900 convict labourers.**

Integrity: **Partly conserved and restored (eg. Devines Hill section); other sections underlie the existing road.**

Authenticity: **Confirmed by Archaeologists and Engineering Heritage experts.**

Comparable works (a) in Australia: **The Great Western Highway over the**

Blue Mountains.

(b) overseas: N/A

Statement of significance, its location in the supporting documentation:
Stage 1 Conservation Plan , section 4, pp 26-35.

In summary ...”The Great North Road is an item of National heritage significance. It has values under all relevant heritage assessment criteria, including historic, aesthetic, scientific and social significance as expressed by the ICOMOS Burra Charter, and under the SHI criteria. The Road also fulfils numerous assessment criteria as expressed by the Australian Heritage Commission.”

NSW Heritage Council Listing: **Section between Devines Hill & Mount Manning, Wisemans Ferry (Ref No 00991, Gazette Date – 2 April 1999).**

Australian Heritage Commission Listing: **Great North Road Section, Wisemans Ferry (Registered 21 March 1978, Database Number 003206).**

Citation (70 words in optimum): **See attached plaque wording**

Attachments to submission (if any):

- **‘Explore the Convict Trail, Great North Road’, publication produced by Tourism New South Wales, The Convict Trail Project and the NSW Roads and Traffic Authority.**
- **Copy of paper printed in Transactions of the Institution of Engineers-Multi disciplinary, (Vol GE9, No 2, October 1985) titled ‘The construction of the Great North Road, NSW, 1826-1836’, Dr Grace Karskens;**
- **Copy of paper printed in the United Service publication (Vol 45, No 4, April 1992) titled ‘Lieutenant Percy Simpson - Road and dam construction in early New South Wales, Lieutenant R R Ash; and**
- **Percy Simpson: Some background notes, Alan Wickham.**
- **A copy of the *Stage 1 Conservation Plan for the Great North Road including mapping* can be viewed on the Convict Trail Project’s website (www.convicttrail.org).**
-

Proposed location of plaques:

- **Bottom of Devines Hill, northern side of Hawkesbury River**

(Logo)

**NATIONAL ENGINEERING
LANDMARK**

GREAT NORTH ROAD

This road was built between 1826 and 1836 to connect early Sydney to the rapidly developing Hunter Valley region. It is over 240 kilometres long and was constructed by convict labour under the supervision of colonial engineers. Lieutenant Percy Simpson was responsible for the Devines Hill section. It illustrates efforts to apply methods emerging from the road building revolution in Europe to the harsh environment of the new colony. The Great North Road was part of Governor Darling's vision of a fine, permanent and all-encompassing road system.

**DEDICATED BY
THE INSTITUTION OF ENGINEERS, AUSTRALIA AND
THE NSW NATIONAL PARKS AND WILDLIFE SERVICE
2001**

Reference Material:

Guide to the Australian Engineering Plaquing Programme, The Institution of Engineers, Australia, November 1994.

Stage 1 Conservation Plan for the Great North Road, prepared by Siobhan Lavelle, Dr Grace Karskens, and RTA Technology for the Convict Trail Project, December 1998.

Old North Road, Devines Hill and Clares Bridge: Remedial Works, prepared for NSW NPWS by Bill Jordan & Associates Pty Ltd.

Great North Road Conservation Plan, Dharug National Park (Draft), NSW NPWS, May 1997.

The Convict Trail, the Great North Road, a self guided tour prepared by the RTA.

Convict Trail Project website at: www.convictrail.org

The construction of the Great North Road, NSW, 1826 - 1836, Dr Grace Karskens, Transactions of the Institution of Engineers - Multi-disciplinary, Vol GE9, No 2, October 1985.

Lieutenant Percy Simpson - Road and Dam Construction in early New South Wales, Lieutenant R R Ash, United Services, Vol 45, No 4, April 1992.

"The Grandest Improvement in the Country " - An Historical and Archaeological Study of the Great North Road, NSW, 1825 - 1836, Grace Karskens, M.A. Thesis, Uni. of Sydney, 1985 (2 volumes).

By Force of Maul & Wedge - Talking about the Great North Road - An informal Oral History of a Monument to Convict Engineering and Plans for its Preservation, compiled by Bill Bottomly, May 1996.

Percy Simpson: some background notes, Alan Wickham.

The Institution of Engineers, Australia
Newcastle Division
122 Parry Street
Newcastle West NSW 2302



NSW
NATIONAL
PARKS &
WILDLIFE
SERVICE

Attention: Mr Alastair Peddie

Dear Alastair

Re: Proposed IEAust Heritage Plaquing of Old Great North Road, Dharug National Park

Many thanks for your recent letter confirming proposed arrangements for the plaquing of the Devines Hill section of the Old Great North Road in Dharug National Park. As discussed with you I wish to confirm acceptance of the proposal on behalf of the Central Coast Hunter Range Region of the National Parks and Wildlife Service who will support the plaquing ceremony process in the following areas;

1. Production of sandstone stand to hold plaque. Please provide details of plaque dimensions to Acting Ranger Alan McDonough on 0245 664458 by 20 May 2001 in order that financial arrangements can be addressed.
2. Morning tea for official party and guests. The NPWS will facilitate morning tea for the official party and guests. An expected or estimated number of participants is required.
3. Media coordination. As discussed the NPWS Media Officer Mr Brian Davies will coordinate media prior to and on the day. I have discussed tentative arrangements with Mr Davies and will ask him to liaise with you in due course in this regard.

The NPWS liaison officer in regard to the ceremony will be Mr Alan McDonough, Acting Dharug Ranger, who can be contacted on 0245 664458. Would you please liaise with Mr McDonough in due course in relation to the details mentioned above.

Thank you again for considering the Devines Hill section of the Old Great North Road for the plaquing ceremony. The NPWS is very proud of its recent achievements in managing conservation on the road, and believes that the plaquing ceremony is due recognition of the efforts of all parties in conserving this very important heritage site.

Yours sincerely

Anthony Horwood
Area Manager Yango
Central Coast Hunter Range Region
For Director-General

1 May 2001

Central Coast
Hunter Range Region
Suits 36-38,
207 Albany Street North,
Gosford 2250.

PO Box 1477,
Gosford
NSW 2250
Tel: 4324 4911
Fax: 4324 7747
Internet:central.coast
@npws.nsw.gov.au



OFFICE OF THE GOVERNOR

SYDNEY 2000

18 April 2001

Ms S Chapman
Newcastle Division Director
The Institution of Engineers, Australia
PO Box 208
THE JUNCTION NSW 2291

Dear Ms Chapman,

Her Excellency the Governor would be delighted to accept the Institution's kind invitation to attend a ceremony, plaquing the Great North Road as a National Engineering Landmark, to be held at Devine's Hill, Wiseman's Ferry on Saturday 13 October 2001 at 9.30 a.m.

I would appreciate receiving from you no later than 21 September 2001 written details of the intended arrangements for this Vice-Regal occasion.

Enclosed is a copy of Vice-Regal notes and some guidance material which may assist you in the development of a program for the morning. Should you have any queries please do not hesitate to contact me on 9242 4225.

Yours sincerely

Brian L. Davies
Official Secretary

The Construction of the Great North Road, NSW, 1826-1836*

Introduction

Upon his appointment as Chief Commissioner for Railways in 1856 Captain Martindale reported on the roads of New South Wales:

... on every side I learn that the roads of the country are deficient in everything that constitutes good roads. Originally ill-laid out, ill-drained or not drained at all, and never sufficiently metalled, in winter they are impassable sloughs, and in summer the rudest common earth roads. (Martindale 1857- 60)

His report thus succinctly dismissed the history and state of roads in New South Wales as universally inferior. He had been misinformed. The grand and elaborate feats of road engineering of only thirty years earlier had already been forgotten, along with the few ambitious engineers and the hundreds of unskilled convicts who executed them. The Great North Road is a material record of their strivings which belies Martindale's condemnation. It illustrates in a very direct way their attempts to apply the methods emerging from the road-building revolution in Britain in the late eighteenth and early nineteenth century to the new terrain, the difficulties they encountered and the modifications they made.

This paper gives a brief historical account of the road's inception, progress and eventual abandonment, and outlines the various aspects of early nineteenth century road-building in NSW in the general context of the contemporary developments in British road-building techniques.

**First published in Transactions of the Institution of Engineers - Multi-disciplinary, Vol GE9, No 2, October 1985*

By the early 1820s the colonists of New South Wales were beginning to see the new colony in a more favourable and optimistic light as a 'true mine of colonial wealth' (Byrne 1848). Demographic expansion from this time was extremely rapid, particularly in the Hunter Valley where many newly arrived, wealthy and well-connected immigrants took up land. (Jeans 1972, Wood 1972). They were fortunate in having a responsible and far-sighted Governor in Ralph Darling, who tried to endow the colony with, among other things, a fine, permanent and all-encompassing road system.

The original line of the Great North Road had already been surveyed by Assistant Surveyor Heneage Finch in 1825. He had arrived only a few months earlier and was said to have '... graduated brilliantly in Mathematics at Christ Church, Oxford' (Wood 1972). The line of road selected and

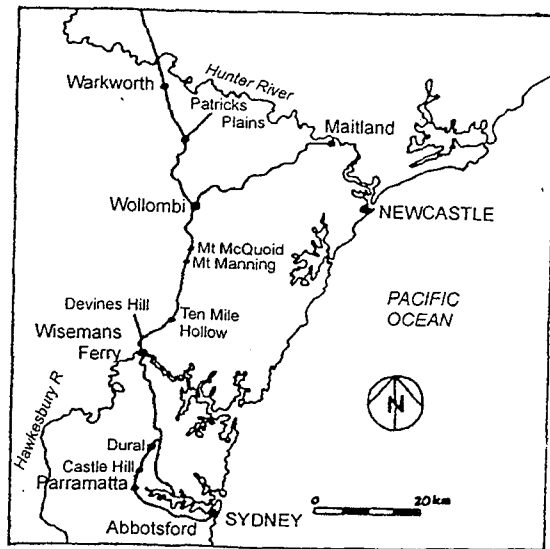


Fig 1: Original location of the Great North Road, New South Wales

(see Figure 1). In 1826 a petition was received from the wealthy and articulate settlers of the Hunter Valley and construction commenced with a modest force of 62 men at Castle Hill North shortly thereafter (Ref. 1a).

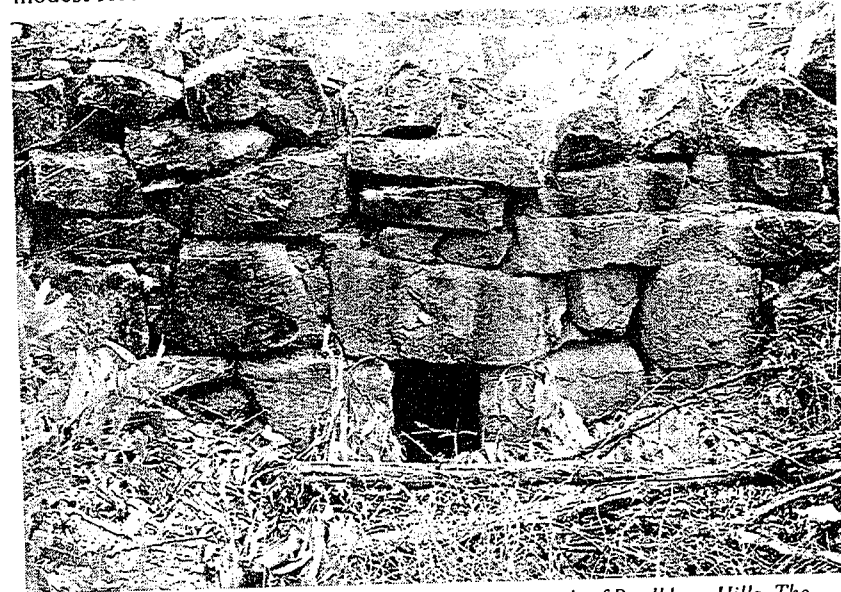


Fig 2: Culvert outlet and retaining wall, 40.4km north of Baulkham Hills. The small scale and low standard of the work are typical of the early construction period (1828-28).

From 1827 the works were supervised at Wisemans Ferry by Lieutenant Jonathon Warner of the Royal Veterans. Judging from his reports, his approach appears to have been one of thrift and expedience, a judgement reinforced by the material remains from this early period (Ref.1a). The walls and drainage structures are scarce, crude and poorly built (see Figure 2) and the road itself is in places narrow and winding even by contemporary standards.

This work contrasts dramatically with the impressive structures supervised by Warner's successor, Lieutenant Percy Simpson, who arrived at Wisemans Ferry in mid-1828. Simpson probably had formal qualifications as a surveyor or engineer, although the source is unknown. In a letter to Earl

...ing in England, which indicates his conver-
 sance with the road building technology emerging in Britain at that time
 (Refs. 4, 1a). Over a four-year period he superintended up to 700 convicts,
 the majority in chain gangs, and designed a road which scaled steep rocky

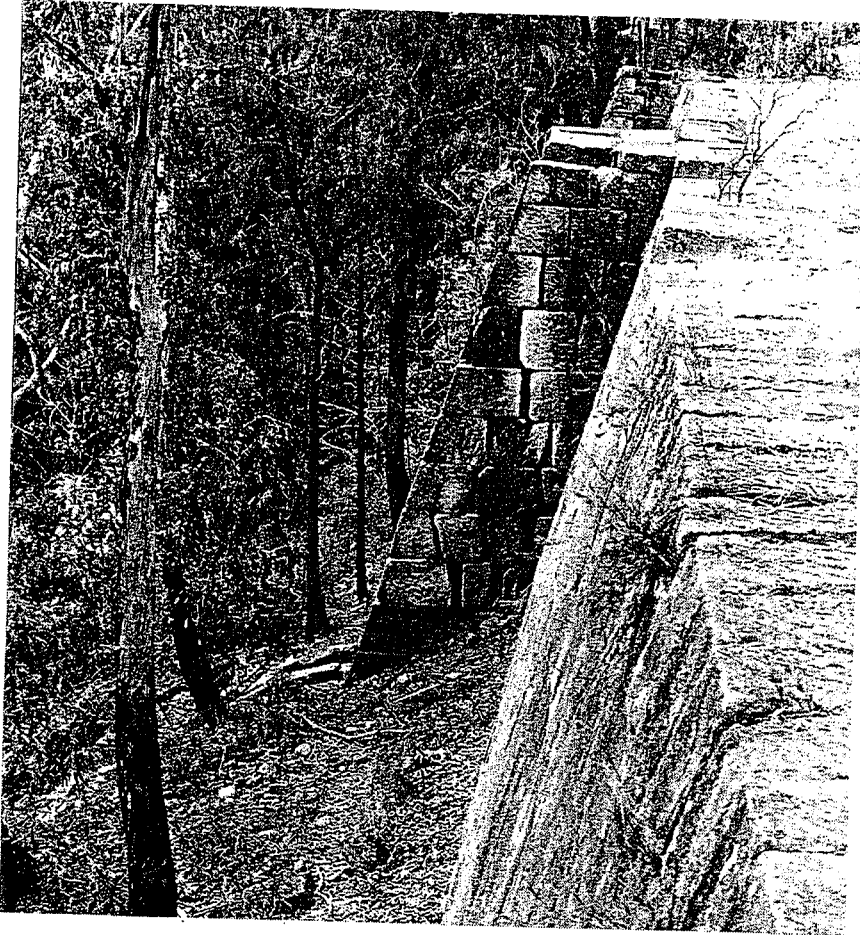


Fig 3: Buttress 1, south elevation and adjoining retaining wall. This is the smallest of the four (originally five) buttresses on Devine's Hill (1830-31.)



Fig 4: Culvert outlet with arched voussoir stones, set in curved retaining wall; 13.9 km north of Mt Manning junction (1830-31)

valleys between Wisemans Ferry and Mt Manning. The formation at Devine's Hill was supported by ashlar masonry retaining walls, at one point heavily buttressed, and drained by an extensive drainage system of tremendous variety in design and finish (see Figure 3).

It was during Simpson's period that the new Surveyor General, Thomas Mitchell was assigned the reassessment of the road's location. Mitchell was obsessed with the directness of roads and this led him not only to considerably alter the established line between Ten Mile Hollow and Wollombi, but also to add a branch between Abbotsford and Dural and a new section at Devine's Hill, just north of Wisemans Ferry (Mitchell 1856). These additions entailed the abandonment of sections already constructed by the gangs. Mitchell also added the branches to the Upper Hunter between Wollombi and Broke and thence to Warkworth and Patrick's Plains (see Figure 1) (Mitchell 1856, Jeans 1972). His vision of an all-encompassing great thoroughfare fitted neatly into his overall plan for the colony. A

me as perpendicular to a horizontal coast of N.S.W., succinctly illustrating his whole approach to colonial road planning (Ref. 2a).

In 1830 Heneage Finch, the road's original surveyor, was appointed supervisor of the area up to and including the Hunter Valley north of Mt Manning. His aim was to 'complete a road equally secure with the other part' (Ref. 2b) (that is, Simpson's section) and, as the material remains at Mt McQuoid, Mt Simpson and Mt Finch testify, he succeeded. The gangs again blasted and cut their way through rocky spurs, built massive embankments and retaining walls, and bridged the numerous creeks in the Wolombi Valley (see Figure 4).

Finch was abruptly dismissed from the post in 1831 after conflict arose between Governor Darling and Mitchell over Finch being stationed with the gangs on his own property at Laguna (Ref. 2a, H.R.A. Vol.16 p.25). His departure marks a turning point in the construction period. Where the earlier engineers had been confident, ambitious and successful in conquering vast distances and the wilderness, Finch's successors, L.V. Dulhunty (1831-1834) and Peter Ogilvie (1835-1836) showed progressively less enthusiasm for the works (Ref. 2b, H.R.A., Vol.16 p.188). Governor Darling was recalled in 1832 and with him went the impetus towards the completion of the Great Roads. The labour force of convict gangs dwindled - in 1836 Ogilvie was left with two gangs of ten men each and 'many of those are cripples' (Ref. 2b).

From 1832, settlers used the newly established steamboat service between Sydney and Newcastle. If they did travel on land, they often ignored the official road, following instead the more direct or hospitable lines such as the Maroota Ridge Road, the St Alban's Road and the Peat's Ferry Road (Abbott 1943, Upton 1932).

In spite of early promise and ambitions, the Great North Road was virtually abandoned, probably unfinished, in 1836. It is, however, as a direct result of this early abandonment that so much material evidence survives, providing, as we have seen, a record not only of the impressive but also of the more modest work.

Interest in road construction in Europe and particularly in France during the eighteenth century spread to England in the 1790s and 1800s and thence to New South Wales in the 1820s (Forbes 1958). The new technology, developed principally by John Metcalfe, Thomas Telford and John Loudon MacAdam, focussed on the development of long-wearing pavements and the proper drainage of roads, because it was the continual and rapid rutting, sinking and decomposition of the traditional convex earth roads which was regarded as their major defect (Law 1881, Newell 1938). Close attention also began to be given to the tracing and relocation of roads.

Later in the nineteenth century an explosion of publications about road building by men such as Henry Parnell, Richard Edgeworth, Henry Law, and of course Telford and MacAdam, covered almost every conceivable aspect of road tracing and construction (Parnell 1833, Edgeworth 1817, Law 1881, Telford 1838, MacAdam 1824). In retrospect their recommendations seem obvious and simplistic, but it must be remembered that the very concept of systematic road planning and design was, in the early nineteenth century, nothing less than revolutionary. Written and archaeological records indicate that much of this new technology was familiar to the engineers who arrived in New South Wales in the 1820s, and interest in this subject was fostered by Governors Brisbane and Darling (Ref. 2a, Dumaresq 1827). The following sections will examine the way in which the colonial engineers applied what they knew of this new technology, and the extent to which they were successful.

Clearing

The one aspect of road-making neglected in British texts was the clearing of new ground for roads. The tedious and laborious process of cutting through virgin forests was, of course, usually not necessary in Britain, while in New South Wales it was an essential and time consuming operation. Occasionally, when formations and cuttings were considered unnecessary or too expensive, clearing was the only form of road-making undertaken, and usually this path-breaking work provided a serviceable if rough 'horse track', preceding more elaborate work for some months or even years.

In August 1827, Lieutenant Wilford, the Surveyor of Roads and Bridges,

chain (22 yds/20.1m) in width and stumping one half that space in the centre' (Refs 1, 3b). The stumps of the felled trees were removed from the central carriageway but left in place on either side. Felling was done with either broad axes or cross-cut saws and the trees were cut so that they fell off the line of road. Much of the gangs' labour was expended in splitting, grubbing up and removing stumps. Later in the construction period, they were burnt out. The holes were then filled in and raked over in preparation for the construction of the pavement (Refs 2b, 3b).

Formation - Excavation and Embankment

The achievement of a manageable gradient involved the two basic operations of cutting the natural surface down to the level of the road, and/or filling over the surface to the required height, as circumstances dictated. Like their British counterparts, colonial road builders referred to such irregularities as 'hollows and points' (Parnell 1833, Telford 1838). Whenever the natural terrain sloped from one side of the alignment to the other, the lower side was embanked and/or the higher side was cut down (see Figure 5).

The formations from the second and third construction periods of the Great North Road (Simpson and Finch respectively) in particular were very impressive and durable. Both cutting and filling were required on very steep slopes, such as the descent to Wisemans Ferry, and at Devine's Hill, Mt Baxter, Mt McQuoid, Mt Simpson and Mt Finch, and the operations were usually simultaneous, the material from the cutting forming the embankment.

Where land was naturally level and well-drained, however, advantage was taken of these features and the line was simply cleared and, if necessary, a broken stone pavement laid (Ref. 1a). Two elaborate zig-zag ascents were constructed from the north and south banks of the Hawkesbury River at Wisemans Ferry.

Convicts employed in excavating the line were variously described as 'moving and splitting rocks', 'quarrying', 'widening', 'picking the side of the hill' or 'picking the bank' (Ref. 3b). Generally, where a rock cutting was required up to approximately 1.5 m in height, it was hand-cut with chisels or rock picks and the cutting had a vertical face. Larger cuttings were

in height from 150 mm to 15 m while embankments are as shallow as 300 mm and, where enclosed by retaining walls, reach 9 m in height.

The filling of deep or extensive hollows and embanking of steep slopes was usually accompanied by the construction of masonry retaining walls of

widely varying quality. The operations were again simultaneous - the embankment was kept filled to the height of the retaining wall. Lockyer, the Surveyor of Roads and Bridges from 1828, instructed that formations and pavements were to be compacted by natural settling and evenly distributed traffic (Ref. 1a). Hand carts and waggons drawn by bullocks were used to transport this fill material (Ref. 3b).

The engineers who designed the Great North Road faced a multitude of topographical conditions, often extreme in extent and ruggedness. Some measures, such as the avoidance of any formation whatsoever on the flat, rocky, well-drained ridges, were taken for economy. In other areas, such as precipitous mountain slopes, no expense was spared in constructing the massive formations necessary to maintain easy grades. The formation of continuous cuttings, drains and pavements from natural rock shelves and platforms illustrates the utilization of available material in a simple and convenient fashion. For the main part, the formations from the

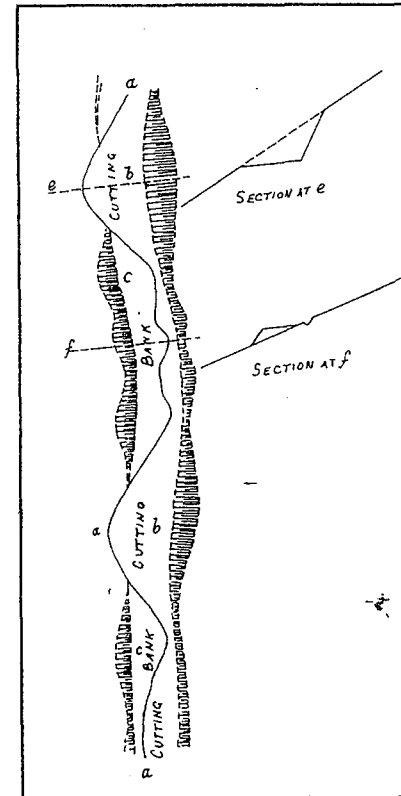


Fig 5: "Contouring a road on surface gradients"; Dobson's illustration of cutting and filling. Source: Edward Dobson, *Pioneer Engineering*, (1877), p46.

Blasting and Quarrying

The use of gunpowder was essential in opening the difficult parts of the line and blasting was undertaken throughout the construction period. Without it, the sheer volume of rock at locations such as Wisemans Ferry, Geber Gunha, Sampson's Pass, Mt Simpson and Mt Finch in particular, would have precluded the construction of the road on this scale. Assistant Surveyor Hughes wrote in July 1828:

Overseer Barker's gang [No. 4 Iron Gang on the descent to Wisemans Ferry] is quite at a standstill for want of mauls and gunpowder. The road which they are about was made through solid rock principally...(Ref. 1a)

As early nineteenth century blasting techniques were very traditional and fairly simple, it is likely that those convicts involved in 'jumping and blasting' employed basically the same general techniques as described by nineteenth century writers. These comprised

...boring suitable holes in the rock to be dislodged ... inserting a charge of some explosive compound into the lower portion of these holes... filling up ... the remaining portions of the holes with suitable material and... exploding the charge. (Andre 1878, Burgoyne 1863)

The on-site evidence of blasting on the Great North Road comprises shot holes, usually triangular in cross section but sometimes round or faceted. In contrast to the methods universally described in technical manuals, the triangular and faceted jumpers used in boring were not turned as they were driven into the rock. Most of the shot-holes are 38 mm wide at the top, decreasing slightly over their lengths, which vary between 300 mm and 1200 mm. At very rocky points several hundred shot holes are scattered all over the cuttings, notably at Devine's Hill, although in less rugged areas groups of more than two or three are rare.

Specific references to tools and techniques are scant in the written records, but a number of points may be drawn from the road gang reports and other reports. Since even numbers of convicts are invariably listed for the task of jumping holes, it appears that men were employed in pairs, rather than alone or in threes. The jumper was thus probably used with a hammer or sledge, rather than alone, in the 'double-handed' fashion described by

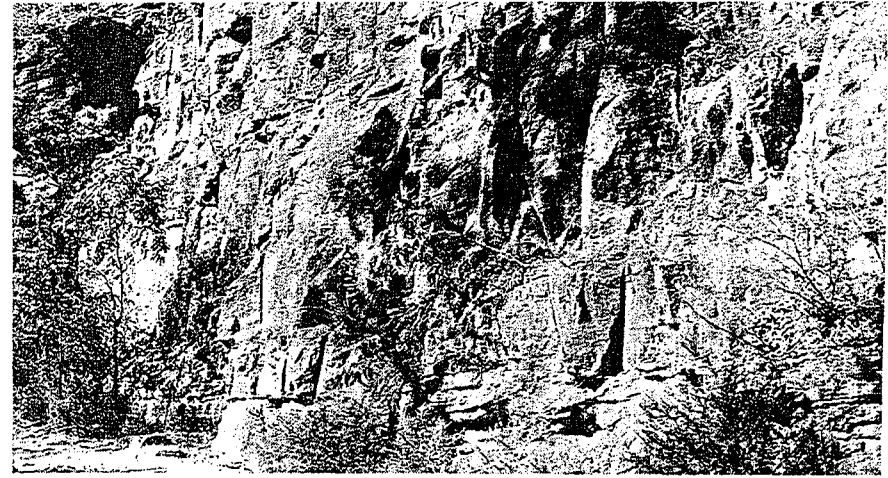


Fig 6: Heavily blasted and quarried cutting, Devines Hill. These cuttings are common along the road in precipitous areas.

Andre (Andre 1878). As a result of the scarcity and irregular supply of gunpowder, the tasks of jumping and blasting were often divided, the former being undertaken well in advance of the arrival of the powder (Ref. 3b). It appears that clay was the material used for tamping the holes, as recommended in the British manuals of Burgoyne and Andre (Ref. 1a, Burgoyne 1868, Andre 1878).

Simpson unwittingly summed up the nature of much of the road's construction when he reported in 1830 that 'some lofty and massive side walls will be necessary and are constructed on this road from stone quarried by force of maul and wedge' (Ref. 3b). These tools were mentioned frequently in reports and there are numerous examples of abandoned wedge-pits or 'pool holes' cut into rock faces with chisels or picks. The wedges were driven into these with mauls in order to split the rock into large slabs. It was then removed from the quarry (see Figure 6) to the construction site, and there dressed to the required shape and size.

In both blasting and quarrying operations, the gangs employed the simplest

Pavements

Of the numerous engineers working on road construction in the early nineteenth century, Thomas Telford and John Loudon MacAdam achieved the widest recognition, mainly for their experimentation with and design for the new durable surfaces. Thomas Telford (1757-1834), originally a stonemason, gained most of his recognition for road-building through his work on the London-Holyhead Road between Shrewsbury and Holyhead. He directed that it be 30 feet wide, with a causeway 18 feet wide in the centre and constructed in three layers:

... a bottom course ... set seven inches deep in the middle and five inches at the side (of) stones neatly set by hand, the lengthways ... across the road, the broadest edge to be downwards (Telford, 1838)

The interstices were to be filled in with stone chips 'firmly packed by hand'. The next course comprised six inches (deep) of 2 1/2 inch gauge broken stone, and the third layer was one and a half inches of 'good binding gravel' (see Figure 7).

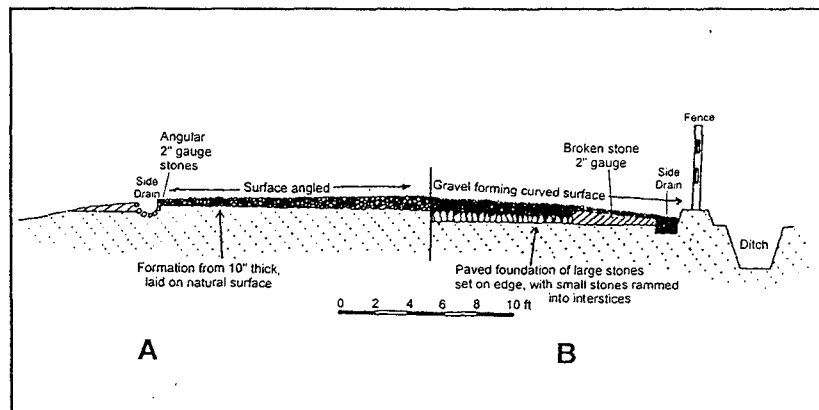


Fig 7: Cross section of (a) MacAdam's, and (b) Telford's road design. Drawn from specifications given in John I. MacAdam, *Remarks on the Present System of Roadmaking*, (1824) and Thomas Telford, *Life of Thomas Telford*, (1838).

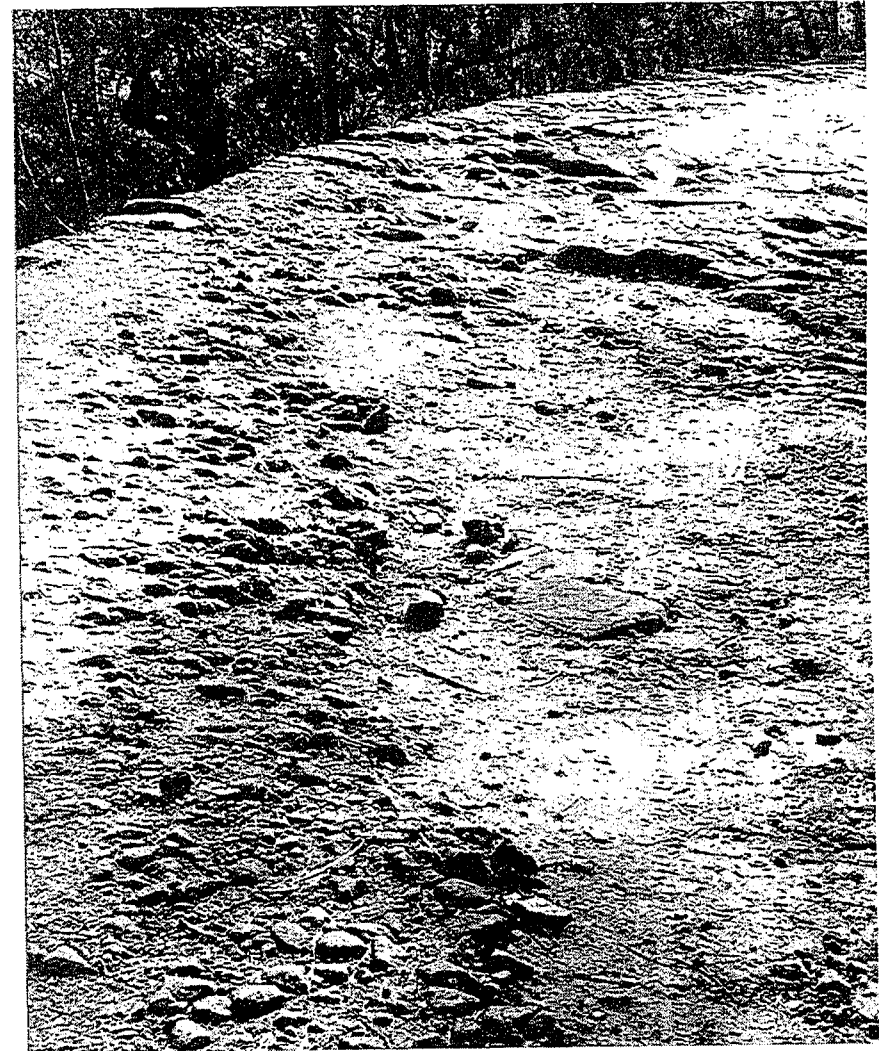


Fig 8: Typical pavement construction, Devines Hill. Remnants of the fine gravel course are visible near the retaining wall

it is preserved in a dry state, it will carry any weight without sinking (cited in Forbes, 1958).

The key to the success of this theory was the maintenance of the road in a completely dry state. The first step was 'the reverse of digging a trench', the road being raised above the adjacent ground so that there was a sufficient fall to take off water. The pavement was to be of carefully graded angular stones of up to 2" gauge, laid in thin layers in three stages, with time allowed between each application for consolidation by traffic (see Figure 7). MacAdam maintained that this surface could be as little as 10 inches thick, but he provided no rigid rules for thickness such as those given by Telford - he wrote that 'the thickness of the road should only be regulated by the quantity of material necessary to form such impervious covering' (MacAdam, 1824).

Although they agreed on the need for solid surfaces, proper drainage, and on the evils of the highly convex surface, the theories of Telford and MacAdam differed radically, the argument being based on the actual function of the pavement and its foundation. In Telford's view, the pavement, with its heavy foundation, was to bear the weight of traffic, while to MacAdam the relatively thin layers of stone simply kept water from penetrating the natural ground, which was the true carrier of traffic.

The controversy in England over the merits of the rival theories of Telford and MacAdam apparently did not concern the early nineteenth century road engineers in N.S.W. Faced with the problems of vast distances, an unwilling and unskilled labour force, rugged terrain and lack of tools, they could not afford the luxury of argument over the issues which concerned their counterparts in England. The interest in constructing strong, durable roads had, however, been present since Macquarie ordered that pavements be made of 'lasting materials'. (*Sydney Gazette*, 28 April 1810).

By 1828, only four years after MacAdam published his major work, the Surveyor of Roads and Bridges, Edmund Lockyer, was giving detailed instructions on the construction of such pavements to his Assistant Surveyors at their various outpost stations:

It is necessary that Assistant Surveyors should be particular in the selection of the material for laying on the road. The best in the colony is the

over, first passing it with a screen to let the soil pass through, makes an almost impenetrable road (Ref. 1a).

This pavement was thus a hybrid of both Telford's and MacAdam's directives. Lockyer's instructions echo almost exactly those of Telford for the Holyhead Road, as discussed, except that the expensive foundation of large stones was omitted, as recommended by MacAdam. The inclusion of fine gravel and the specified thickness of only 6", however, clearly distinguishes the instructions from those of MacAdam. The screening of gravel to remove any water-retaining material had been stressed by both theorists. Lockyer's further directives show that he had also shared MacAdam's particular concern with adequate drainage, continual maintenance and even wear and compaction by traffic (Ref. 1a).

The road gang reports from the Great North Road surviving in the State Archives indicate that a large proportion of men in each gang was involved in forming the surface, and the tasks connected with it were described variously as 'breaking stone', 'picking gravel', 'shovelling gravel' and 'raking the road' (Ref. 3b). It is clear from the written records that broken stone was commonly used for constructing the surfaces of the Great North Road and other colonial roads in the 1820s and 1830s. More detailed information concerning these pavements is provided by their material remains.

The problems connected with examining and assessing such remains are obvious. This aspect of the road's construction is the most transient, having been subject to more wear, damage and alteration than any other. In spite of this there are a few small sections scattered at various locations which, by their strong resemblance to contemporary descriptions and instructions, appear to be original. The remnants occur exclusively in sections which have been long abandoned, and are thus more likely to have been safe from both extensive wear and maintenance operations.

The most southerly example of Lockyer's instructions put into practice occurs in the abandoned section 40.4 km north of Baulkham Hills. A pavement of fairly evenly graded compacted broken stone of 60 - 65 mm gauge extends for 9 m and is up to 7 m wide. Part of the pavement on the west side of the road has been washed away, revealing its thickness of approximately 150 mm.

been eroded across the roadway, the fill of large broken stones is exposed, with the remnants of an upper layer of compacted stone, 75-100 mm gauge (rather than 50-65 mm), forming a central strip above. Figure 8 shows examples of the upper layer and the fairly even grading of the stones, and also the remnant of a course of ironstone gravel, 12 mm gauge and finer, which runs continuously along the outer edge of the road. Another abandoned section at Mt McQuoid also illustrates a version of Lockyer's instructions. Two sections of broken stone pavement are intact. The first is 6-7 m wide and comprises compacted stones up to 100 mm in diameter. An earthen table drain on the east side reveals the thickness to be, again, approximately 150 cm. A similar section, approximately 8 m long and 7 m wide, occurs further north.

Where rock platforms or shelves were encountered on the line of road, they were usually incorporated into the roadway by simply smoothing any projections with picks or chisels, cutting the requisite width and filling any gaps with broken stone to level it. Side drains were also cut from the rock at the same time. Examples of such sheet stone surfaces are numerous and often extensive, and it appears likely that, given the vast masses of rock occurring in some locations, such as Mt McQuoid, the road was frequently aligned and levels arranged to take advantage of the virtually imperishable surface they provided.

What emerges from both written and material sources is that several of the most important strands from the new theories about road pavements were drawn out, transferred and applied in N.S.W., resulting in a range of hybrid constructions featuring characteristics of both Telford's and MacAdam's approaches, interspersed with the totally expedient selection and shaping of natural rock platforms to form the Great Road.

Drainage

In 1835, towards the end of the road's construction period, Assistant Surveyor Ogilvie informed his superiors that, if a road were to be permanently completed, '...it will be necessary to ditch on either side and also to drain by diagonal cuts across the road at the most convenient distance' (Ref. 2b). This was in fact a summary of the drainage system employed on

surviving drainage system illustrates an extremely wide range of alternatives in construction, positioning, and dimensions. This range not only reflects adaptation to the various requirements of the terrain and the material available, but also indicates the large number of builders involved in construction.

In his 1828 'Draft of Instructions to Assistant Surveyors' the Surveyor of Roads and Bridges, Edmund Lockyer, reiterated the importance of drains but failed to give details of their construction:

...one mode of keeping roads in good order is to keep them dry, that is that the water must not lodge on them or against them. The drains cut at the sides already prove the great good of them. (Ref. 1a).

He thus understood MacAdam's maxim that the maintenance of the road in a dry state was crucial to its preservation. In a subsequent 'Circular to Assistant Surveyors' (May 1829) he further directed that drains be regularly cleared.

Side drains would originally have lined the entire road on both sides in the case of flat land, and on the uphill side only where the road was built up on a slope. They were excavated from earth or cut from rock where it occurred, and, in the latter case, often combined with cuttings and sheet stone surfaces. The size of surviving rock drains varies considerably between 50 mm and 600-900 mm in depth, and widths range between 300 mm and 1200 mm. Where a distinct shape was given to stone drains, they were either square or rounded and many bear chisel and pick marks. The most sophisticated include low walls or edging of 1-2 courses of stone on the alignment side.

Culverts of stone were set either perpendicular to the road alignment or obliquely across it at intervals according to the gradient. Culverts at sag points have double inlets to take water from both directions, while in continuously graded sections they have single inlets set at an angle to the alignment. The length of the culvert depended on the gradient and the variable width of the road.

In the case of oblique culverts, the length varies between approximately 7.7 m and 13.8 m. The angles at which most of them are set vary between 130 and 145 degrees, thus conforming with Major Browne's later recommenda-

primary road cuttings.

The most common surviving type of culvert is the stone box culvert, in which the inlet, four sides of the lining and the outlet comprise stone blocks and/or slabs. Generally, the earlier and more primitive examples are composed entirely of roughly cut rectangular stones and are usually relatively small (300mm x 300-600mm - see Figure 2). The culverts constructed during the second and third periods under Simpson and Finch usually comprised evenly shaped slabs of stone, or 'flags', of up to one square metre in size for the invert and lintels, with large stone blocks forming the walls. The later culverts also tend to be larger (600 mm square to 1 m square) and the lintels of the inlets and outlets commonly have curved soffits. Bedrock was often carved to form the base and/or sides of the lining. More elaborate versions of the stone box culvert are located at 12.3 km and 13.9 km north of the Mt Manning junction. These are rectangular and have arched outlets, the first carved in the lintel for decorative effect, the second constructed of shaped voussoir stones supporting the retaining wall above (see Figure 4). The more elaborate structures, such as the Devine's Hill buttresses and the Ramsay's Leap culvert, were equipped with substantial stone spillways and races, while many of the smaller culverts have cantilever slab spillways.

Like their British counterparts, the colonial engineers in N.S.W. placed great importance upon the provision of proper road drainage. They selected a simple system, suitable to the conditions and the workforce available, but then went to considerable lengths to ensure that it was adequate and sometimes even extravagant. The structures and their layout reflect not only a grasp of the basic principles of road drainage, but also a measure of improvisation and innovation on the part of the engineers.

Retaining Walls

The construction of the road over a ten-year period by numerous gangs under different supervisors resulted in an extremely diverse range of retaining walls, including rubble, block-in-course and ashlar work (cf. Figures 2, 3 and 4). Extensive examples of these walls line the road today, varying in dimensions from approximately 300 mm to over 9.5 m in height and between 300 mm and 1 m in thickness. In some cases a single course

The single common factor is that all the walls are dry-laid. Even walls comprising the smallest and most ill-shaped stones were not mortared, contrary to Henry Law's suggestion (Law 1881). The time consuming, much more expensive use of mortar would have complicated the works in these remote areas greatly and delayed progress even further.

The structurally efficient method of battering the face of the retaining wall was used extensively, as recommended by Telford and later road-builders in Britain (Telford 1838, Dobson 1871). Three techniques were used to achieve the batter - the first was to incline the beds slightly so that the face sloped. Often the beds were gradually made horizontal towards the top of the wall so that the coping course was level. The second method was to cut each of the outer stones with a sloped face, especially in the case of the

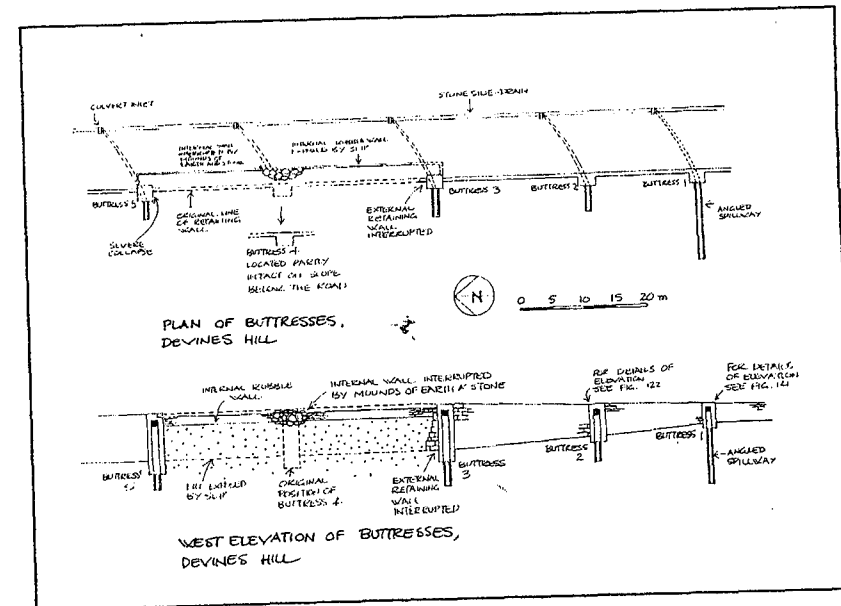


Fig 9: Plan and west elevation of the buttresses, Devine's Hill, showing extent of slip and exposed internal retaining wall.

profile. In some cases two of these techniques were combined, while for the crudest walls no attempt was made to slope the rough and uneven face at all. Most of the more carefully-prepared stones have tooled faces and bear evidence of the use of pointed, blunt, broad or flat-edged chisels or gads, while for walls of poor quality the stones were roughly worked with a hammer or axe.

The descent to Wisemans Ferry on the Hawkesbury River is particularly interesting, as it features two distinct styles of masonry, reflecting the work supervised by men of contrasting approaches and skills. At the base of the hill, where the gangs began in 1827, the work is roughly executed, with open bedding and perpend joints. Much of this portion of wall has collapsed. At around 311m from the summit, the style changes dramatically, having regular and continuous coursing (though still unlevel), tight joints and a relatively smooth face. This work matches the other walls supervised by Percy Simpson after mid-1828.

On the opposite side of the river it is, ironically, a massive slip in the retaining wall which provides important and otherwise inaccessible information about the construction of walls on the steepest sites. The damaged section occurs between the third and fifth buttresses, 840-888 m from the base of Devine's Hill. The wall was torn close to the north side of the third buttress and the whole of the retaining wall, including the fourth buttress, was dislodged, slipping in one section down the slope. The fourth buttress is still partly intact, surrounded by mounds of enormous dressed stones. The removal of the outer retaining wall and much of the fill behind it has exposed another retaining wall of lesser quality, though still quite solid, which was originally located about 3 m behind the outer wall, within the formation. It is possible that this inner wall continues further downhill, reinforcing the entire section (see Figure 9).

The five buttresses themselves comprise some of the most massive work undertaken on the whole road. Each was equipped with a culvert, with the outlet in the centre of the front face (see Figure 9). A 270-300 mm deep race below the mouth conveyed water down the face onto an apron and thence into a substantial stone block and slab spillway. At the end of this, stones and slabs were positioned at random to disperse water into the valley below.

along the side of the Simpson, prepared stones, tight bedding and perpend joints, a smooth face and even battering. A cantilever spillway directs water from a central culvert onto a flume with horizontal and inclined races. The coping course is carefully tapered to match the gradient of the roadway.

A broad spectrum of stone masonry styles was thus employed on the Great North Road, encompassing extremely diverse standards. On one hand, the simple broken stone walls are of the crudest standard possible. At the other extreme, the massive and highly visible ashlar work at Wisemans Ferry and Mt Simpson is a remarkable achievement, especially in view of the scarcity of skilled labour, the vast distances and isolation, and the scale of work necessitated by the rugged topography.

Bridges

The surviving bridges constructed on the Great North Road are the oldest known on the Australian mainland and comprise an excellent collection of evidence about bridge building in N.S.W. before the appointment of David Lennox in 1832. The latter, whose work is well-documented, was the first 'scientific' bridge builder in the colony (Newell 1938). Relatively little has been written about the simple bridges preceding his work, and primary sources are scattered and vague. On the Great North Road, however, seven bridges, or remains of bridges survive, each with different constructional features, forming a unique range of styles indicative of the state of engineering skills in N.S.W. at that time.

Conclusion

The end of the Napoleonic Wars in 1815 meant that the colony of New South Wales received not only large numbers of convicts and free settlers, but also a group of military men and civilians with much-needed engineering and surveying skills. They were for the main part ambitious for the success and recognition possible in the young colony, and they approached their staggering tasks with enthusiasm and determination. The difficult conditions and lack of adequate skills and tools forced the simplification of the new methods emerging from the road building revolution in Britain. Primitive means were employed to ambitious ends, resulting in the best road engineering possible in the colony at that time. The Great North Road represents a tangible and instructive record of both the engineers' vision

References:

UNPUBLISHED MANUSCRIPTS

Manuscripts held by the Archives Office of New South Wales:

1. Colonial Secretary

- a. In-letters, 1826-1834 and special bundles.
- b. Copies of letters to Surveyor General 1826-1833.

2. Surveyor General

- a. Copies of letters to Colonial Secretary, 1828-1835.
- b. Letters from private individuals and officials (including surveyors), 1822 - 1836.

3. Surveyor of Roads and Bridges

Letters from Colonial Secretary, 1826-1829 b. Weekly and monthly road gang reports, 1 volume, 1827-1830.

Manuscripts held in the Mitchell Collection, Public Library of New South Wales.

4. Colonial Office Records, Memorial of Lieutenant Percy Simpson to Earl Bathurst, 26 February 1822, C.O. 201/111, Folio 581.

PUBLISHED SOURCES

- Abbott, J.H.M., *The Newcastle Packets and the Hunter Valley*, Sydney, (1943).
- Andre, George G., *Rock Blasting - A Practical Treatise on the Means Employed in Blasting Rocks for Industrial Purposes*, London, (1878).
- Browne, Major James, "Construction of Roads of in Mountainous Tropical Countries", *Minutes of Proceedings of the Institution of Civil Engineers*, Vol.38, No.2, 1873-74, pp.67-85.
- Burgoyne, Sir J., *A Treatise on Blasting and Quarrying of Stone for Building and Other Purposes*, London, (1868).
- Byrne, J.C., *Twelve Years' Wanderings in the British Colonies from 1835 to 1847*, 2 Vols, London, (1848).
- Dobson, Edward, *Rudiments of the Art of Building*, London, (1871).
- Dobson, Edward, *Pioneer Engineering*, London, (1877).

(1011).

Forbes, R.J., "Roads to c1900", in Charles Singer et.al. (eds), *A History of Technology*, Oxford, (1958), Vol. 4, pp 520 - 545.

Historic Records of Australia, (H.R.A.), Vol.12, p.266; Vol.14, p.69; Vo1.15, p.820; Vo1.16, pp.24, 188.

Jeans, Dennis, *An Historical Geography of New South Wales to 1901*, Sydney, (1972).

Law, H., and Clarke, D.R., *The Construction of Roads and Streets*, London, (1881).

MacAdam, John Loudon, *Remarks on the Present System of Making Roads*, London, (1824).

Martindale, Captain Benjamin H., *Report to the Honourable The Secretary for Lands and Public Works on the Internal Communications of New South Wales*, Parts I-V, Sydney, (1857- 1860).

Mitchell, Sir Thomas L., *Report Upon the Progress Made in Roads and in Public Works in N.S.W. from 1827 to June 1855*, Sydney, (1856).

Newell, H.H., "Road Engineering and its Development in Australia 1788-1938", *Journal of the Institution of Engineers*, Vol. 10, parts 2 and 3, 1938.

Parnell, Sir Henry, *A Treatise on Roads Wherein the Principles on Which Roads Should be Made are Explained and Illustrated*, London, (1833).

Telford, Thomas, *Life of Thomas Telford Civil Engineer, Written by Himself*, London, (1838).

Upton, T.H., "The Establishment of Direct Road Communication between Sydney and Newcastle", *Journal of the Institution of Engineers*, Vol. 4, parts 5, 6 and 7, 1932, pp. 159-174, 204- 211, and 234-240.

Wood, W.A., *Dawn in the Valley: The Story of Settlement in the Hunter River Valley up to 1833*, Sydney, (1972).

LIEUTENANT PERCY SIMPSON — ROAD AND DAM CONSTRUCTION IN EARLY NEW SOUTH WALES

Address to members by Lieutenant R R Ash

It is a strange circumstance that the Australian Dictionary of Biography contains no entry under the name of Lieutenant Percy Simpson.

Simpson was a remarkable man who contributed greatly to the development of this Colony; he arrived in Sydney in 1822 with his wife and two children. I trust this talk will be helpful in providing some information about the life and work of this man.

He had an eye for style and elegance as evidenced by Oatlands House at Dundas which he built in 1838, but more importantly he was a man of great resource and versatility.

PERCY SIMPSON DISCOVERED

I first came across mention of Percy Simpson when making arrangements for a safety review of the graceful 140-year-old dam at North Parramatta standing on Hunts Creek behind the Burnside Homes. Built originally to provide a water supply for Parramatta, it now impounds a considerable storage in the Lake Parramatta Recreation Reserve.

It was necessary to go back to the dam's origins and I found that the Parramatta Committee of Water Commissioners at the time, had commissioned Lieutenant Percy Simpson to prepare the plans for a "circular dam". Regrettably, the plans do not seem to have survived.

PARRAMATTA DAM

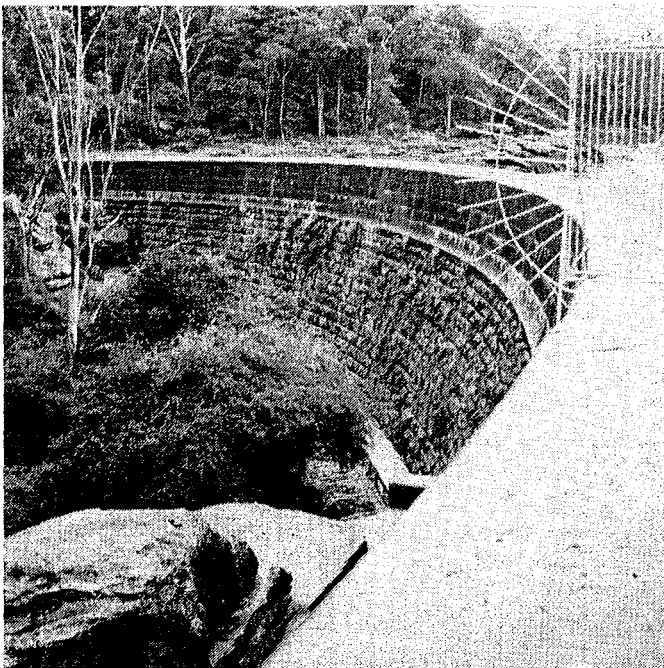
For its time, this arch dam is quite remarkable. When completed in 1856 it was only the twelfth single arch dam constructed anywhere in the world since antiquity, but to me, as an engineer, it had features that marked it out as representing the turning point towards modern arch dam technology.

The decision in the 1840s to build an arch dam in this remote colony was an adventurous one. We must ask the question whose concept did Simpson's plan express — his own or someone else's. I have been intrigued to find out, and decided to research Percy Simpson to this end in the manner of a devil's advocate.

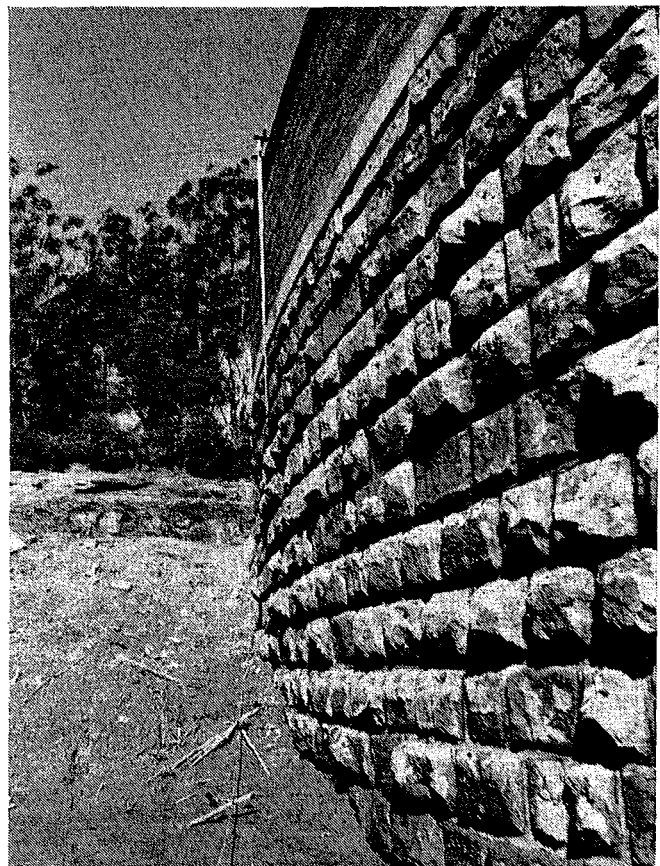
PERCY SIMPSON

Simpson was born in Canada on 5 March 1789, the son of Major Noah Simpson of the 31st Regiment of Foot. He was baptised Pierce but known as Percy. He was from an apparently Anglo-Irish family with property in County Limerick. He married Hester Elizabeth McNeill in 1818.

I have found nothing as yet about his schooling or upbringing, but an entry in the Naval Chronicle notes him as having been appointed Lieutenant from Midshipman in 1808 when he would have been 19.



Downstream face and curve of Arch.



Upstream face — excellent masonry exposed after draining stored water.

PARRAMATTA DAM
(Courtesy of Parramatta City Council)

He did not stay long in the Royal Navy, for next we hear of him in the British Army. He appears as fourth in the list of Ensigns for 1810 in the First Garrison Battalion, a unit very likely serving in Ireland; he would then have been 21. By 1812 he had moved up to first among Ensigns in that Battalion.

The Garrison Battalions and Regiments formed a group, the role of which seems to have included the construction of infrastructure works, such as roads, buildings and facilities for water supply, in occupied or governed territories; some functions of government and administration also fell to them among. It is my assumption that officers in these units would have gained experience in these functions, and so with Simpson who may also have had the added advantage of naval training in navigation to equip him later as the competent surveyor he proved to be.

THE ROYAL CORSICAN RANGERS

The Royal Corsican Rangers, serving at the time in the Mediterranean theatre, were one such unit. It was to this Regiment that Percy Simpson was posted in June 1812, as first in its list of Lieutenants. The Rangers were raised in 1803 by the British Army mainly from Corsican nationals, and included some foreign officers. It was commanded by Lieutenant Colonel Hudson Lowe, and was involved in the campaigns against the French. It garrisoned Capri after its capture from the French in 1806. Companies of the Rangers were in the expedition to Calabria and in 1806 took part in the battle of Maida there. In 1808 the French recaptured Capri which was gallantly defended by the Rangers who were permitted to march out "with all the honours of war".

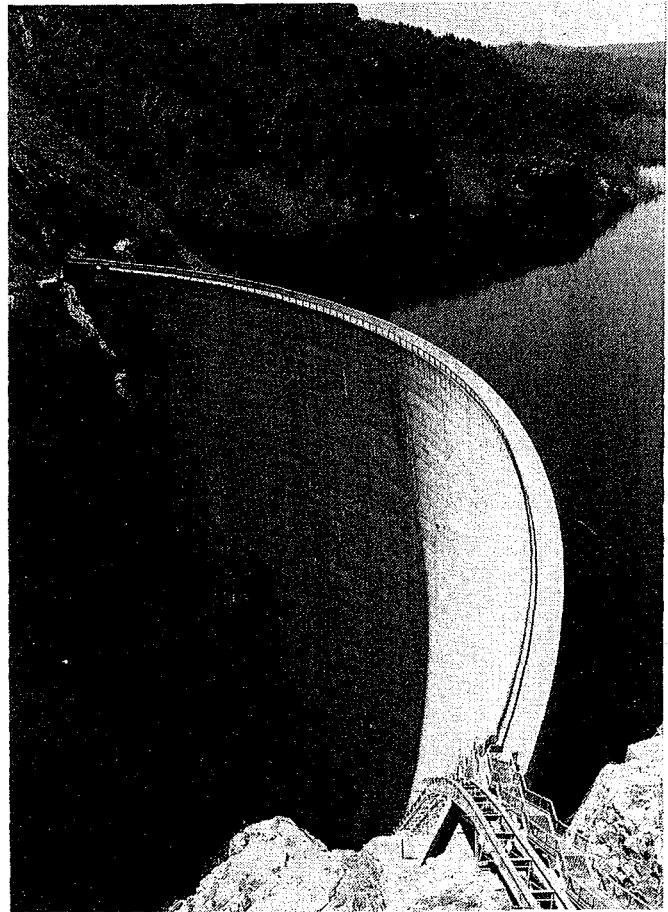
In 1809 the British mounted an expedition against the Ionian Islands (the largest of which is Corfu) taking several of these, but it was not until 1814 that Paxos, one of the smallest of the group, was reduced. Thereupon, Simpson was appointed Governor and Advocate General of the Island. Later, in a submission from New South Wales, he describes himself as "Capi di Governo" or Head of Government at Paxos.

After the conclusion of hostilities with France by the Treaty of Paris in 1815, the Rangers remained in the Islands, until disbanded in Corfu early in 1817. Thereupon Simpson was repatriated to join the 5th Royal Veteran Battalion, which in turn appears to have been disbanded in 1821, with Percy being retired on full pay.

PAXOS AND THE IONIAN ISLANDS

Paxos is a small island about 8 km long and 2 km wide, with a population of about 5000. It is closely cultivated with terraces incorporating rock walling. It is watered by one small stream and springs, which according to the Encyclopaedia Britannica, the British developed by excavating a number of cisterns, no doubt similar to those built in the same era alongside the Tank Stream, at Sydney Cove. Current-day tourist brochures mention the British Residency building, but it is likely this was built under the Protectorate, following Simpson's departure.

Under the Peace Treaty, the Ionian Islands regained their independence but under a Protectorate from Britain, which continued to 1864 when a union with Greece occurred. Under the British Protectorate the Islands benefited in a number of material ways, such as from the building of roads.



Modern arch dam in Tasmania.
(Courtesy of Ancold Dams in Australia)



PAXOS — Present day road system.
(Courtesy of Greek National Tourism Organisation)

PERCY SIMPSON ARRIVES IN SYDNEY

Simpson saw better prospects in New South Wales than at home, and migrated to Sydney with his wife and two children on the ship "MANGLES", arriving on 8 November 1822. While on service in the Napoleonic War he is said to have met Sir Thomas Brisbane, a relative of his wife, and who was Governor of New South Wales on his arrival. He came with an order for a grant of 2000 acres of land, and letters of recommendations from a number of influential people including Sir Thomas Maitland and the Adjutant-General Sir Henry Torrens. General Sir Thomas Maitland had been prominent in the Mediterranean, and was the first High Commissioner of the Ionian Islands.

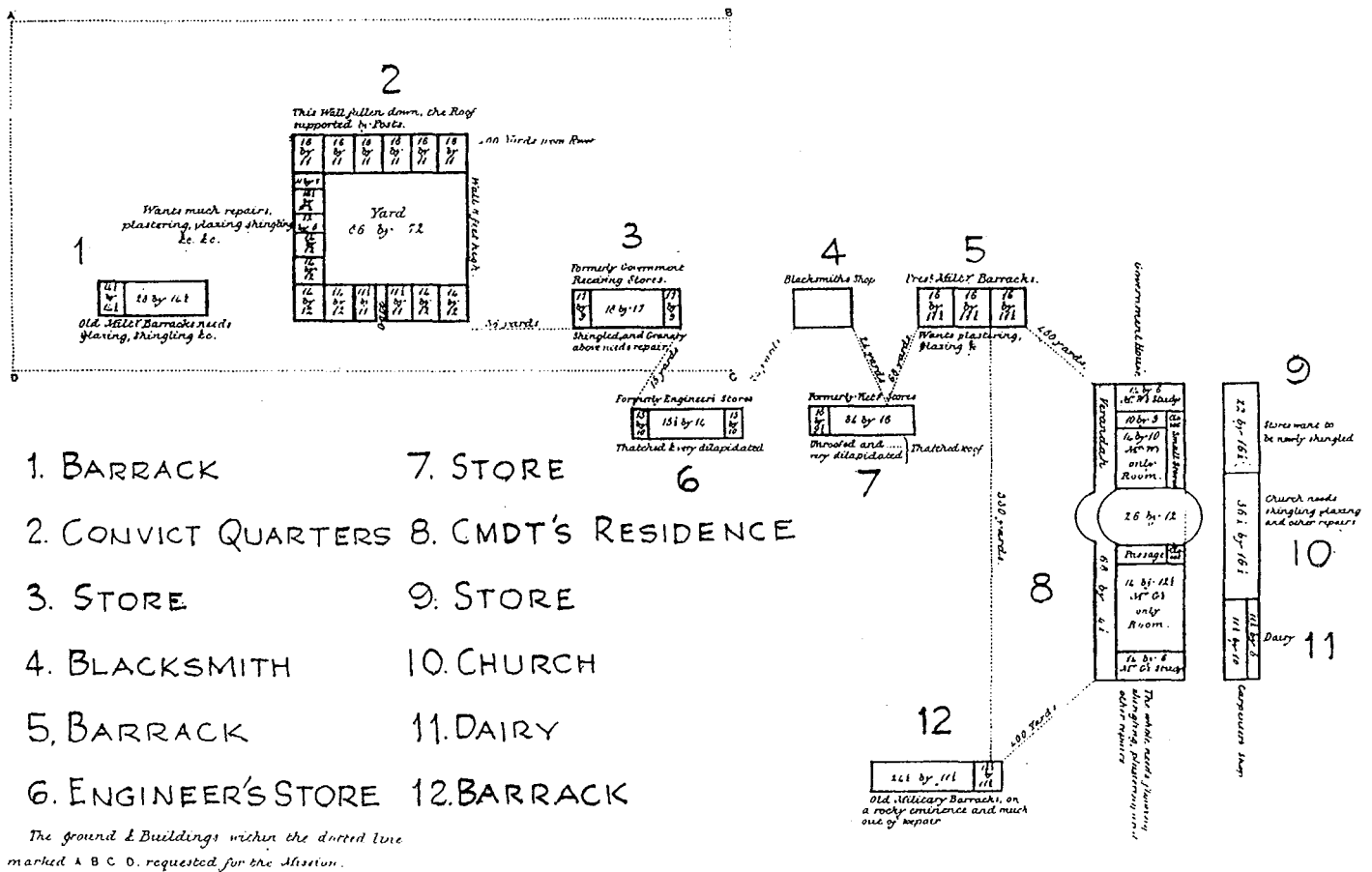
No doubt Brisbane saw in their ex-garrison officer just what he needed to establish an outpost in the Wellington Valley, west of Bathurst, and an area seen as having a potential for wheat growing. Someone was needed to prove this, and at the same time provide an out-of-the-way location for a number of "gentlemen" convicts. These included those transported for political offences, and seen as having the capacity to generate dissension among the general convict population in Sydney.

Simpson accepted the offer and deferred taking up his land grant. His contract was for payment on a per capita basis of soldiers and convicts who would be resident on the proposed station.

THE WELLINGTON VALLEY OUTPOST

Simpson set off on the 1st January 1823 via Bathurst accompanied by his wife, with soldiers and convicts and stores to undertake his commission. Simpson had not been permitted the services of any other officers to share his burden. As such he was expected to fill the offices of Commandant, Chaplain, Commissary and Engineer. In addition, it was necessary.

Simpson succeeded in his task but not without many difficulties and problems. By June 1826 he had 8900 bushels of wheat held in store, plus cattle and livestock and had provided rations for 250 persons. He was not happy with the terms of his per capita leased contract and the Government offered him a notional variation but still on a per capita basis. With wheat selling at 14/6 (\$1.45) a bushel, Simpson also raised the matter of a value-based commission as a consideration in a payment package. The Government, however, refused to meet him, and an impasse developed. The operation had proved attractive enough for interests in Sydney to influence the Home Office to have the Valley thrown open to private development, and to this end Simpson was withdrawn in May 1826. His replacement was a man of lesser calibre, and the Depot waned, the buildings becoming, ultimately, an Aboriginal Mission Station.



Plan of building at Wellington Valley Depot. Original carries printer's date of 1844. (Courtesy of Wellington & District Historical Society)

It is interesting to note that Governor Brisbane's term finished in December 1825, when he was replaced by Ralph Darling. Simpson staked his claim to the new governor in a formal memorandum in July 1826, seeking a proper reward for his efforts.

SIMPSON BECOMES A SETTLER

As nothing transpired, he had to consider his position and decided he would become a settler on his grants of land. In September 1825 Governor Brisbane had promised him 2000 acres in addition to the 2000 acres for which he had an order on his arrival in 1822. He chose two tracts adjacent to each other at Koorumbung in the region of Dora Creek, and decided to run cattle. He appointed Moses Carroll, a former convict as overseer.

He was now in financial difficulty and sought a loan from the Government offering his 4000 acres as security, but his request was refused.

Problems developed later on with his land holdings, and he had to relinquish his second grant at Koorumbung, but was later compensated with a substitute tract at Eraring.

The ramifications of this matter are not pertinent to today's talk and can be left there. Suffice to say that the venture to graze cattle on the poor country he had selected was not successful and eventually Simpson sold both grants. We might note that his disappointing performance here contrasts with his success at Wellington Valley.

SIMPSON TAKES UP ROAD BUILDING

No doubt to help his finances, Simpson took up an appointment as Assistant Surveyor of Roads and Bridges at Wisemans Ferry and moved to there in 1828. His ability as a road builder from his Garrison days had already been acknowledged, and it is recorded that he wrote to Earl Bathurst in 1822 claiming "his knowledge of surveying and road making might be useful in the new Colony", and he later referred to the improved system of road making in England.

Because he was dealing with convicts on the road-works he was appointed temporary magistrate at Wisemans Ferry. This was appropriate, as he had filled the office of Advocate General at Paxos, as well as being Governor.

THE GREAT NORTH ROAD

Work on the Great North Road from Five Dock and through Dural had reached Wisemans Ferry and a supervisor was required for the next section, a horror stretch through most rugged and isolated country over the Judge Dowling Range between Wisemans Ferry and Mount Manning. Simpson was appointed to the job. His value as a road builder was to be realised.

ADVANCES IN ROAD ENGINEERING

At that time in the early nineteenth century, the philosophies of the Engineers Telford and Macadam were being applied to road building, and had no doubt been adopted by army units such as the Garrison Regiments.

The then new techniques may seem obvious and simplistic to us now, but they were novel at that time. These embraced good location, and grading, Telford emphasising drainage, crossfall and adequate foundations, while Macadam introduced a hard wearing system for handling both

traffic and drainage. These principles were adopted on the Great North Road and elsewhere in the Colony with appropriate local variations to suit availability of materials and remoteness of location.

SIMPSON BUILDS THE ROAD

On the great work to which he had been assigned, Simpson applied all the knowledge and skill that he had acquired in road making and in the direction and management of a labour force. Over a three-year period he superintended up to 700 convicts, both on the job and in quarters, the majority in chain gangs, between Wisemans Ferry and Mount Manning. He expressed his differing views on some aspects on location and on the provision of military guards. He had to cope with the connivings of a less than scrupulous victualling contractor.

On the matter of routing, Simpson expressed a view that Mitchells "shortest distance between two points" philosophy took the road through country that was too remote and inhospitable to be appealing to travellers, notwithstanding the difficulties of construction along this rugged route. He was proved to be right, as travellers in time avoided the lonely waterless road in preference to a route that developed up the McDonald River and through St Albans, to rejoin the main road further north.

In all Simpson and his work on the road were outstanding, and he was commended for his zeal by the new Governor Sir Richard Bourke in 1834. Most notable on the road were the structures on Devines Hill where the formation was supported by ashlar masonry retaining walls and drained by an extensive system of tremendous variety in design and finish.

DUTIES AT PARRAMATTA

Simpson spent three years constructing this road — 1828-1831. As a magistrate he was required to clear his debt, but he was unable to do this and was declared bankrupt in 1851. To add to his discomfort, he had to sell his military commission for \$700. Then the surveyors came under control of the Colonial Engineer and under the staffing rearrangements, he found himself temporarily unemployed. These were hard times for Percy but he managed to clear his insolvency shortly after.

Following completion of his section of the Great North Road, Simpson resided at Parramatta from 1833, having been reappointed Assistant Surveyor of Roads and Bridges. His position put him in charge of the Parramatta Depot. In 1833 he was also appointed as a Crown Lands Commissioner. In 1839 he was appointed Police Magistrate at Patricks Plains (Singleton) and moved his family there in 1840.

While at Parramatta, he derived little satisfaction from his work during the regime of Governor Gipps "handing out tools" as he said. Nevertheless, he carried out a notable upgrading of Parramatta Road, reported on the need for new bridges at Church Street (LENNOX) and Duck Creek and built his elegant residence, Oatlands, at Dundas.

PARRAMATTA AGITATES FOR A DAM

It was in this period that the residents of Parramatta started agitating for a safer and adequate water supply based on a headworks storage set away from polluting influences.

He would have developed contacts with influential citizens working to this end and we can be confident that the means of achieving this exercised his active mind. Indeed, one present day researcher has expressed an opinion that his ideas for an unusual dam on Hunts Creek were conceived in this period. This however requires substantiation.

Fate did not treat Simpson kindly. Having moved to Singleton his appointment as magistrate there was terminated in 1843, under a Government programme of magistracy reductions. Once again he was out of work and out of favour with Governor Gipps, but all this is a story for another place.

ARRANGEMENTS FOR PARRAMATTA DAM

Fed up after dismissal from Singleton, Percy departed for London on 5th March 1843, in the barque "PERSIAN". The purpose of his trip was to petition the Colonial Secretary for payment of his claim for service at Wellington. He was unsuccessful.

While there he resided at 9 Whitehall Place. At about this time the French engineer, Francois Zola, would have been considering his designs for an arch dam at Aix-en-Provence. Whether Simpson was aware of this or knowledgeable in any way of what Zola was doing we do not know. Zola was father to the novelist Emile Zola, and is known to have used an analytical method for his design.

Percy returned without achieving any success with the Colonial Secretary. In 1846 he submitted another formal claim through the Governor. In 1847 the Parramatta citizens petitioned the Government to provide a "full and sufficient supply of pure water". In the same year Percy set off again for London to pursue his claim, and Zola would have progressed his work. Again, whether he had or received any knowledge of what Zola was up to, we don't know. To read

any correspondence to and from Simpson on these visits would be interesting.

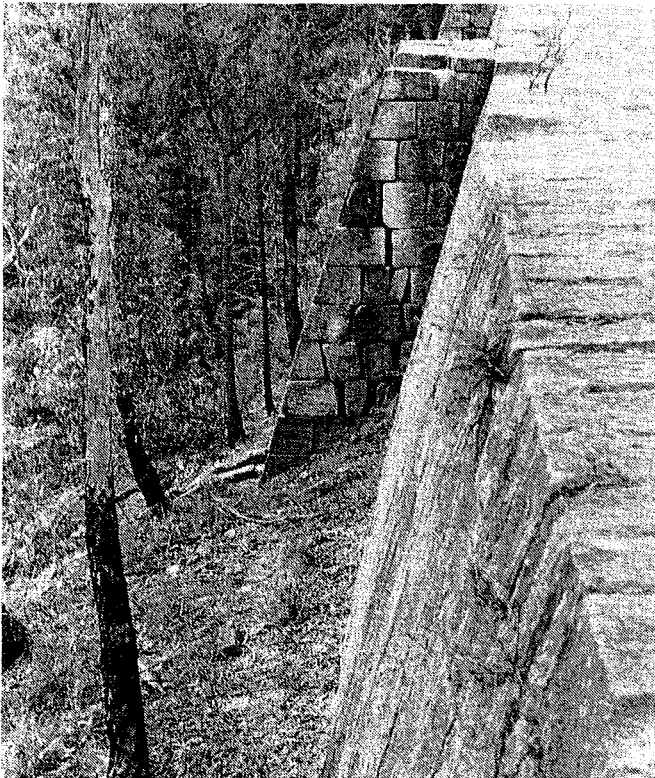
In 1849 a large meeting petitioned the Government for action, and as a result provided initial funds towards the cost of necessary works.

THINGS GET UNDERWAY FOR THE DAM

A Committee of Water Commissioners of prominent and competent citizens was set up, and on 22 May 1851 it approved the erection of a "circular" (arch) dam on a site at Hunts Creek — a tributary of the Parramatta River at North Parramatta. It is not clear if Simpson were consulted on this decision but it is likely that he was. I have not been able to locate any minutes of the meeting of the Committee; they would be revealing.

There were problems in getting the contract going, and indeed it lapsed. A new committee was set up, approving the previous site as chosen, and causing plans to be prepared by "Captian" Percy Simpson and appointing him Engineer for works. It is interesting that Simpson adopted this promotion of title in his later years; we might ask on what justification.

The dam was completed in September 1856, Zola's dam having been completed two years before in 1854. Simpson deferred taking on the role of Supervising Engineer in favour of a Mr Edward Moriarty, a capable consulting engineer in the Colony at the time, and who was regarded as an authority on dams. Moriarty could well have had an input to deciding on a design concept and method of analysis for the dam. The plans would only be expressions of what concept, whosoever it was — Simpson's, Moriarty's, Zola's or another.



Retaining Wall



Culvert Outlet

Masonry structures — Great North Road
(Courtesy of Grace Karstens, Historian)

CONCLUSION

Not wanting to bore you with engineering details, I can say that the dam was very unusual for its time, and had some novel features. As said at the outset, I believe it represents a turning point into the modern era of arch dam technology.

I have not achieved my objective of demonstrating that Percy Simpson had any particular experience or expertise to devise such structure, notwithstanding his other great gifts. It is possible of course, he had the special gift of inspirational judgment.

His final years were given to the practice of surveying and as a Registrar of Births, Deaths and Marriages at Parramatta, and as a Crown Lands Commissioner. His wife was, no doubt, as capable in her way as he was. During his absence in 1847, she made a petition to Governor Fitzroy that at least brought a favourable if not final response to his Wellington claims. I don't know how the matter was finally resolved, and must confess to not having followed this through. Between them the Simpsons raised ten children. Percy died in Sydney in 1877, aged 88.

DISCUSSION — CONTRIBUTIONS

I would appreciate contributions to discussion of any aspect of this talk, especially as may help me further my enquiries. Contributions may be forwarded to Mrs Davidson, Editor of this Journal.



Percy Simpson: Some background notes

ALAN WICKHAM*

Following are the notes used by Alan Wickham for the talk on Percy Simpson which he delivered to Forum participants at Hangmans Rock on Devines Hill. These notes are extracts from a much larger work written by Alan and his wife Lesley which is currently in preparation for electronic presentation.

Lt Percy Simpson at Lower Portland Head (1828-1832)

Lt Percy Simpson was appointed to the position of Assistant Surveyor of Roads at Lower Portland Head, later known as Wiseman's Ferry, in June 1828¹. His predecessor, Lt Jonathon Warner, had left the employ of the Surveyor Of Roads and Bridges for his properties at Brisbane Water and later at his estate at the northern end of Lake Macquarie (now Warners Bay). It would appear that the transition of duties between Warner and Simpson occurred without much overlap, if any. Indeed Percy, Hester and their five children moved into the cottage vacated by Warner and rented from Solomon Wiseman.

When Percy Simpson took over from Warner, a 'cart road' descended from the Hawkesbury's southern side to Wiseman's property at Lower Portland Head. On the river's northern side, a cart road ascended the Finch Line for approximately eight miles² about four miles short of Twelve Mile Hollow. Simpson proceeded to complete the southern de-

**Alan Wickham has combined his long experience in education and writing with field studies in the prehistory, history and landscape of the NSW Central Coast, especially in exploring early colonial and Aboriginal routes and trails. His research into Percy Simpson goes back to time spent teaching in his land grant area of Eraring and encountering folklore about his life in the region. With wife Lesley, he has spent considerable time tracing Simpson's proposed route for the Great North Road, known as Simpson's Track or McDonnells Line.*

scend into Lower Portland Head.

The Governor, Ralph Darling, travelled the road to Wisemans in September 1828 and the *Sydney Gazette* (September 17) reported, *His Excellency was very much struck, and expressed his gratification at the state and progress of this noble-looking and serviceable road.* In fact, the Governor seemed less than impressed with the steepness of Warner's cart-road up the Finch ascent on the northern side. His concern appears to have been communicated to Surveyor General Mitchell, who instructed surveyor Finch in December 1828 to locate and survey a new line of ascent of *...the hills opposite Wisemans.*³

Finch surveyed two other lines to the north⁴, both of which were rejected by Mitchell, who journeyed to Wisemans in January 1829⁵ to do the job himself. Within days he had plotted the existing route up the section now known as Devines Hill. Mitchell was satisfied with his new line because, not only did it conform with his contention that main roads should be straight, but it turned out to be a saving of two and a half miles over the original Finch line to Twelve Mile Hollow. Mitchell attempted to rename the area Snodgrass Valley, after his friend Colonel Snodgrass, but the name later became Ten Mile Hollow in common usage.

Mitchell had optimistically predicted that work on the Devines Pass would take six months. However, he was a surveyor, not an engineer, nor in command of convict gangs and their military guards. The finishing touches were still being added to Devines in 1832!

In order to start work on Devines Pass, Simpson had to construct new stone wharves upstream of the former Finch Line crossing, in addition to a bridge over the ravine at the foot of the Pass. This bridge is the oldest bridge still in use on the Australian mainland.

Simpson — The man behind the road

Simpson was not a qualified engineer or surveyor but he was experienced in supervising soldiers and civilians in stone constructions, particularly roads and drains. Most of this experience was gained from his military service (1810-1817)⁶ and, in particular, during his term on the Ionian island of Paxos, as its Governor and Advocate General. Whilst on Paxos, Simpson embarked upon a series of projects to improve the little island's road system, thus keeping his garrison and the civilians usefully occupied. Prior

to his joining the terrestrial military forces, Simpson had been a naval lieutenant. His naval college training would have included extensive studies in science, mathematics, navigation and fortifications. Having been an officer since the age of fifteen, Simpson's supervisory and management skills would have helped with the daunting daily challenges at Lower Portland Head.

Simpson was undoubtedly ambitious and seized the opportunity in the Hawkesbury valley to make his mark, having recently failed as a gentleman farmer at Dora Creek. Prior to that, his four years of service to the Colony as commandant at the Wellington Agricultural Station appear to have been devalued by the new Governor (Darling). He was in financial difficulties and the size of his family grew with his debts.

His wife, Hester Simpson, suffered indifferent health. She had been used to a more affluent lifestyle back home in Ireland and had difficulty coming to terms with the colonial environment — the weather, the isolation, the hardships, the constant company of convicted felons and her frequent state of pregnancy.

Simpson needed success at Wisemans. He needed Governor Darling to authorise the payment of £4,000 which he still considered owing from his work in Wellington⁷. Keen to display his skills in comparison to those of Warner and Finch, he exploited the talents of his convict overseers. Were it not for the enthusiasm for the Road by overseers such as Anderson, Martineer, Castles, Clare and Hawkins — and their vast convict labour force — then perhaps the road would not have become such a monument. However, his borrowings against his unpaid Wellington earnings began to catch up with him and his debts grew worse.

The Simpson family left Wisemans in 1832 under a cloud. He had been declared a bankrupt, the Governor still unwilling to support his Wellington claims, and had been stripped of his Magistracy⁸. When he offered his Dora Creek property for sale, he discovered that, due to a clerical error by Surveyor-General Oxley, he owned only 2000 acres, not the 4000 originally granted by Governor Brisbane⁹, and therefore had to sell at barely the quit rent value of the land. His relationship with Solomon Wiseman had deteriorated. His official complaints about Wiseman's victualling and ferry service had alienated him. Simpson's refusal to pay rent on the cottage resulted in his eviction. Simpson claimed that, as the cottage was being

used as the Police House, the government should pay the rent. After extensive deliberations the government agreed to pay the two years' worth of arrears, but no more.¹⁰

Yet despite this, one could envisage the departing Simpsons looking back into the Hawkesbury valley when they gained the heights and seeing the fruits of four years labour, a magnificent road already in use by settlers and drovers, a road that stands today as a monument to the convict labour force, their inspired and often maligned overseers and the skills of the surveyors, Warner and Simpson.

Notes

1. There is some confusion over the actual date Simpson arrived for duties at Lower Portland Head. It may have been in July, although his official reports began in August 1828.
2. Warner to Dumaresq, 28 April 1828, AO.
3. Mitchell to Finch, 23 December 1828, AO.
4. *Report on Roads*, 1856, T.L. Mitchell.
5. *ibid.*
6. During his military service in the Napoleonic Wars he met and became friendly with Thomas Brisbane, who later became Governor of NSW, preceding Ralph Darling.
7. An informal agreement between Simpson and Sir Thomas Brisbane at the beginning of the assignment led Simpson to believe that he would be paid on a more favourable formula than he actually was. (HRA 1, v12, p409). After Darling's succession this disagreement was never fully resolved. His wife, Hester, won some concession on his behalf from the Governor in 1846.
8. Although an honorary position, its status was very important to Simpson.
9. When Simpson arrived in NSW he was granted 2,000 acres, later supplemented by another 2,000, both of which he finally selected in the Mandalong Valley, running down to Dora Creek. After Brisbane's departure, Surveyor-General Oxley, perusing the Grants Register, took the second grant to be a duplication and struck it out. Simpson did not discover this until much later, when his second grant had already been taken up by John Eade Manning. He was granted another 2,000 acres at nearby Eraring, in compensation, but he never took up this land, using it to pay debts instead.
10. (Extensive correspondence in NSWAO, January - March 1832.)

HISTORICAL CONTEXT:

Lt PERCY SIMPSON at Wisemans 1828 - 32

	1828	1829	1830	1831	1832
	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND
Governor of N.S.W.	RALPH DARLING			BOURKE	
Surveyor General	Major THOMAS L MITCHELL				
Surveyor of Roads & Bridges	Lt WILFORD	Lt HUGHES	Maj EDMUND LOCKYER	JOHN NICHOLSON	
Asst Surveyor (Wisemans)	Lt JONATHON WARNER	Lt PERCY SIMPSON			
Asst Surveyor (Wollombi)				HENEAGE FINCH	LAWRENCE DULHUNTY
Asst Surveyor (Newcastle)	PATRICK CAMPBELL				
Progress of the Northern Rd (Dural - Wollombi)	Dural to Twelve Mile Hollow: 45km cart road Commencement of substantial works on the descent into Wisemans	Maroota to Wisemans - work in progress Devines Hill ascent: - bridgeworks - work in progress Cart road to Mt Baxter	Cart-road to Mt Manning Descent into Wisemans: work in progress Clares bridge commenced Devines Hill - work in progress	Devines: work progressing Wollombi to Mt Manning: cart road Ramsays Leap: work in progress Descent into Wisemans: work in progress	Descent into Wisemans -- completed Devines Hill ascent - completed Mt Manning ramp - work in progress
Notes	1: Gov Darling inspects road to Wisemans (incl. Finchs ascent) 2: Finch ordered to find alternatives to his former ascent on north side	1: After rejecting alternative routes proposed by Finch, Mitchell surveys a route up Devines Hill 2: Simonsons gangs start work on	1: Mitchell takes over the Roads and Bridges Dept 2: Additional gangs and guards assigned to Devines Hill	1: Mitchell loses control of Roads and Bridges Dept until Darling recalled 2: Simpson declared bankrupt 3: Finch dismissed	1: Simpson completes his road sections and returns to Parramatta

Percy Simpson, 1789 - 1877

- 1789** Pierce (Percy) Simpson, Born 5 March, Canada. Father: Major Noah Simpson, 31st Reg't of Foot.
- 1804** Midshipman, Royal Navy (trained in mathematics and its application to navigation).
- 1808** Lieutenant, Royal Navy.
- 1812** Ensign 1, British Army.
- 1812** Lieutenant, 1st Corsican Rangers.
- 1812-14** Active Service v France in Ionian Islands, particularly Paxos Island (Napoleonic Wars).
- 1814** Appointed Governor and Advocate General of Paxos.
- 1815** War with France ends.
- 1817** Corsican Rangers disbanded. Simpson returns to England.
- 1818** Assigned to 5th Royal Veteran Battalion, then marries Hester Elizabeth McNeill.
- 1821** 5th Royal Veterans Bn disbanded. Simpson retires on full pay.
- 1822** Accompanied by Hester and 2 infant children, Simpson sails on *Mangles*, arriving in NSW, 8 November. Renews acquaintance with Sir Thomas Brisbane, now NSW Governor; granted 2000 acres.
- 1823** Commissioned to establish an experimental agricultural station in the Wellington Valley.
- 1825** Governor Brisbane grants an additional 2000 acres to Simpson.
- 1826** The Wellington Station reviewed; Simpson and family return to Sydney. Lt John Oxley, Surveyor General, mistakenly strikes Simpson's second land grant from the register.
- 1826** Simpson selects his '4000' acres (Kourumbung) in the Mandalong Valley, bounded by Dora Creek, near Lake Macquarie. Moves his family there.

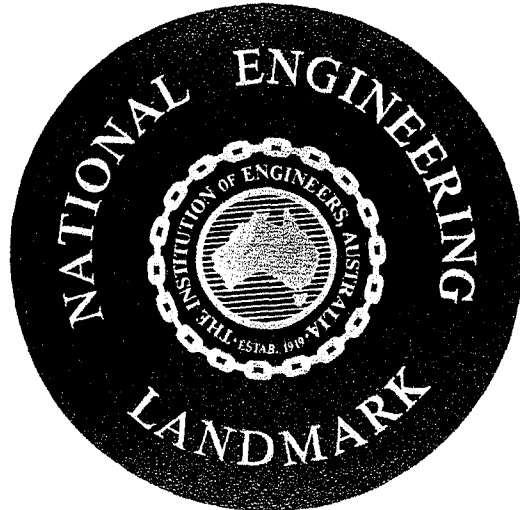
- 1827** Lean times for Simpson, gentleman farmer and grazier, his expenses far exceeding his income; many pleas to the new Governor (Darling) for payment of £4000 he considered owed him from Wellington.
- 1828** The *Sydney Gazette* publishes an anonymous letter promoting the advantages of the McDonald line as the main northern route, from Twelve Mile Hollow to Maitland. Simpson later admits writing it. As a result the Line is surveyed by Warner and convict McDonald, who recommend its adoption. Warner's recommendation rejected by Dumaresq, highly placed representative of the gentry farmers of the Upper Hunter valley (and Governor Darling's brother-in-law). Governor Darling appoints Simpson as Assistant Surveyor of Roads and Bridges to supervise construction of the northern road from Maroota to Mt Manning. Simpson moves the family from Kourumbung (Cooranbong) to Lower Portland Head (Wisemans Ferry). Simpson appointed a temporary magistrate to dispense justice to the convicts in his charge.
- 1828-31** Simpson works on the Northern Road. His financial problems worsen. Much correspondence between him and the Governor over outstanding recompense for duties at Wellington. Many disagreements with Solomon Wiseman, his landlord and contracted supplier of stores to the gangs of convict road builders. Simpson mortgages Kourumbung. Overseer Moses Carrol remains as station manager.
- 1831** NSW Supreme Court declares him bankrupt and his magisterial powers are removed.
- 1832** Simpson completes his section of the road and returns to Parramatta to sell his military commission and its pension entitlements. Clears his debt and begins building his 'Oatlands House' residence, Dundas.
- 1833** Simpson re-appointed Surveyor of Roads and Bridges and Magistrate and becomes a Commissioner for Crown Lands (Parramatta).

- 1834** New Governor, Sir Richard Bourke, commences work on the Northern Road. Simpson sells land, discovering that his grant had been reduced. He applies for restitution.
- 1835** Simpson granted 2000 acres at Eraring in exchange. He attempts (unsuccessfully) to exchange. He sells the land.
- 1834-39** Simpson in charge of stores at the Parramatta. He supervises improvements to Parramatta Road, Church St (Lennox) and Duck Creek bridges.
- 1839** Simpson appointed Police Magistrate at Parramatta.
- 1840** Simpson moves his family (now 8 children) to Parramatta.
- 1843** The Singleton appointment terminated as a result of review of legal staff. The Simpson family returns to Parramatta and Simpson to his former duties. Simpson travels to England (without his family) on an unsuccessful mission to become Colonial Secretary for financial settlement of the Parramatta affair.
- 1844** Simpson returns to Parramatta and continues as Surveyor of Roads.
- 1846** Simpson pleads his case before the new Governor, now supporting Percy's claims and using legal arguments resulting in a partial settlement.
- 1851** Simpson involved in the early planning of the Parramatta Dam.
- 1856** Parramatta Dam completed. Simpson's role in the project acknowledged.
- 1855-65** Simpson employed in Parramatta as Surveyor of Crown Lands and Registrar of Births, Deaths and Marriages.
- 1877** Simpson dies, survived by his wife Hester and children.



The National Engineering Landmark (NEL)

The NEL plaque is a 300 mm diameter bronze casting bearing the Institution's seal and the title "National Engineering Landmark".



An Information Plaque may complement the NEL plaque. It is a rectangular bronze casting measuring 400 mm long by 300 mm deep with the Institution's seal and the name of the work across the top. The information being presented should address the following points in about 70 words of succinct plain English,

- What it is**
- Who did it**
- Its engineering significance**
- Its social impact**

The name of the owner of the works or an approved sponsor may appear with that of the Institution in the dedication at the bottom of the plaque together with the year of the plaquing ceremony.

