NSW GOVERNMENT

sydney METRO

FastTracking the Future

Planning, designing and building Sydney Metro Northwest in your classroom

Secondary Edition

Front cover: Train testing at Tallawong Station, May 2018.
Inside front cover: Tallawong Station, July 2018.

FastTracking the Future

Ready to teach, syllabus-based lessons for 7–10

- Links to current syllabuses
- Activities and units of work for 7–10
- Lessons for Geography, English, History, Mathematics and Science
- Teacher reference notes and extension work

Contents

Acknowledgments

Sydney Metro would like to thank all writers, members of the Sydney Metro Northwest Education Reference Group, principals and teachers who have contributed to this education program.

Disclaimer

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FastTracking The Future Secondary Edition

Summary

Fifth Edition – March 2019

Fourth Edition – November 2017

Third Edition – November 2016

Second Edition – September 2015

First Edition – March 2014

ISBN: 978–1–922030–45–0

FastTracking the Future education program

Sydney Metro's FastTracking the Future education program is focused on providing learning experiences for students about the new Sydney Metro railway; its purpose, construction and environmental and social context.

Sydney Metro is Australia's biggest public transport project. It introduces new technology like driverless trains to Australia and a new mode of public transport.

Since 2013, the highly visible construction process in the city's north west has allowed students to follow progress using the FastTracking the Future resource, watching – and learning about – a major piece of infrastructure coming to life in their backyard.

This resource has been produced by Sydney Metro in consultation with practising teachers, curriculum specialists and independent reviewers. It is designed to assist teachers with the implementation of the New South Wales Education Standards Authority or the Board of Studies, Teaching and Educational Standards NSW 7–10 syllabuses.

This is the final FastTracking the Future Secondary Edition. Since its release in March 2014, teachers have used this resource to support stage-based programming, lesson planning and classroom teaching and learning in schools across Sydney. Sydney Metro thanks all schools; and particularly those in the city's north west, which have used this resource and participated in the education program.

As at 18 February 2019, 45 presentations have been attended by 3413 students and 23 school excursions have been attended by 2711 students.

Some of the schools involved include:

Bankstown Girls High School
Barker College
Belmore Boys High School
Crestwood High School
Cumberland High School
Hills Grammar
Holy Spirit North Ryde
LaSalle Catholic College Bankstown
North Sydney Boys High School
Mosman High School
Muirfield High School
Redfield College
Rouse Hill Anglican College
Rouse Hill High School
Sydney Secondary College, Balmain Campus
Trades Norwest Anglican Senior College
Wenona School.

The education program will now focus on the next stages of Sydney Metro – the City & Southwest, and West lines and the line serving the new Sydney Western Airport and Greater Western Sydney.

About Sydney Metro

Sydney Metro is a new world-class railway for Sydney.

Services start in the city's north west in the second quarter of 2019 with 13 metro stations on Australia's first fully-automated railway.

A new generation of metro trains will run every four minutes in the peak in each direction. Customers won't need a timetable, they'll just turn up and go.

All metro stations will be fully accessible with lifts and level access between platforms and trains, making it easier for more customers to use public transport.

From the north west, metro rail is being extended under Sydney Harbour, through new underground city stations and beyond to the south west.

In 2024, Sydney will have 31 metro railway stations and a 66-kilometre stand-alone metro railway system.

There will be capacity for a metro train every two minutes in each direction under the Sydney city centre.

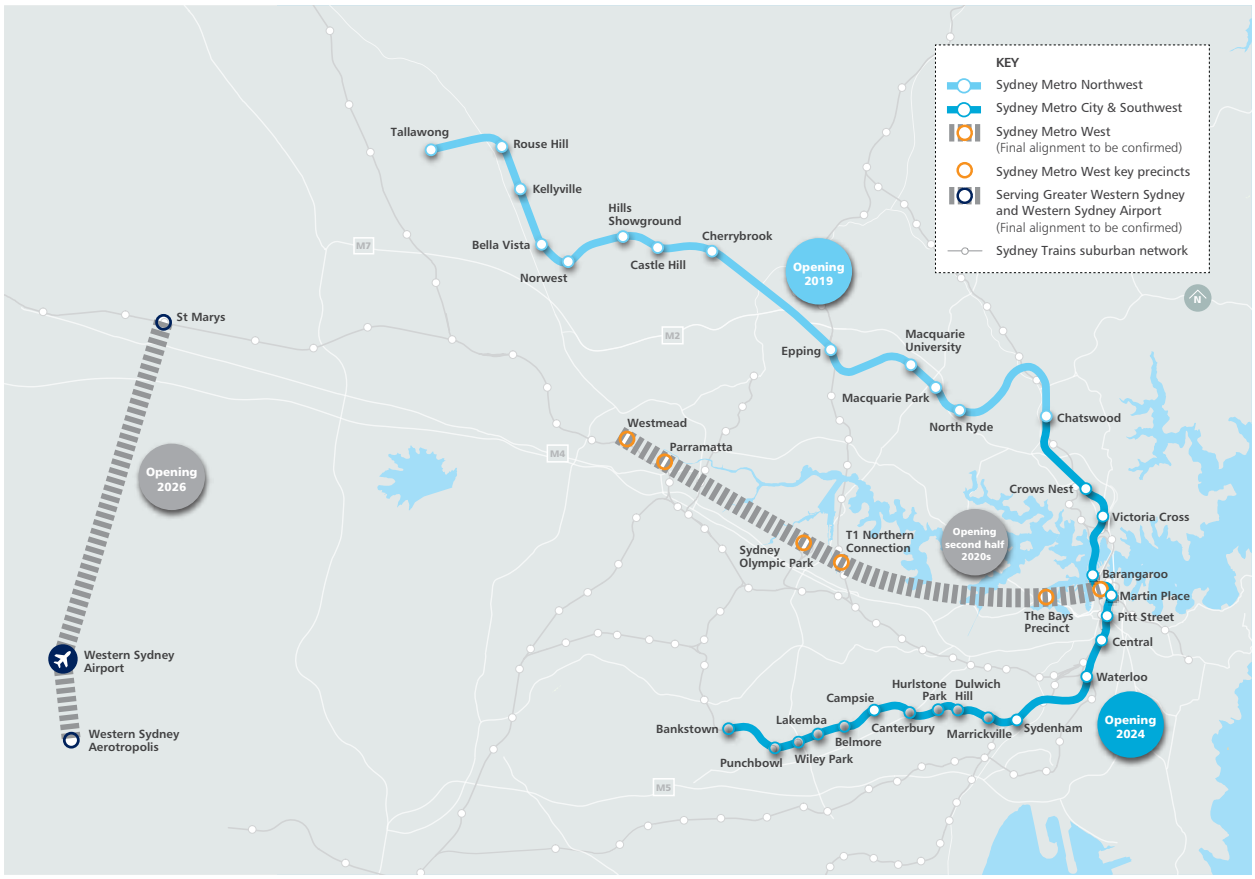


Figure 1: Sydney's new 66-kilometre long high-frequency metro rail system.

Sydney's new metro, together with signalling and infrastructure upgrades across the existing Sydney suburban rail network, will increase the capacity of train services entering the Sydney central business district (CBD) – from about 120 an hour currently to up to 200 services beyond 2024. That's an increase of up to 60 per cent capacity across the network to meet demand.

New metro rail will also link the Sydney CBD to Parramatta and Westmead. The railway servicing the new Western Sydney Airport will be also developed and delivered by Sydney Metro.

Key features

- **More than 66 kilometres** of metro rail from Rouse Hill to Bankstown
- **A new generation** of fast, safe and reliable metro trains
- **No timetable** – just turn up and go
- **Higher frequency** trains during the day and late at night
- **Reduced travel times** for customers across the rail network
- **More trains, more often** in the peak through the CBD
- **Reduced crowding** on the T1 Western Line and on trains from the south west, by creating extra capacity
- **More trains** from Sydney's north west and south west
- **Opal ticketing** and fares the same as the rest of Sydney, providing a seamless journey for customers, making it even easier to move around
- **Fast and easy** to change to trains, buses, ferries and light rail
- **Stand-alone line** operating independently of the existing rail network, not subject to wider suburban delays
- **Connecting** Sydney's economic centres with a boost of activity up to $5 billion per year
- **New choices** for jobs, education and recreation
- **Faster transport** to employment growth areas

Sydney Metro Northwest

What is Sydney Metro Northwest?

The $8.3 billion Sydney Metro Northwest project is on track to open to customers in the second quarter of 2019.

Sydney Metro Northwest, formerly the North West Rail Link, is delivering eight new railway stations and 36 kilometres of metro railway to Sydney's growing north west. Trains will run every four minutes in the peak; that's 15 trains an hour. Customers won't need a timetable, they will just turn up and go.

Sydney Metro Northwest will use Opal ticketing, with fares set like the rest of Sydney.

Sydney Metro Northwest will deliver, for the first time, a reliable public transport service to a region which has the highest car ownership levels per household in NSW. Over the coming decades, an extra 200,000 people will move into Sydney's North West region, taking its population above 600,000, or twice the size of Canberra.

Sydney's new generation of fast, safe and reliable metro trains will be rolled out on Sydney Metro first. They will have the highest level of customer safety including constant CCTV monitoring and platform screen doors to improve safety.

The project includes construction of twin 15-kilometre tunnels from Bella Vista to Epping. Four mega tunnel boring machines (TBMs) built the twin tunnels on Sydney Metro Northwest. This was the first time in Australian history four TBMs were used on the one transport infrastructure project.

Figure 2: First look at Cherrybrook Station, February 2019.

Why is Sydney Metro Northwest so important to the North West region?

Sydney's population is projected to grow significantly over the coming years to 5.1 million people by 2021 and 6 million by 2031. To meet the needs of this growing population, the greater Sydney area will require additional housing, more jobs and critical infrastructure projects to satisfy demand.

One of the areas of greatest predicted population growth is Sydney's North West region. More than 200,000 extra people will move into Sydney's North West Growth Centre over the next 40 years – taking the region's population above 600,000, or twice the size of Canberra. At present, many residents in the North West region have limited transport options and rely heavily on cars and bus services to get to where they need to go. Many commute long distances for work or education, and depend primarily on private vehicles. As a result, suburbs in this region have the highest private car ownership in Australia, and some of the lowest percentage of journeys to work by public transport.

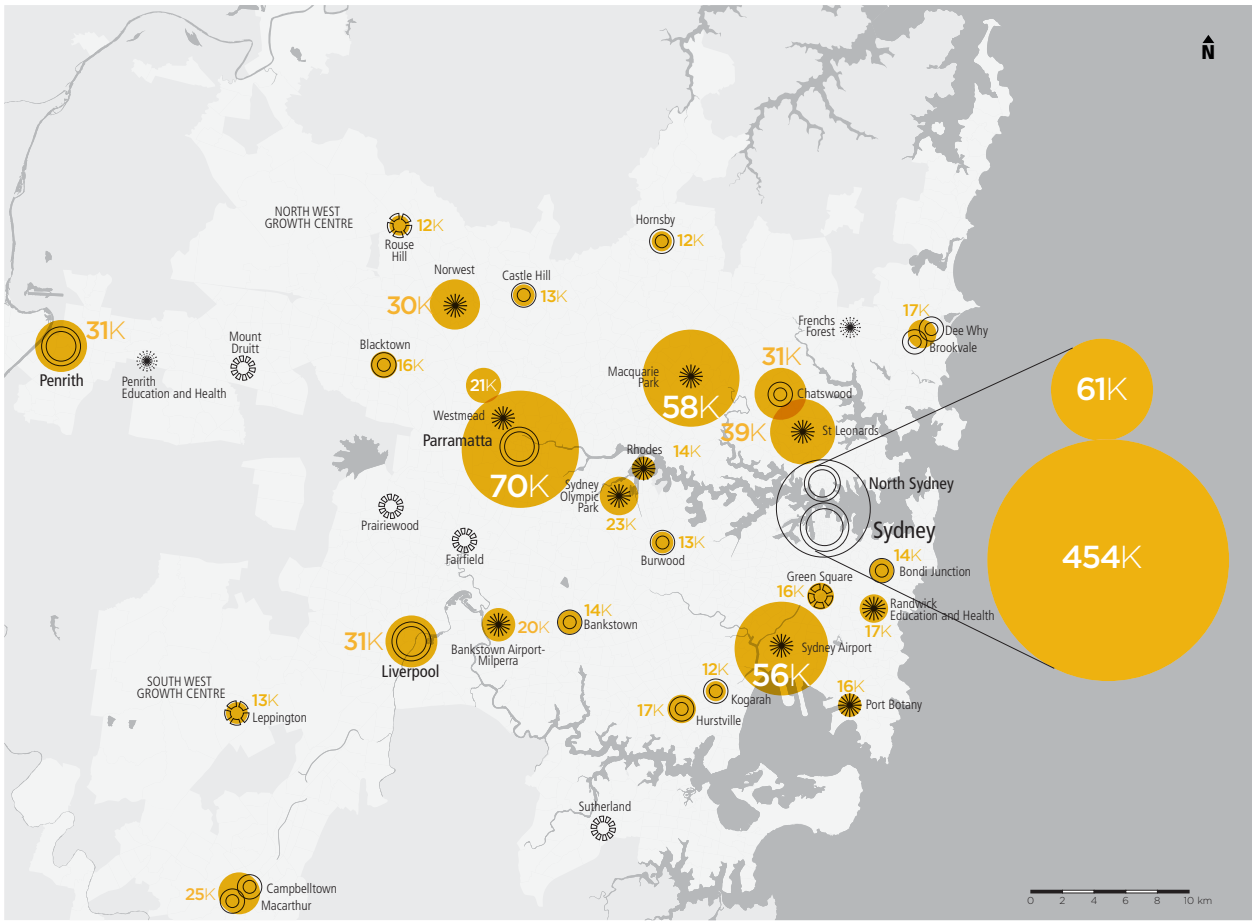


Figure 3: Major employment centres, Sydney 2031.
Source: Sydney's Rail Future, Transport for NSW.
https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/sydneys-rail-future.pdf

Sydney Metro Northwest at a glance

Sydney Metro Northwest will be the first fully-automated metro rail system in Australia.

Sydney Metro Northwest will feature:

- **36 kilometres of track** between Chatswood and Rouse Hill.
- **Fast, safe, reliable single-deck trains which carry about 50 per cent more people per hour than double-deck carriages.** Each carriage will have three doors per side, which will quicken passenger movement in and out of the train. As such, the stop period at each station will be reduced (called 'dwell time').
- **15 kilometres of tunnels** between Bella Vista and Epping. These twin tunnels will be almost six times longer than the Sydney Harbour Tunnel. They will be six metres in diameter, with crossover tunnels every 240 metres.
- **Eight new railway stations.** These include Cherrybrook, Castle Hill, Hills Showground, Norwest, Bella Vista, Kellyville, Rouse Hill and Tallawong. Each will be developed with bus shelters; drop-off, wait and pickup areas (called 'Kiss and ride'); taxi ranks; and cycling facilities.
- **4000 commuter car parking spaces.** This includes 400 parking spaces at Cherrybrook, 600 at Hills Showground, 800 at Bella Vista, 1200 at Kellyville and 1000 at Tallawong.
- **Trains will run every four minutes in the peak travel times**.
- **No timetable, just turn up and go**.
- **16 construction sites**.
- **Four kilometres of 'skytrain' viaduct** from Bella Vista to Rouse Hill to ensure the rail lines do not physically divide local communities. The skytrain viaduct will run beside the major arterial road that serves the growing North West region, alongside and interacting with a T-way bus transit system. It will include major bridge crossings over Memorial Avenue and Samantha Riley Drive, Windsor Road, Sanctuary Drive, White Hart Drive, Rouse Hill Drive and Second Ponds Creek.
- **Four kilometres of bridges and other viaducts and earthworks will be built.** These include road bridges over the rail line at Windsor Road, Cudgegong Road and Tallawong Road, and large earthworks between Balmoral Road and Tallawong Station.
- **Temporary and permanent traffic and transport management works.** People who live in the North West region of Sydney have the highest car ownership level in the country, so facilitating traffic movement during the construction phase is an integral part of the plan.

Current Sydney Metro Northwest features:

- **A major metro train stabling facility** has been established beyond Tallawong Station at Rouse Hill.
- **Road bridges** over the rail line at Windsor Road, Cudgegong Road and Tallawong Road.

Figure 4: Sydney Metro train testing over Windsor Road bridge, July 2018.

Kiss and ride

Figure 5: The team working on the railway station precincts have taken on board community feedback in planning the facilities like commuter car park, kiss and ride, taxi and bus interchange infrastructure, bicycle racks and a further 1000 commuter car parking spaces.

Web links

Sydney Metro Northwest

Sydney Metro Northwest is a priority rail infrastructure project for the NSW Government.

https://www.sydneymetro.info/northwest/project-overview

NSW Department of Planning and Environment

http://www.planning.nsw.gov.au

Sydney's Future Transport Strategy

https://future.transport.nsw.gov.au/plans/future-transport-strategy

Sydney's new metro trains infographic

https://www.sydneymetro.info/metro-trains

Sydney Metro Northwest Project Overview June 2014

https://www.sydneymetro.info/sites/default/files/15082-Project-overview-September-2015_web.pdf%3Fext%3D.pdf

Sydney Metro Northwest Project Overview September 2015

https://www.sydneymetro.info/sites/default/files/15082-Project-overview-September-2015_web.pdf%3Fext%3D.pdf

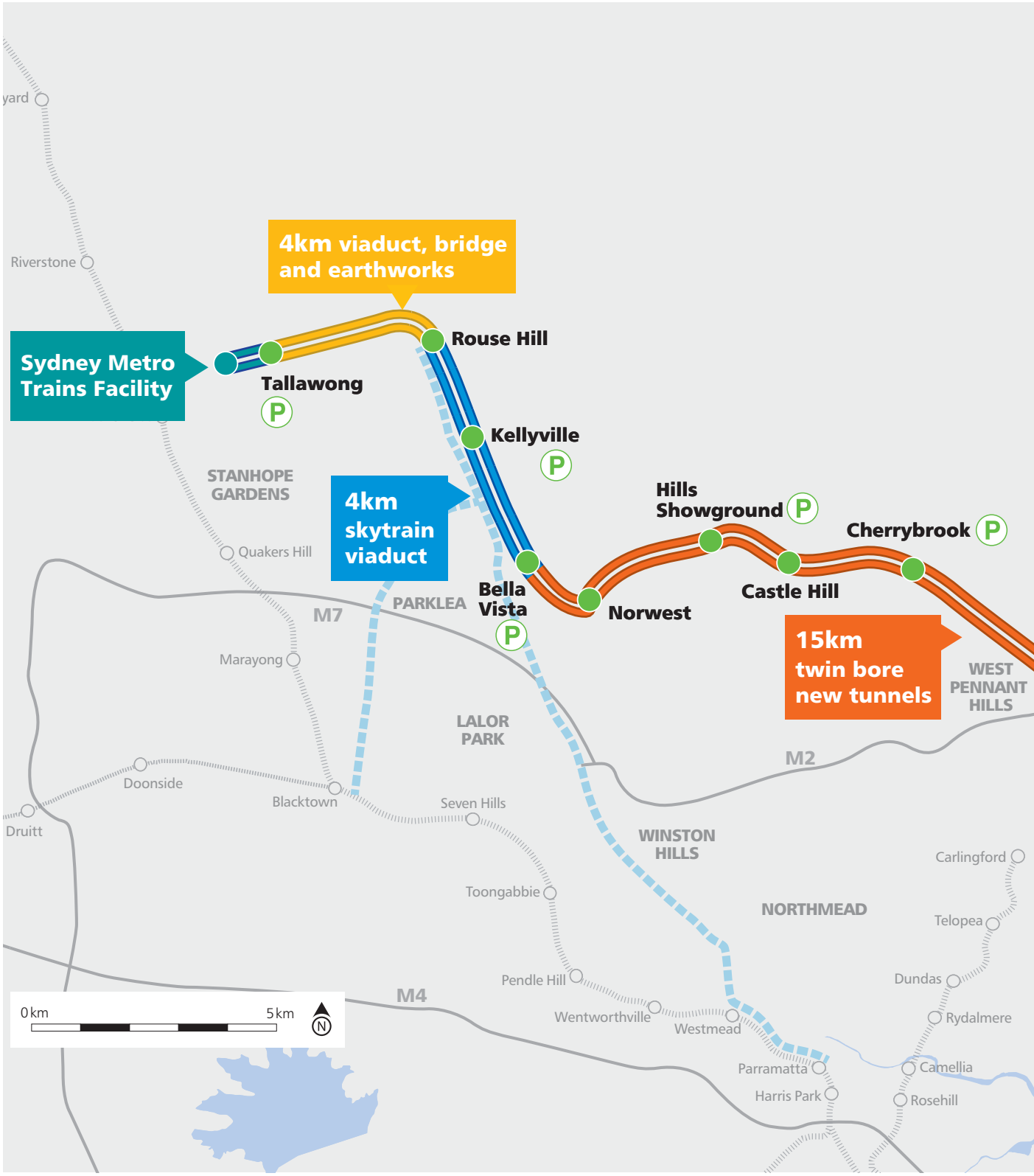
Sydney Metro Northwest Corridor Strategy

The Sydney Metro Northwest *Corridor Strategy* proposes a vision of sustainable, well-connected, liveable communities. Find out the details for each area.

https://www.planning.nsw.gov.au/~/media/Files/DPE/Reports/north-west-rail-link-corridor-strategy-2013-09.ashx

Train over Windsor Bridge road, January 2019.

Sydney Metro Northwest map




Mount Kuring-gai
Mount Colah
DURAL
Asquith
Hornsby
Waitara
Normanhurst
Wahroonga
Warrawee
Thornleigh
Turramurra
Pennant Hills
Pymble
Beecroft
Gordon
Cheltenham
M2
Killara
Epping
Macquarie University
Lindfield
Roseville
Macquarie Park
North Ryde
13km
Epping to Chatswood line upgraded
Chatswood Interchange
Artarmon
Meadowbank
St Leonards
Rhodes
Wollstonecraft
LEGEND
Project
Project alignment
New railway stations
Existing railway stations
Commuter car parking facilities
Facilities at all new stations
Bus interchange
Taxi
Cycle
Kiss and ride
Easy access
Other
Existing railway
Strategic road network
T-ways

Teacher briefing

The resource

This book and related online materials are curriculum resources for secondary teachers and students produced by Sydney Metro Northwest in consultation with practising teachers and curriculum specialists. Both teachers and specialists are members of the Sydney Metro Northwest Education Reference Group, an advisory body formed under the auspices of the Sydney Metro Northwest Education Program in March 2013. The Sydney Metro Northwest Education Reference Group advised on the design and development of this resource and, along with independent reviewers, provided comments on a final draft of this document.

Since its release in March 2014, teachers have used *FastTracking the Future* extensively to support stage-based programming, lesson planning and classroom teaching and learning in schools across the North West Sydney region.

Sydney Metro's *FastTracking the Future* Education Program won the Planning Institute of Australia (NSW) Promotion of Planning Award in November 2014.

Judges said the education program, is an:

"...innovative and important initiative developed specifically for school aged children to engage directly with Australia's biggest public transport project.

"It ensures that school children have a unique opportunity to participate in the delivery of a major infrastructure project, which will also change their built environment and impact their lives now and into the future.

"The judges believe that this is an excellent model for using an idea or project to implant an interest in children's minds about planning and what infrastructure means for a city. Hopefully this will lead to many young people from Sydney's north west considering planning as a career option!"

Subsequent editions offer additional features to assist teachers with the implementation of NSW Education Standards Authority K–10 syllabuses.

These features include:

- The review of outcomes to align with all current NSW K–10 syllabuses
- The addition of lessons to support teaching and learning about the Indigenous history and geography of Sydney's North West, and to underpin learning across the curriculum: cross-curriculum priorities in the area of Aboriginal and Torres Strait Islander histories and cultures
- Integration of an archaeological perspective into teaching and learning about the history and geography of Sydney's North West with the addition of Indigenous lessons as noted above and a lesson on the White Hart Inn, Kellyville.

Educational aims – Think global, teach local

The aim of this resource is to provide teachers with classroom-ready materials that will assist students explore the goals of the Sydney Metro Northwest project and its legacy for the people and communities of Sydney's North West region.

To achieve this, the resource surveys the unique historical and geographical identity of the North West region, examines the design and construction of Sydney Metro Northwest, and investigates the types of changes this large infrastructure project will bring to the region. The construction of the rail line offers a unique opportunity for students to investigate a locally significant project inside and outside the classroom, and to participate in regional growth and change.

About this resource

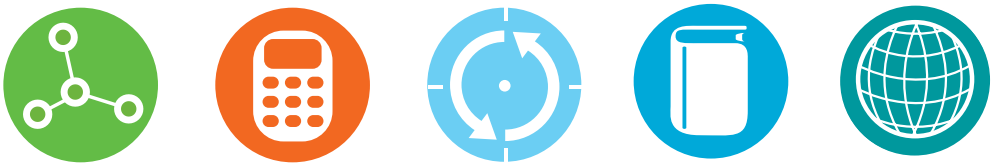
This resource consists of three elements:

- **A teaching and learning book** containing classroom-ready teaching and learning ideas and activities, unit and lesson plans, source materials and worksheets
- **Book chapters in PDF format**
- **Downloadable materials** in PDF and MS Word document format including worksheets; images of maps and photographs for use with the interactive whiteboard; and additional teacher support materials to assist with lesson planning and delivery.

Key features

This resource employs an inquiry approach to place-based teaching and learning and features:

- **Background information for teachers** on the resource topics with web-based support
- **Unit plans and lessons for different subject areas** to assist in developing students' understanding of their locality and its changing nature as the Sydney Metro Northwest project rolls out
- **Teaching ideas and activities** that fit with existing teaching programs and units of work or form the basis for a whole new program, built around local change. As such, the materials contained in this resource, although specifically designed to support the Sydney Metro Northwest Education Program, may be used by teachers elsewhere to examine change in their own locality
- **Colour coded icons** to navigate Key Learning Areas



- Lessons and learning activities that provide clear curriculum connections to the new NSW Education Standards Authority Australian Curriculum-based syllabuses in terms of subject area and learning across the curriculum content. Learning across the curriculum content addressed in this resource includes: cross curriculum priorities (Aboriginal and Torres Strait Islander histories and cultures) and sustainability; general capabilities (critical and creative thinking, ethical understanding, information and communication capability, intercultural understanding, literacy, numeracy, and personal and social capability); and areas identified by the NSW Education Standards Authority as essential to students' learning (civics and citizenship, difference and diversity, and work and enterprise)
- **Resources in digital form** with links throughout the book, identifying where materials can be downloaded
- **Student planned investigations** supported by materials and tools, which encourage participation in authentic learning tasks grounded in local events and issues. Research suggests that some of the most powerful learning takes place in environments and around experiences which are personally relevant to learners
- **Lesson writers who are experienced practising teachers**. Like all experienced teachers, the writers of this resource have found their own interesting and effective ways of doing things in the classroom. Writers' individual approaches have been retained as much as possible.

How this resource is organised

This resource is organised around three topics which provide teachers and students with materials to investigate strands in the Sydney Metro Northwest story: the geography of the localities through which the rail line will pass; the history and character of the region over time; and the rail line as a technological innovation and its role in accessing social and economic opportunities for people and communities in Sydney's North West region.

Each part of the Sydney Metro Northwest narrative is examined in the following topics:

Topic One: **A railway for Sydney's North West region** – lessons and a unit of work about planning for the future.

Topic Two: **Linking the nation** – lessons and a unit of work linking the past to the present of Australian transport.

Topic Three: **Planning, designing and building a railway** – lessons linking the present to the future of Sydney's North West region.

How to use this resource

This resource is a teachers' guide to teaching and learning about the Sydney Metro Northwest project. Teachers are not required to complete all lessons, activities and/or units of work contained in each topic. It is appreciated that school programs and student abilities vary widely.

As such, teachers are encouraged to select and adapt topic materials to complement and support their teaching and learning programs, and to suit the needs and interests of students in differing school contexts.

Modifying the resource for English as an Additional Language or Dialect (EAL/D) and Special Education learners

These lessons focus on themes and content that enable teachers to introduce Sydney Metro Northwest into their classrooms at different levels, in different Key Learning Areas and to different groups of learners. Although advice is provided in this resource to demonstrate how materials may be modified, teachers will need to address their own specific classroom circumstances.

Many students in Australian schools are learning English as an Additional Language or Dialect (EAL/D). EAL/D learners are students whose first language is a language other than Standard Australian English and who require additional support to assist them to develop English language proficiency.

EAL/D learners enter Australian schools at different ages and stages of schooling and at different stages of English language learning. They have diverse talents and capabilities and a range of prior learning experiences and levels of literacy in their first language and in English.

Only the teacher can explore ways of modifying the language and concepts in this resource to suit their students' needs. For more information go to the NSW Education Standards Authority website.

https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/english-year-10/english-k-10/introduction/students-learning-english-as-an-additional-language-or-dialect

Teachers will also need to modify the materials for their Special Education and lower ability students. The NSW Education Standards Authority provides advice on how to do this.

Refer to the following materials:

English K–10:
https://syllabus.bostes.nsw.edu.au/english/english-k10/supporting-special-education-students/

Mathematics K–10:
https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/mathematics/mathematics-k-10

Science 7–10:
https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-7-10-2018

History K–10:
https://syllabus.bostes.nsw.edu.au/hsie/history-k10/

Geography K–10:
https://syllabus.bostes.nsw.edu.au/hsie/geography-k10/

Web links

It is important to check the syllabus implementation timeline on the NSW Education Standards Authority website.

https://syllabus.nesa.nsw.edu.au/implementation/

Implementation support at:

https://syllabus.bostes.nsw.edu.au/assets/global/files/hsie-k_6-guide.pdf

Programming assistance at:

https://pb.bostes.nsw.edu.au

Curriculum Links: NSW Education Standards Authority

Each unit of work and lesson in this resource has an indicative connection to the New South Wales Education Standards Authority's K–10 or 7–10 syllabuses incorporating Australian Curriculum content. These syllabuses to which these resources explicitly link are:

Board of Studies New South Wales.(2012). English

K–10 Syllabus. **https://educationstandards.nsw.edu.au/wps/wcm/connect/1c3d7c13-87c1-402a-a43e-897a4b7dd74c/english-k10-syllabus.pdf?MOD=AJPERES&CVID=** on 8/01/19

New South Wales Education Standards Authority (2018) Science

Years 7–10 Syllabus, **https://tinyurl.com/Science7to10** on 8/01/19

New South Wales Education Standards Authority. (2015). Geography K–10 Syllabus. **https://tinyurl.com/Geogr7-10** on 8/01/19

New South Wales Education Standards Authority.(2015). History K–10 Syllabus. **https://educationstandards.nsw.edu.au/wps/wcm/connect/55f81fec-7312-45ff-b7a7-0a92a868c675/history-k10-syllabus.pdf?MOD=AJPERES&CVID=** on 8/01/19

Board of Studies New South Wales, Mathematics K–10 Syllabus (2012). **https://educationstandards.nsw.edu.au/wps/wcm/connect/2e4e2801-eef8-4a9f-bd43-5cc3e9487f19/mathematics-k10-syllabus.pdf?MOD=AJPERES&CVID=** on 8/01/19

K–10 syllabuses are designed to be taught within the New South Wales Education Standards Authority's recommended percentages of time for each Key Learning Area in a typical school week.

The materials in this book are designed to make it as easy as possible to build them into new or existing teaching programs. To assist, use the NSW Education Standards Authority Program Builder.

Cherrybrook Station canopy, November 2018.

Topic One: A railway for Sydney's North West region

Lessons about planning for the future

Key Learning Area	Title	Main focus question
Geography	**Traffic forecasting**	Why does the North West region need improved public transport?
Geography	**The journey to work**	How do your parents and family travel to work? Where do they work? What jobs do they do?
Geography	**Linking the North West region**	What are the main businesses in the North West region growth area? What are the advantages of linking these businesses by rail?
Science	**Measuring sound levels**	Are trains quieter than buses and cars?
English	**Media case study**	How does the media cover the Sydney Metro Northwest?
Geography	**Trip times, trains and the future of work**	Where do people living in Sydney's North West region work and how might Sydney Metro Northwest improve travel for people living along the alignment?
Geography	**Changes in land use in the North West region**	What are the most important land uses in the North West region today? How has land use changed over time?
Geography	**Understanding community consultation**	How does community consultation work? How can an understanding of geography help me participate in the consultative process?

	Key syllabus reference or outcome	Most appropriate level	Suggested number of lessons	Page
	Geography K–10: (GE4–1); (GE4–3); (GE4–7); (GE4–8); (GE5–2); (GE5–3); (GE5–5); (GE5–7); (GE5–8)	Stage 4–5	1–2	28
	Geography K–10: (GE4–7)	Stage 4	2–3	34
	Geography K–10: (GE4–1); (GE 4–7) (GE5–5); (GE5–7)	Stage 4–5	1–3	38
	Science 7–10: (SC4–11PW)	Stage 4	2–4	44
	English K–10: (EN4–1A); (EN4–2A); (EN5–1A); (EN5–2A)	Stage 4–5	2–3	52
	Geography K–10: (GE4–1); (GE4–3); (GE4–7); (GE5–3); (GE5–5); (GE5–7)	Stage 4–5	2–3	58
	Geography K–10: (GE5–3); (GE5–7); (GE5–8)	Stage 5	2–3	64
	Geography K–10: (GE5–2); (GE5–4); (GE5–7); (GE5–8)	Stage 5	4–6	70

Topic two: Linking the nation

Lessons linking the past to the present of Australian transport

Key Learning Area	Title	Main focus question
History	**North West Sydney has an ancient history**	What types of sources have archaeologists unearthed and used to piece together the ancient history of the North West Sydney region? What do these sources reveal about the length and nature of Aboriginal settlement of the area? How have archaeologists, historians and Aboriginal people worked together to develop a deeper understanding of the history of the North West Sydney region?
History	**Stage 5 Mandatory site study: A complete unit of work**	How does the current Sydney Trains network serve the community? What is Sydney Metro Northwest? How will it affect your local area and your community? What evidence of continuity and change over time can be seen in the changing methods of transport in New South Wales and in the local area? What does your site study reveal about the general history of your local area and the significant people and events who have contributed to its development? How can you share what you have learned from this study with the wider local community?
Geography	**Mapping the historical Rogans Hill to Parramatta railway line**	What remains of the old Rogans Hill to Parramatta railway line, closed in 1932?

	Key syllabus reference or outcome	Most appropriate level	Suggested number of lessons	Page
	History K–10: (HT4–1); (HT4–6)	Stage 4	1–2	80
	History K–10: (HT5–1); (HT5–2); (HT5–6); (HT5–7); (HT5–8); (HT5-10)	Stage 5	10–12	94
	Geography K–10: (GE4–2); (GE4–3); (GE4–7); (GE5–2); (GE5–3); (GE5–7)	Stages 4–5	1–2	144

Topic three: Planning, designing and building a railway

Lessons linking the present and the future of the North West region

Key Learning Area	Title	Main focus question
Science	Minimising environmental impact: Air quality in Sydney	How will Sydney Metro Northwest be good for the environmental air quality of Sydney?
Geography		
Science	Rail expansion and contraction	How do engineers allow for the expansion and contraction of railway tracks?
Science	Calculating and graphing vehicle speeds	How fast is my train?
Mathematics		
English	Persuasive writing: Making a railway poster	What is a good railway poster message that will attract the attention of passers by?
Geography	How to plan community development: Doing a population survey	What is the average age and population structure of The Hills Shire community?
Geography	How to plan community development: Meeting the needs of a growing population	How is the community changing? How might Sydney Metro Northwest help solve the needs of a growing population?
Mathematics	Calculating the volume of the tunnels	How much rock material has to be excavated to build the rail tunnels?
Geography	Landscapes, rocks and tunnels: Practical considerations in transport geography	What landscapes and rock types does the railway cross, both underground and over ground?

	Key syllabus reference or outcome	Most appropriate level	Suggested number of lessons	Page
	Science 7–10: SC4–10PW (PW4 b)	Stage 4	2–3	154
	Geography K–10: (GE4–1); (GE4–2); (GE4–3); (GE4–7); (GE5–2); (GE5–3); (GE5–7)	Stage 4–5		
	Science 7–10: SC4–16CW (CW1 b,c)	Stage 4	1–2	160
	Science 7–10: SC4–7WS (WS7.1 a,b) **Mathematics K–10:** MA4–19SP	Stage 4	1–2	164
	English K–10: EN4–2A	Stage 4	1–2	168
	Geography K–10: (GE5–1); (GE5–7)	Stage 5	2–3	174
	Geography K–10: (GE5–2); (GE5–3); (GE5–7); (GE5–8)	Stage 5	3–5	180
	Mathematics K–10: MA5.2–2WM	Stage 5	1–2	194
	Geography K–10: (GE5–2); (GE5–7); (GE5–8)	Stage 5	1–3	198

Topic One: A railway for Sydney's North West region

Over the next decade, the new metro rail link to the North West region will help relieve the congestion on Sydney's road and rail network, which is the result of population growth. The lessons in this topic explore some of the challenges of planning for the future in a sustainable manner.

Using an inquiry approach, students explore this future and find answers to the question:

What will Sydney Metro Northwest mean for me and for my daily life?

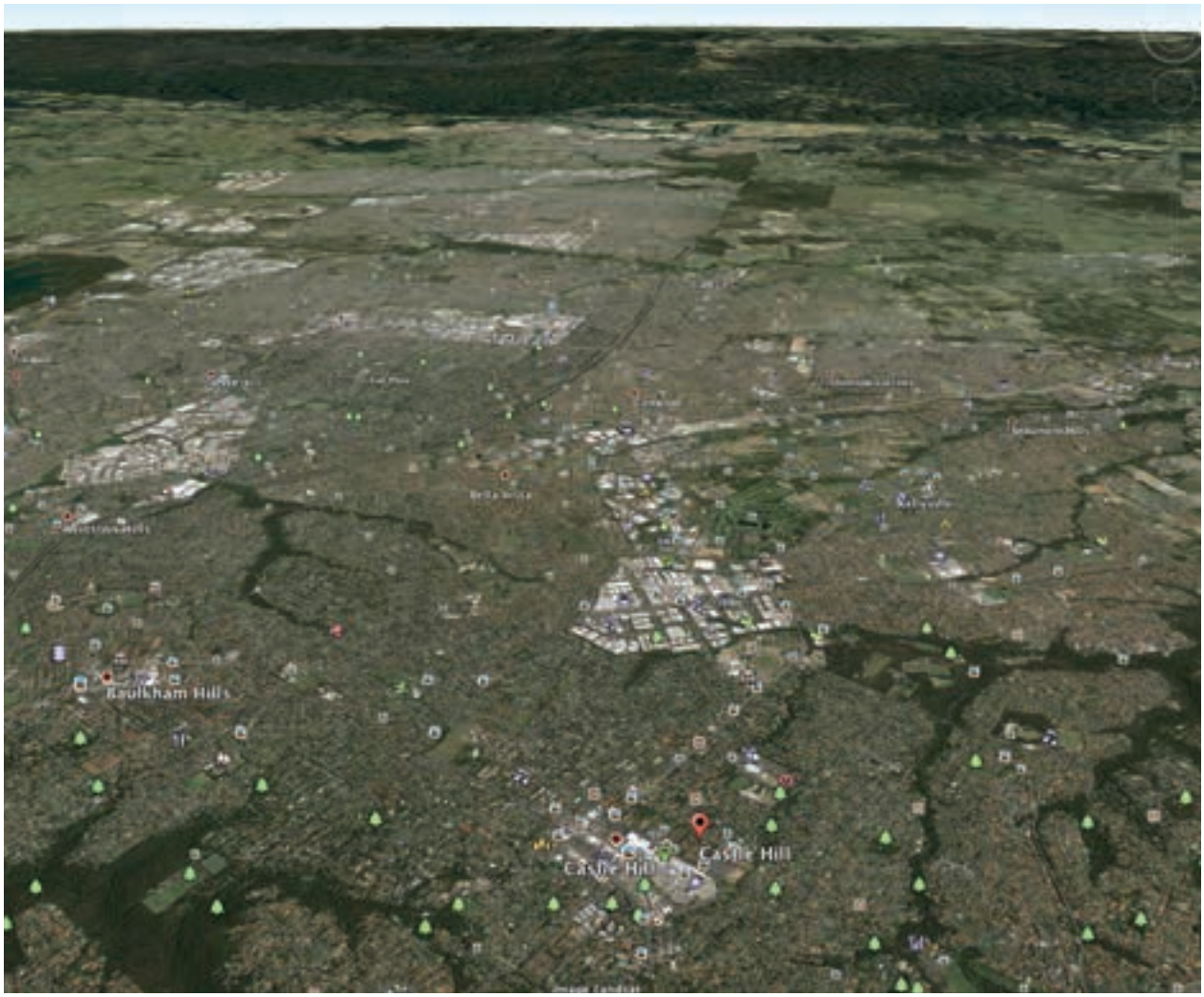


Figure 1: Free software, Google Earth, is a valuable tool in the geography classroom for visualising the landscape. Shown here is the view from Castle Hill towards Bella Vista.

Teachers are not required to complete all lessons, activities and/or units of work contained in this topic. Teachers are encouraged to select and adapt materials to complement and support their teaching and learning programs, and to suit the needs and interests of students in differing school contexts.

The topic at a glance

	The journey to work How do your parents and family travel to work? Where do they work? What jobs do they do?		
	Linking the North West region What are the main businesses in the North West region growth area? What are the advantages of linking these businesses by rail?		
Science			
English			
	Trip times, trains and the future of work Where do people living in Sydney's North West region work and how might Sydney Metro Northwest improve travel for people living along the alignment?		
	Changes in land use in the North West region What are the most important land uses in the North West region today? How has land use changed over time?		
	Understanding community consultation How does community consultation work? How can an understanding of geography help me participate in the consultative process?	**Stage 5** 4–6 lessons	70

Traffic forecasting

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Traffic forecasting** Why does the North West region need improved public transport?	**Stage 4–5** 1–2 lessons

Teacher briefing

People living in Sydney's North West region will be more familiar with travelling by car or bus rather than by train. Why does the North West region need better public transport?

The following activity is designed to help students discover answers to this question, and provide insights into how transport forecasters and planners work.

After reading Source 1 and analysing the information contained in Sources 2 and 3, students can discuss why adding more buses to North West region routes may be unsustainable, and why the region needs a rail link.

This is an introductory Stage 4 Geography learning activity, but can easily be incorporated into lesson sequences in transport or forecasting topics with Stage 5 students.

Requirements for these lessons

- Interactive whiteboard
- Sources 1, 2 and 3, either printed or projected on an interactive whiteboard.

Assessment

Assess students' ability to interpret maps, and understanding of forecasting increased road congestion and longer journeys, as a result of population growth and other factors.

Key terms and vocabulary

Sustainable, extrapolation, trend, Sydney Metro Northwest, North West Growth Centre, Central Business District, Sydney's Global Economic Corridor, travel speed and reliability, traffic volume, layover parking.

Background information

The NSW Department of Planning and Environment published the Sydney Metro Northwest *Corridor Strategy* on 15 May 2013. It is a guide for future development along the Sydney Metro Northwest. It includes planning around studies on each of the eight new train stations that will be built along the alignment at Cherrybrook, Castle Hill, Hills Showground, Norwest, Bella Vista, Kellyville, Rouse Hill and Tallawong. It is predicted that the area surrounding these new train stations will provide 27,400 new homes and 49,500 new jobs by 2036.

Section 2.4 of the Sydney Metro Northwest *Corridor Strategy* details reasons as to why increasing the number of buses operating in the North West region may be unsustainable, and why the region needs a rail link. These reasons include:

- By 2036, over 40 per cent of residents from the North West Growth Centre are expected to travel to Sydney's Central Business District by public transport in the morning peak period, while a further 15 per cent will travel to Macquarie Park, Chatswood, St Leonards and North Sydney
- Without improvements in public transport, it is predicted that by 2021 road congestion will increase travel times from the North West region by more than 50 per cent (in some cases more than 70 per cent)
- It is forecast that there will be an overall increase in buses entering the Central Business District of some 34 per cent by 2021; and growth in M2 express buses will account for almost 70 per cent of that growth.

Web links

Sydney Metro Northwest priority urban renewal corridor

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Urban-Renewal-Corridor

Further information on the challenges commuters currently experience when using public transport can be found in *Understanding the challenges*, Project Overview June 2012, page 15.

https://www.sydneymetro.info/sites/default/files/Project_overview.pdf%3Fext%3D.pdf

Syllabus links

Geography K–10

Geography Stage 4 – Place and Liveability

– the influence of accessibility to services and facilities on the liveability of places

– strategies used to enhance the liveability of places

(GE4–1) locates and describes the diverse features and characteristics of a range of places and environments

(GE4–3) explains how interactions and connections between people, places and environments result in change

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry

(GE4–8) communicates geographical information using a variety of strategies.

Geography Stage 5 – Changing places

– the causes and consequences of urbanisation

– the management and planning of Australia's urban future

(GE5–2) explains processes and influences that form and transform places and environments

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–5) assesses management strategies for places and environments for their sustainability

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

(GE5–8) communicates geographical information to a range of audiences using a variety of strategies.

Learning experiences

Step 1

Print and distribute Sources 1 and 2 (pages 31–32) or download and project on the interactive whiteboard.

Students answer the following questions by studying the sources:

- Why does the North West region need improved public transport?
- Why does the North West region need a rail link?
- Why is there a problem with just adding more buses?

Step 2

Students write a short newspaper article using one of the following headlines or create short 30 second news presentations on the need for improved public transport in Sydney's North West region:

- By 2021 bus journeys may take 50 per cent longer
- Is Sydney's Central Business District filling up with buses?
- What can we do about road congestion in Sydney's North West region?

Teacher references and extension work

This brief study of traffic forecasting may be extended by exploring the growth of employment and housing in the North West region in addition to population growth.

Sources

Source 1

Transport connections

"The current demand for public transport from North West Sydney to the Sydney Central Business District and broader Global Economic Corridor is serviced by a combination of rail and bus services. Access to the rail network from The Hills District is poor, with long bus or car trips required to access stations on the Richmond, Western or Northern Lines. As a result, a network of City Express bus services provides direct connections from The Hills District to the Sydney Central Business District on the M2/Epping Road corridor, with connections to the other centres between Macquarie Park and North Sydney. Transport for NSW has identified the city connection corridor to Macquarie Park and the North West Growth Centre as one of Metropolitan Sydney's five strategic transport corridors that is highly constrained, based on morning peak load factors for the rail network, travel speed and reliability for buses, and the volume and capacity on the road system.

Transport for NSW has forecast North West Sydney to represent one of the largest areas of train patronage growth over the next 20 years. Figure 3 (page 32) shows the change in daily train trip demand projected to occur between 2011 and 2031. There is limited capacity in the regional bus system to cater for increased demand from North West Sydney. Without improvements in public transport, it is predicted that by 2021 road congestion would increase travel times from North West Sydney by more than 50 per cent (in some cases more than 70 per cent). Direct and higher capacity transit connections are therefore required from the North West to the Global Economic Corridor to meet existing and future travel demands.

The demand for M2 Express buses has created substantial congestion problems within the Sydney Central Business District. M2 Express buses make up a significant proportion (30 per cent) of buses entering the Central Business District via the Sydney Harbour Bridge. The requirements for bus stops and bus layover parking contribute to growing congestion in bus terminals and regular substantial delays to buses on the Harbour Bridge.

Transport for NSW forecasts an overall increase in buses entering the Central Business District of some 34 per cent by 2021; and growth in M2 Express buses will account for almost 70 per cent of that growth. The introduction of North West Rail Link is expected to significantly reduce M2 Express bus flows (some M2 Express services will be retained after North West Rail Link becomes operational) and help to relieve pressure on the Central Business District to accommodate buses."

Note: The North West Rail Link is now known as Sydney Metro Northwest.
For more information visit https://www.sydneymetro.info/

Source: Section 2.4 of Sydney Metro Northwest *Corridor Strategy*, NSW Department of Planning and Environment, page 7.
https://www.planning.nsw.gov.au/~/media/Files/DPE/Reports/north-west-rail-link-corridor-strategy-2013-09.ashx

Sources

Source 2

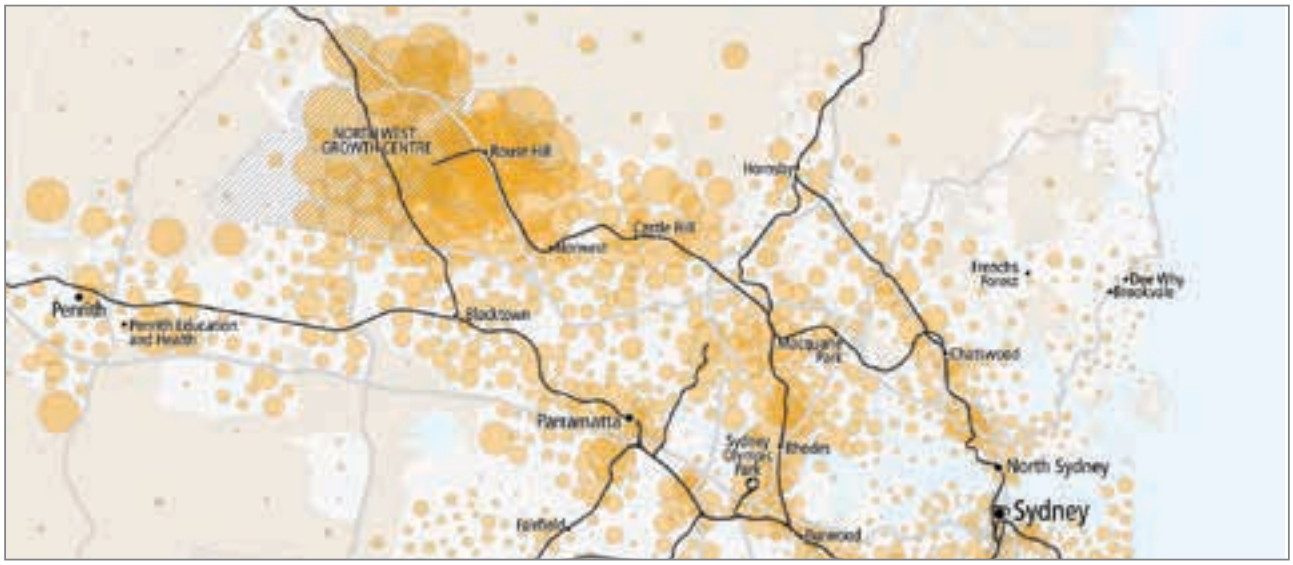


Figure 2: Forecast change in daily demand for trains services by origin zone 2011–2031 (AM peak).

Source: Sydney Metro Northwest *Corridor Strategy*, NSW Department of Planning and Environment, page 7.

Source 3

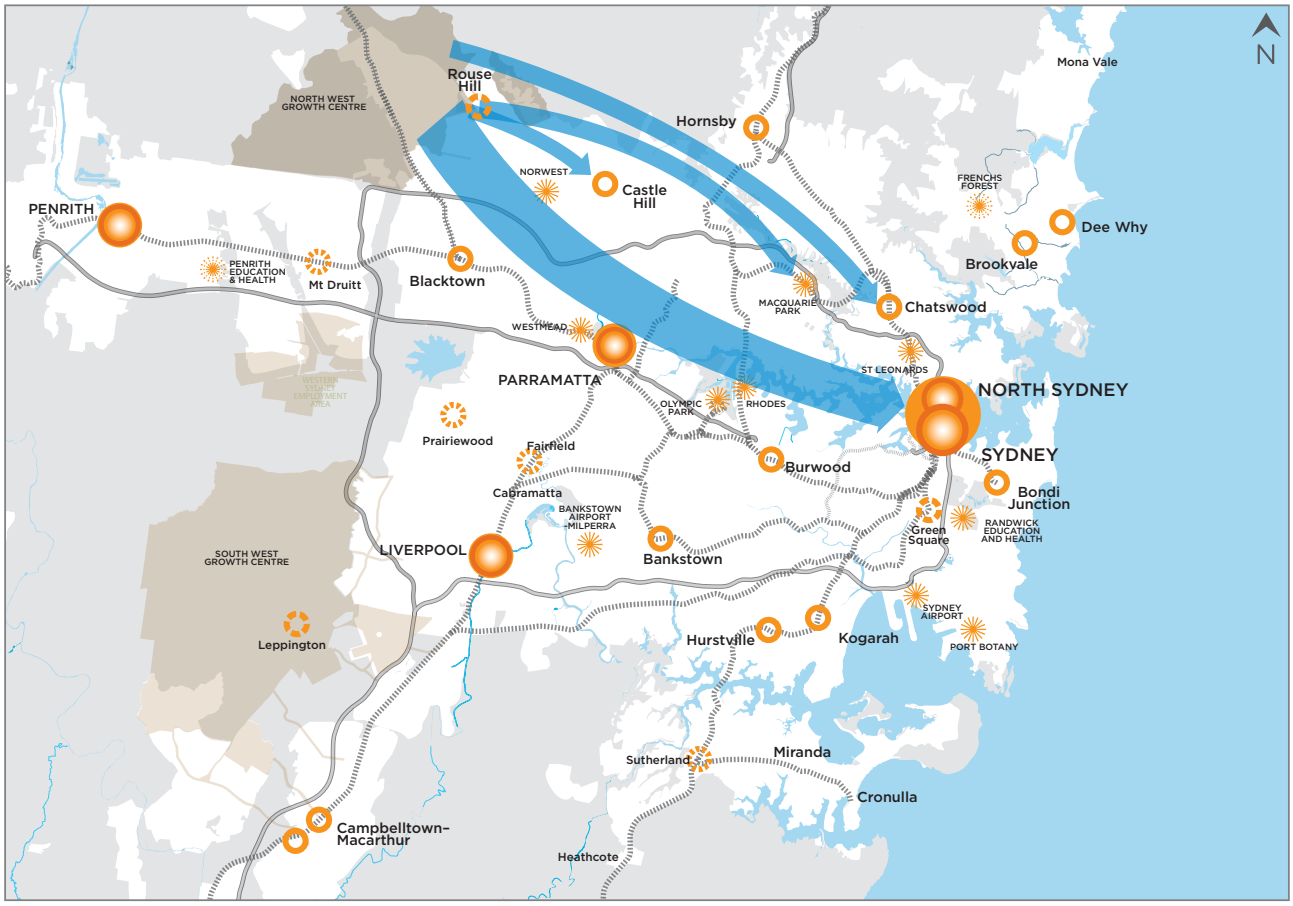


Figure 3: Forecast trip volumes from North West Growth Centre by public transport 2036.

Source: Sydney Metro Northwest *Corridor Strategy*, NSW Department of Planning and Environment, page 9.

First Metro train arrives at Chatswood Station, January 2019.

The journey to work

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**The journey to work** How do your parents and family travel to work? Where do they work? What jobs do they do?	**Stage 4** 2–3 lessons

Teacher briefing

Students record and analyse field data collected at school and in the local community. They use their results to determine how people travel and how travel patterns are measured. This lesson sequence assists students to understand how Sydney Metro Northwest may change the travel patterns of North West region residents.

Focus questions:

- What modes of transport do people use to travel to and from work?
- Where are their places of employment?
- What types of employment are people engaged in?

Requirements for these lessons

- Computers.

Assessment

Students are assessed on the quality of their analysis of survey data, and on the quality of observations presented in their written reports.

Background information

"The North West region is a fast growing area that has a high proportion of managerial and professional workers. The North West Rail Link would support economic growth by ensuring that appropriately qualified workers living in the North West region are provided with significantly improved access to key employment areas within Sydney's Global Economic Corridor, such as the Sydney Central Business District and North Sydney."

Note: The North West Rail Link is now known as Sydney Metro Northwest.
For more information visit **https://www.sydneymetro.info/**

Source: *Sydney Metro Northwest Environmental Impact Statement 2*, page 24, Chapter 22 Project Justification and Conclusion.

Web links

Sydney's Rail Future

https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/sydneys-rail-future.pdf

Sydney Metro Northwest Environmental Impact Statement 2, page 24, Chapter 22 Project Justification and Conclusion

https://www.sydneymetro.info/sites/default/files/24_Ch_22_Project_Justification_and_Conclusion.pdf%3Fext%3D.pdf

The Australian Bureau of Statistics journey to work data from the 2011 Census (called by Australian Bureau of Statistics, 'Travel to Work')

https://www.abs.gov.au/websitedbs/D3310114.nsf/home/2016%20Historical%20Census%20Data

A brief analysis of the 2011 Census 'Journey to Work' data

https://www.transport.nsw.gov.au/performance-and-analytics/passenger-travel/surveys/journey-to-work

Sydney Metro Northwest Corridor Strategy, NSW Department of Planning and Environment

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Priority-Urban-Renewal-Corridor/~/media/3C7B8E2246724F50BC507815AC6169FD.ashx

Syllabus links

Geography K–10

Geography Stage 4 – Place and Liveability

– the influence of accessibility to services and facilities on the liveability of places

Interconnections

– the way transportation and information and communication technologies are used to connect people to services, information and people in other places

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry

Learning experiences

Step 1

Students conduct a short survey of their family and neighbours aimed at collecting data about where they work and how they travel to work. The teacher outlines the task and discusses with students the types of questions they might ask survey participants:

- How do you travel to work?
  Car, bus, cycle, walk or a combination. Students may need to discuss how they will classify journeys that include multiple modes of transport.
- Where do you work?
  The suburb may be an adequate response; however, if students wish to analyse the travel distances by using Google Maps, they may need to collect more detailed data. The class should decide on the level of detail they are seeking from respondents.
- In what area of the workforce are you employed?
  Students may consult the census data to see how jobs are classified, or when analysing and classifying survey responses.
- How long does it take you to travel to work?
  Students discuss how this data will be recorded. Some respondents will provide specific details, while others will provide an estimate of the time taken to travel to work.

Examples of other questions that might be included in the survey include:

- Would they travel by another means, if more available or reliable?
- What would be their preferred means of travelling to work? Why?
- What are the transport options in the area? For example, bus, car, etc.
- Would a train improve reliability and/or travel time?

Students should be made aware of privacy issues when conducting surveys. If they limit the survey to their immediate family, they may be able to collect more information. This discussion is an important one.

Step 2

Students print out their agreed survey and ask family members to complete it. The teacher reminds students to seek permission from parents/guardians before they approach neighbours and ask them to participate in their survey.

Step 3

Students return to class with survey data and discuss how the data will be recorded and analysed.

Points for analysis include:

- Where do the respondents work? Students can work out the approximate kilometres by using Google Maps to calculate distance if respondents were unable to provide exact figures.
- What jobs do they do? Students may use standard categories to classify jobs:
  - Primary sector – farming, mining, forestry
  - Secondary sector – manufacturing
  - Tertiary sector – service industry
  - Quaternary sector – banking, IT, telecommunications.

Students may choose to find their own way of classifying jobs, using categories such as managers, tradespeople, shop assistants. However, it is essential that the class decides on a common classification system.

Step 4

Students then write a report on their results.

Teacher references and extension work

This is a simple field study activity aimed at assisting students to construct a survey tool, and to collect, record and analyse data. All these skills are an important part of practical geography. As an extension of this activity students may like to discuss different types of survey tools – their purposes and reliability.

They could also use Australian Bureau of Statistics census data to compare the 'journey to work' data they have collected with the suburb averages.

Linking the North West region

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Linking the North West region** What are the main businesses in the North West region growth area? What are the advantages of linking these businesses by rail?	**Stage 4–5** 1–3 lessons

Teacher briefing

Students investigate the location of the main economic growth areas in the North West region and identify the types of businesses that operate in these areas. They then link these businesses to other growth areas in Sydney. As a result of this activity, students learn about how the Sydney Metro Northwest will improve the economy of the region.

Focus questions:

- Where are the main business growth areas in the North West region of Sydney?
- What are the main types of businesses located in these areas? List their activities
- How are these businesses currently linked to other growth areas in Sydney?
- List the advantages of linking these businesses by rail.

Requirements for these lessons

- Interactive whiteboard
- Computers
- Internet connection
- Bookmarked websites (see web links).

Key terms and vocabulary

Global Economic Arc, Growth Centre, commercial core, business park, light industrial, bulky goods, station precinct, finance sector.

Background information

The North West Rail Link *Environmental Impact Statement*, Executive Summary states that over coming decades, "an extra 200,000 people will move into the North West region, taking the region's population above 600,000. Sydney Metro Northwest will, for the first time, deliver a reliable heavy rail public transport service to this growing region which has the highest car ownership levels per household in Australia."

Note: The North West Rail Link is now known as Sydney Metro Northwest.
For more information visit https://www.sydneymetro.info/

Source: Sydney Metro Northwest *Environmental Impact Statement 2*, Executive Summary.

How do metropolitan areas like Sydney plan for the type of growth detailed in the Sydney Metro Northwest *Environmental Impact Statement 2*? There are several planning models used internationally; however, the one used in Australia – 'growth-centre theory' – remains one of the more widespread and successful. According to this model, the city selects specific areas to be the focus for jobs and housing. These areas then become 'magnets' for economic activity and are linked to other growth areas so that synergies can be developed. The Sydney Metro Northwest helps provide this vital link.

Web links

Sydney Metro Northwest Corridor Strategy, NSW Department of Planning and Environment

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Priority-Urban-Renewal-Corridor/~/media/3C7B8E2246724F50BC507815AC6169FD.ashx

The draft structure plans for each station precinct can be found at:

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/North-West-Growth-Area

Google Maps

https://maps.google.com.au

Syllabus links

Geography K–10

Geography Stage 4 – Interconnections

– the way transportation and information and communication technologies are used to connect people to services, information and people in other places

(GE4–1) locates and describes the diverse features and characteristics of a range of places and environments

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry

Geography Stage 5 – Changing places

– the management and planning of Australia's urban future

(GE5–5) assesses management strategies for places and environments for their sustainability

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

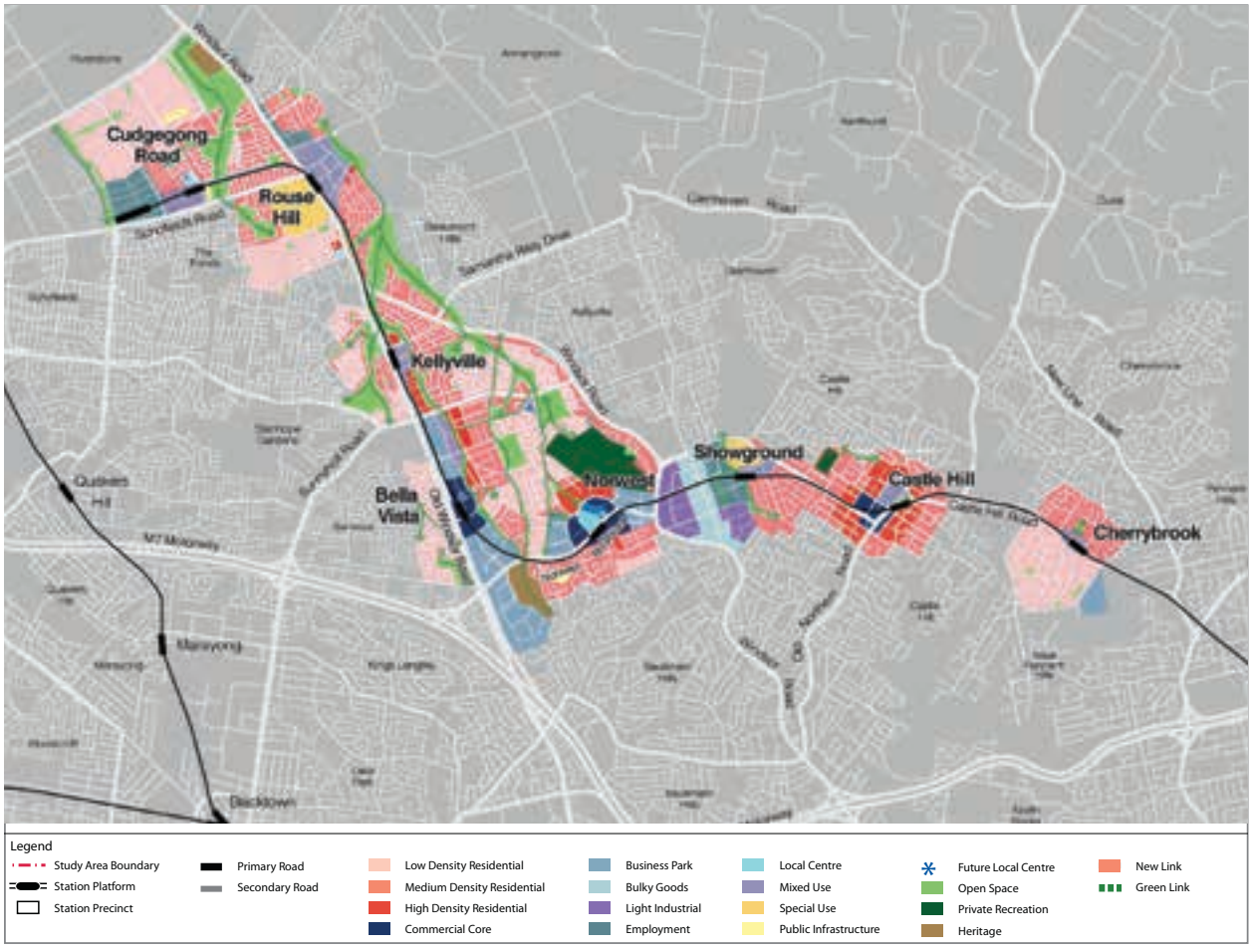


Figure 4: Land use map, Sydney Metro Northwest *Corridor Strategy*, NSW Department of Planning and Environment. This map can be downloaded and printed. It can also be displayed on the interactive whiteboard.

Learning experiences

Step 1 – Identify the main business areas

Students identify the main business areas as shown on the Sydney Metro Northwest *Corridor Strategy* land use map page 13. Business areas are shaded blue and purple. For a detailed examination of the map, it is recommended that students download copies onto their computers, laptops or iPads.

https://www.planning.nsw.gov.au/-/media/Files/DPE/Reports/north-west-rail-link-corridor-strategy-2013-09.pdf

Alternatively students can download the individual Finalisation Reports for each of the station precincts and local businesses.

Step 2 – Find the major businesses on Google Maps

Students then use Google Maps to find the business areas they have identified on the Sydney Metro Northwest *Corridor Strategy* land use map.

Using Google's Map View and Street View, students find the names of the major companies that have businesses in these areas.

Step 3 – Identify products and services

Using the internet, students identify services or products these businesses provide and answer the following questions:

- What are the main businesses found in these areas?
- What services or products do they provide?
- Why do you think they are located there?

Step 4 – Explore the Corridor

Use Figure 5 (page 42) to locate other business areas in the Global Economic Corridor. Students should repeat the exercise for the North West region by answering the following questions:

- What businesses are found there?
- Are these types of businesses similar or dissimilar to those found in the North West region?

Step 5 – Discuss why a rail link would bring economic advantages to businesses in the North West region

In groups, students discuss why linking business areas in the North West region would be economically advantageous to the area, and why a rail line may be the best option to achieve this outcome. Groups share their thoughts with the whole class.

- Is there agreement among groups?
- Why or why not?

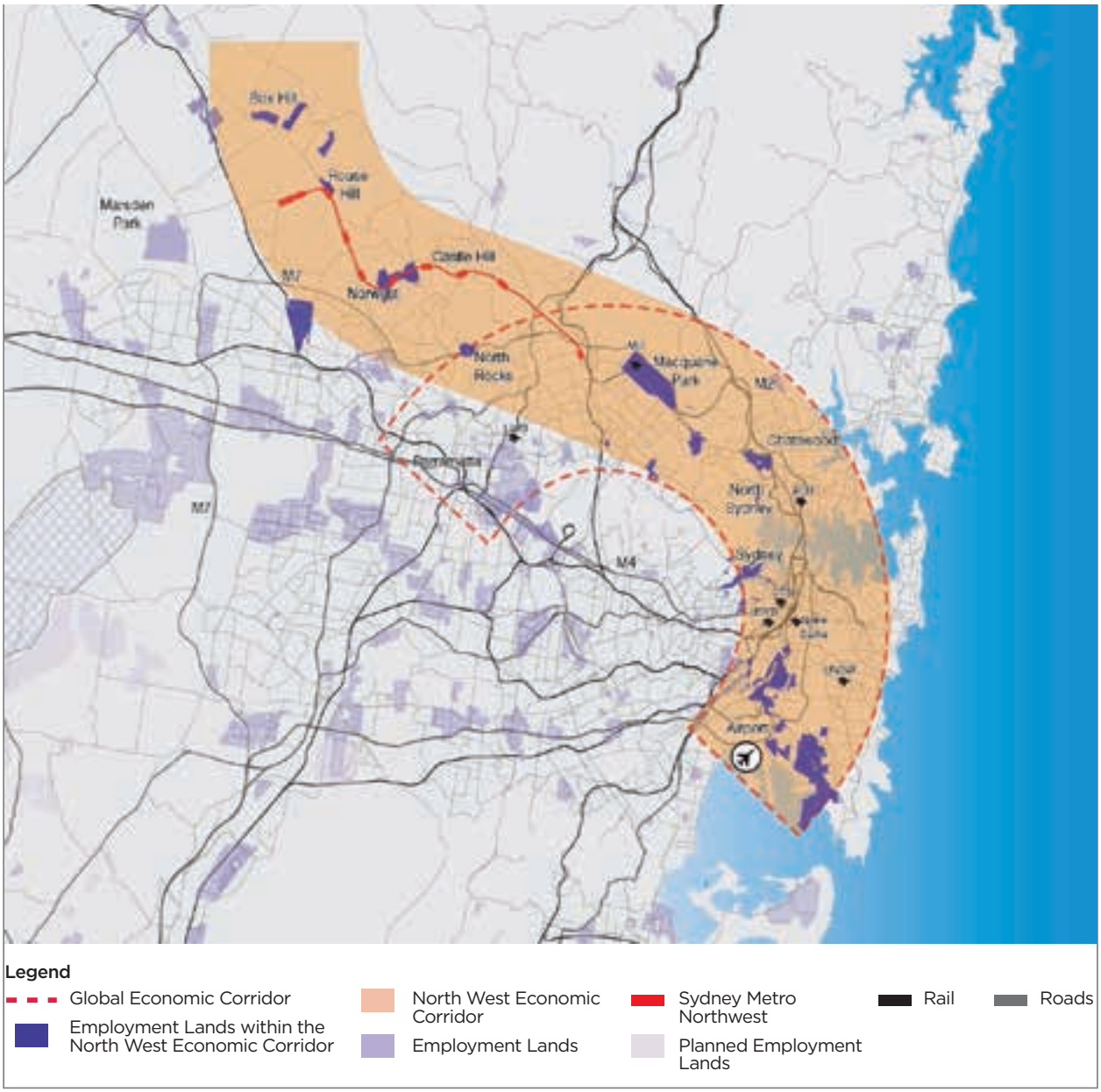


Figure 5: The North West region in the context of the Global Economic Corridor.

Source: Sydney Metro Northwest *Corridor Strategy*, NSW Department of Planning and Environment.

Train testing in the tunnel, September 2018

Measuring sound levels

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Science	**Measuring sound levels** Are trains quieter than buses and cars?	**Stage 4** 2–4 lessons

Teacher briefing

This lesson examines noise and how to measure it. It addresses an important question in the field of environmental planning – 'Are trains quieter than buses and cars?'

Residents and commuters have been limited to road transport when travelling to and from Sydney's North West region, and are familiar with the noise generated by busy traffic on highways.

When undertaking these activities, remind students they are modelling the skills used by the scientists and engineers who developed the Sydney Metro Northwest plan. It will help them understand the 'real world' application of the scientific knowledge and skills they are learning.

Requirements for these lessons

- Smart phone, iPad or similar tablet with a built in microphone
- Sound level recording App.

Assessment

This exercise requires students to record and analyse data and draw conclusions from their observations and readings taken. Students can be assessed on their level of understanding about how to make their sound recordings as accurate as possible, and on the quality of their conclusions.

Key terms and vocabulary

Decibel, noise, vibration.

Background information

Noise

A 'noise' is generally thought of as an unwanted sound. Sound is a form of mechanical energy and energy can do physical work. Many activities that are a part of our modern world are generators of noise. If noise can be avoided most of us would takes steps to avoid it. Work places have a special requirement to make sure that noise is minimised to protect workers and the surrounding environment.

Sydney Metro Northwest is a large scale construction project that will operate for many decades. Before large scale projects like this, experts including scientists and engineers measure existing noise environments, and try to forecast operational and construction noise and vibration. These tests are undertaken to ensure the best possible outcomes for people and the environment. Data from these tests are published in Environmental Impact Statements (EIS).

Measuring noise

The instrument for measuring noise levels is a sound level meter. A professional sound level meter is regularly calibrated. The meter has a microphone that picks up sound and gives a reading of the noise based on a logarithmic scale (each increase of one unit on the scale means an increase in sound level intensity of ten) called the decibel scale. The meter measures a frequency-weighted and time-weighted value of the sound pressure level. Noise assessments should be carried out when workers and others may be exposed to damaging noise levels.

Web links

Sound level diagram

https://www.sydneymetro.info/sites/default/files/document-library/05_NWRL%20EIS%20Stage%202_%20Chapters%2010%20to%2013.pdf

See Teacher references (page 50) for more detailed information on noise.

Syllabus links

Science 7–10

(SC4–11PW) discusses how scientific understanding and technological development have contributed to finding solutions to problems involving energy transfers and transformations.

Learning experiences

Activity 1 – What effect does noise have on you?

Initiate a class discussion. Brainstorm the question 'What effect does noise have on you?' Record the responses on a white board.

Sample responses could include:

Exposure to noise in any environment can cause physiological (real impacts on the person's body) problems or conditions:

- Speech interference
- Sleep disturbance
- Fatigue and aggression
- Reduced immune response
- Increased risk of heart disease
- Hearing damage.

Exposure to noise in any environment can cause psychological (mental) problems or conditions:

- Irritability
- Interference with concentration
- Interference with thought processes.

The class may not recognise some of these effects or may not have thought about them.

Activity 2 – Understanding how to measure sound levels

Select and download an appropriate sound meter App to measure sound levels.

Using a sound meter

Many people now have a smart phone or tablet such as an iPad. Sound meter Apps are available for download for both Android and IOS (previously iPhone OS) based devices either free or at minimal cost. These Apps use the built-in phone microphone on the device to collect sound and give a reading on the decibel scale. These devices are not calibrated and hence not necessarily accurate, but they do give a good idea of sound level (relative sound level).

Figure 6: Examples of Apps for IOS devices.

Figure 7: Example of a reading output from a sound meter App.

Measuring sound level is measured in decibels (dB)

Distribute the following list and consider the effects to help understand the scale of different level readings.

Sound dB	Noise description
20	Faintest sound most people can hear
30	Quiet room or a quiet location away from development
45	Typical office space or the sound of the city at night
60	Noisy office
70	Sound of a car passing close by on the street
80	Loud music played at home or a noisy class
90	Sound of a big truck passing close by
100	Sound from a rock band or operating jackhammer
120	Pain threshold

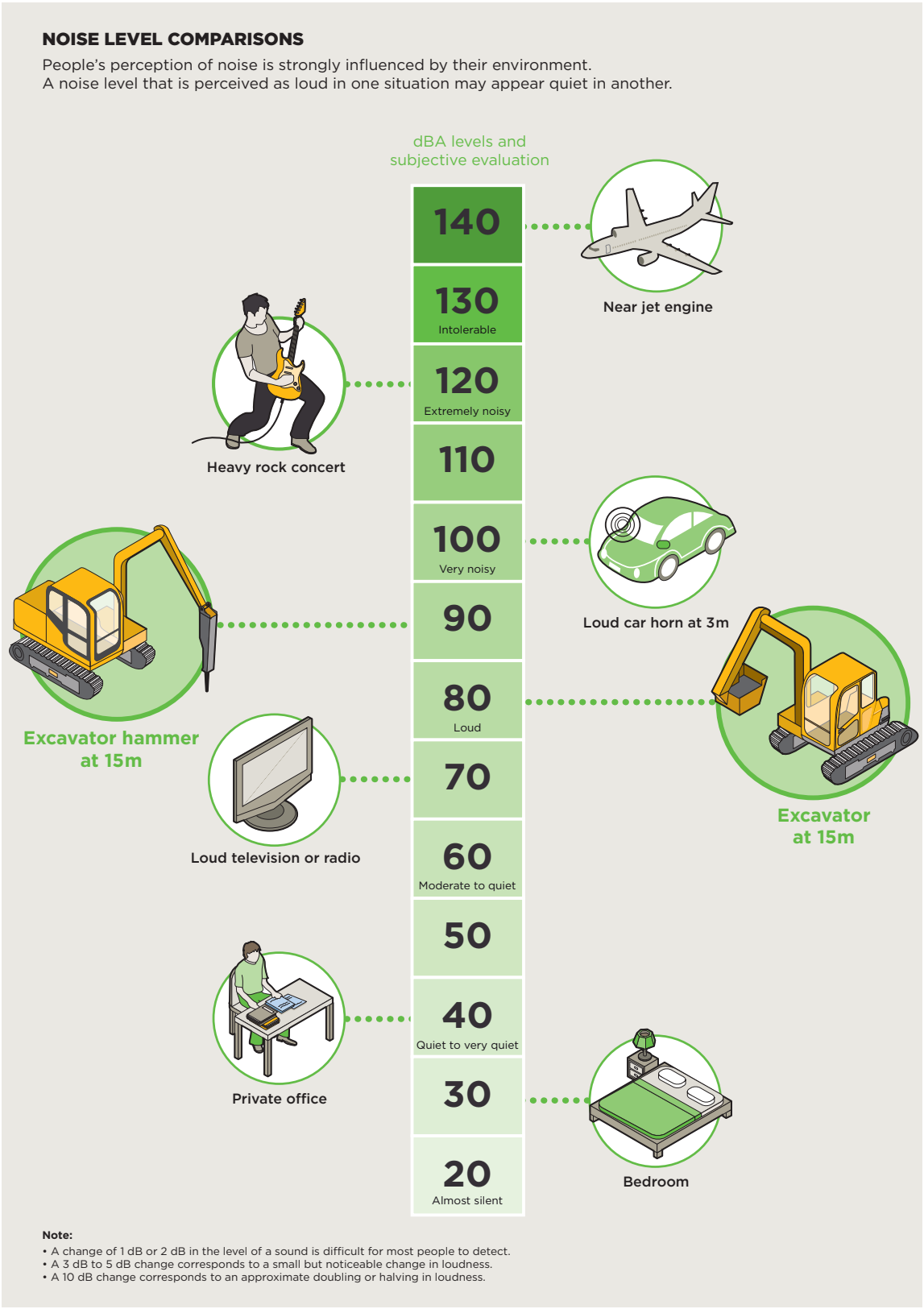


Figure 8: Noise level comparisons: The noise levels that could be typically encountered in the described situations.

Activity 3

This exercise requires students to either do the readings near their homes, on their way to and from school, or on the weekend. Alternatively, the class can do all the recordings at locations near the school during class time.

Discuss the logistics of where and when students can make the following recordings. Instructions are provided below for the lesson sequence.

Step 1

Use a sound level meter or App on a smart phone or tablet computer to measure average sound levels during a period of time in various locations around you. Check your meter is reading approximately the correct values by comparing your results to the examples in the list you have been given. Is your meter reading close to these values?

Step 2

Choose one location where there is little noise or sound and another location where you would describe the average sound level during a period of time as typical. Then, if possible record the noise level near to operating machinery or a busy road or adjacent to a passenger rail line. If you have a very busy road nearby it may have sound buffer fencing. You may be able to record the level of noise on both the road and house side of the barrier (refer to Figure 8 'noise level comparisons', page 48).

Step 3

Teachers may have to collect these readings themselves and present them to the class, as you will need to observe activities near a rail line to record the noise level when no train is passing (background sound level) and when a train is passing.

(Under no circumstances should children or teachers enter the actual rail corridor – this is dangerous and illegal).

Step 4

Make a table and record your sound level reading for each location. You should look for any variation over a minute or two and record a reading range for each source of the noise.

Step 5 – Discuss your readings

- How did the readings vary for different locations?
- If the readings were higher, was this uncomfortable for you?
- Do sound barriers make a difference to the sound from traffic?
- Are trains less noisy than cars and buses?

Teacher references and extension work

Extension activity

Explore different strategies used to mitigate transport noise levels in terms of their capacity to reduce sound levels. These strategies should include:

- Noise barrier fences
- Tracks in cuttings
- New trains.

All of these features are used in the Sydney Metro Northwest project as strategies to minimise the environmental impacts due to noise.

Web links

The NSW Government report on the Environmental criteria for road traffic noise in New South Wales

https://www.epa.nsw.gov.au/noise/traffic.htm

Specific sections of Sydney Metro Northwest *Environmental Impact Statement 2* that deal with issues related to noise and vibration are in Chapter 10

https://www.sydneymetro.info/sites/default/files/document-library/05_NWRL%20EIS%20Stage%202_%20Chapters%2010%20to%2013.pdf

Technical paper 3 of the Sydney Metro Northwest *Environmental Impact Statement 2* is dedicated to reporting on noise and vibration

https://www.sydneymetro.info/sites/default/files/36_Technical_Paper_3_-_Noise_and_Vibration_-_Part_1_of_4.pdf%3Fext%3D.pdf

Chapter 5 describes the process for predicting and assessing airborne operational noise impacts associated with train passbys.

AP-R277/05 Austroads research report, Modelling, measuring and mitigating road traffic noise. This free publication can be downloaded from **https://austroads.com.au/publications/environment/ap-r277-05** as a pdf document from the Austroads website after registering and obtaining a login.

Appendix 3 of this document, Measuring traffic noise and preparing a noise impact statement, provides technical information on measuring road noise.

Kellyville Station pedestrian bridge, November 2018.

Media case study

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
English	**Media case study** How does the media cover the Sydney Metro Northwest?	**Stage 4–5** 2–3 lessons

Teacher briefing

This media case study may be adapted for either Stage 4 or 5 English. Students find and review articles and news clips found on the web that relate to the Sydney Metro and discuss the following questions.

Note: Sydney Metro Northwest was formerly known as North West Rail Link. It had a name change in June 2015. For more information visit **https://www.sydneymetro.info/**

- How much coverage is there of the Sydney Metro project?
- Is the coverage positive or negative? What would you expect for such a big project?
- What type of coverage is it? How detailed is it?
- Is there a difference in focus in national and local newspaper articles?
- Do all journalists seem to agree or disagree about the purpose of the project?
- What aspects of Sydney Metro project do journalists seem most interested in?

Requirements for these lessons

- Computers
- Interactive whiteboard
- Bookmarked links (see web links).

Assessment

Assess how well students are able to compare media texts that represent ideas and events in different ways, and are able to explain the effects of differing approaches.

Web links

Examples of media coverage

Articles may be found by searching the web using key phrases such as 'North West Rail Link' (as it was previously known prior to being renamed Sydney Metro Northwest in June 2015). For example:
https://www.google.com.au/search?q=north+west+rail+link

Below is a selection of Sydney Metro project coverage in major and local newspapers.

Sydney metro line 'on track and on budget' as first tracks laid
https://infrastructuremagazine.com.au/2018/04/23/sydney-metro-northwest-under-budget/

https://www.railexpress.com.au/track-finished-on-sydney-metro-northwest/

Sydney CBD buildings to be demolished for underground Metro interchange
https://www.sbs.com.au/news/sydney-buildings-to-be-torn-down-for-metro

Sydney Metro Northwest train test at Rouse Hill
https://www.dailytelegraph.com.au/newslocal/rouse-hill-times/sydney-metro-northwest-train-test-at-rouse-hill/news-story/8f165526e2934e5342296af8f7f47fd2

Sydney's Metro Northwest rail line to be completed $500m under budget
https://www.smh.com.au/national/nsw/sydney-s-metro-northwest-rail-line-to-be-completed-500m-under-budget-20180422-p4zazf.html

The Sydney suburbs on list of station sites for new metro line
https://www.smh.com.au/national/nsw/the-sydney-suburbs-on-list-of-station-sites-for-new-metro-line-20180323-p4z5vw.html

https://theurbandeveloper.com/articles/developers-shortlisted-for-waterloo-station-development

NSW Government announces new city stations for Sydney Metro
https://www.smh.com.au/national/nsw/new-cbd-rail-station-to-link-wynyard-and-martin-place-20180708-p4zq8g.html

Sydney unveils new single deck and driverless trains
https://www.abc.net.au/news/2018-03-19/nsw-government-unveils-new-metro-line-driverless-trains/9562722

https://www.smh.com.au/national/nsw/sydney-s-first-driverless-metro-train-passes-major-test-20180702-p4zoya.html

Skytrain's the limit as Sydney Metro North West speeds up ambitious rail link
https://www.dailytelegraph.com.au/newslocal/rouse-hill-times/skytrains-the-limit-as-sydney-metro-north-west-speeds-up-ambitious-rail-link/news-story/219a164b6a7fe52472be8884cd211d24

Sydney Metro crosses Skytrain bridge in testing
https://www.themercury.com.au/news/national/raw-sydney-metro-crosses-skytrain-bridge-in-testing/video/c08eb325d21ebb791677ed423424516f

Sydney's new trains unveiled
https://plenarygroup.com/news-and-media/news/2018/sydneys-new-trains-unveiled

Sydney metro: Battle over route for $11 billion project
https://www.abc.net.au/news/2018-07-01/alp-to-spend-246b-on-western-sydney/9928922

Monorail becoming temporary bridge to keep traffic moving during Sydney Metro Northwest construction
https://infrastructuremagazine.com.au/2017/09/04/monorail-beams-removed-as-sydney-metro-project-moves-forward/

Hong Kong metro gives commuters a clue to what North West Rail Link will look like
https://www.msn.com/en-au/news/australia/sneak-peak-at-future-of-sydney-rail-travel/ar-BBNowNH

3 companies are building the new $2.8 billion train line under Sydney Harbour
https://www.businessinsider.com.au/3-companies-are-building-the-new-2-8-billion-train-line-under-sydney-harbour-2017-6

Second Sydney Harbour crossing to follow North West Rail
https://www.smh.com.au/national/nsw/secret-reports-show-tunneling-to-start-on-northern-sydney-motorways-by-2021-20180723-p4zt49.html

Chatswood will cope with rail link passengers
https://www.abc.net.au/news/2018-04-09/epping-to-chatswood-train-line-closure-impacts/9632816

There are also news video clips online. Several recent examples:

https://www.news.com.au/video/id-5348771529001-5989409750001/sydneys-driverless-train-completes-first-test-run

https://www.dailytelegraph.com.au/news/national/raw-sydney-metro-crosses-skytrain-bridge-in-testing/video/c08eb325d21ebb791677ed423424516f

Syllabus links

English K–10

(EN4–1A) responds to and composes texts for understanding, interpretation, critical analysis, imaginative expression and pleasure.

(EN4–2A) effectively uses a widening range of processes, skills, strategies and knowledge for responding to and composing texts in different media and technologies.

(EN5–1A) responds to and composes increasingly sophisticated and sustained texts for understanding, interpretation, critical analysis, imaginative expression and pleasure.

(EN5–2A) effectively uses and critically assesses a wide range of processes, skills, strategies and knowledge for responding to and composing a wide range of texts in different media and technologies.

Learning experiences

Students read a range of the media examples provided in web links and discuss these. Alternatively bring up each article on the interactive whiteboard and discuss.

Use the following questions as a guide:

- How much coverage is there of the Sydney Metro project (or North West Rail Link as it was previously known prior to June 2015)?
- Is the coverage more or less than you would expect for such a big project?
- What type of coverage is it? How detailed is it?
- Is there a difference between the focus of national and local newspaper articles?
- Do all journalists seem to agree or disagree about the purpose of the project?
- What aspects of the project do journalists seem to be most interested in?

After discussion and note-taking from the sources, follow-up activities can involve:

- Writing news headlines
- Writing news items in the format of web-news or newspaper articles
- Developing a short 30 second TV report explaining forthcoming change to the local area or some feature of the Sydney Metro project.

Teacher references and extension work

This lesson may be a perfect addition to a larger lesson sequence about 'What is journalism?'

A good introduction to this lesson might include:

- What is a journalist?
- What are some of the tasks of a journalist?

Through discussion, a list such as the following may be created about the roles of a journalist:

- News gathering and recording eyewitness accounts of events
- Accuracy and corroboration of facts with multiple sources
- Ensuring balance of viewpoints and 'both sides of the story'
- Stories with conflict are more interesting than stories without.

Through discussion, students identify different types of journalism:

- Broadcast journalism
- Advocacy journalism
- Investigative journalism
- Consumer journalism
- Tabloid journalism
- Political journalism.

First look at Bella Vista Station, October 2018

Trip times, trains and the future of work

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Trip times, trains and the future of work** Where do people living in Sydney's North West region work and how might Sydney Metro Northwest improve travel for people living along the alignment?	**Stage 4–5** 2–3 lessons

Teacher briefing

In this lesson students consider two key features of modern urban growth planning – trip analysis and the journey to work. Minimising the length and time of the journey to work is at the forefront of most people's decisions about where to live and work.

In this lesson students gather community data, extrapolate trends and suggest potential solutions to important issues of urban planning.

Focus questions:

- Where do people living in Sydney's North West region work?
- How might Sydney Metro Northwest improve travel for people living along the alignment?

Requirements for these lessons

- Computers
- Internet connection
- Bookmarked websites (see web links)
- Printouts of Sources 1–3.

Key terms and vocabulary

Extrapolate trends, traffic congestion, Global Economic Corridor.

Background information

Sydney is a modern international city experiencing growth in population and employment. Sydney currently has a population of about 4.6 million people, but this is projected to grow significantly to 5.1 million by 2021 and six million by 2031. Driven by population growth, employment in Sydney is expected to increase from its current level of 2.1 million workers to 2.6 million by 2031.

As Source 2 (page 62) illustrates, the Sydney Central Business District will remain the primary employment centre and the Global Economic Arc, including Macquarie Park, North Shore, Central Business District and the Sydney Airport, will account for about a third of the employment opportunities in Sydney. This growth will place pressure on a rail system already straining to cope with current demand.

In the launch of the Sydney Metro Northwest's *Environmental Impact Statement 2*, 30 October 2012, the NSW Transport Minister's media release 'New stations, new trains and 14 million fewer car trips' highlighted the following benefits of the Sydney Metro Northwest project:

- Sydney Metro Northwest is forecast to reduce car trips by 14 million a year after opening. This is about 12,000 fewer car trips in an average two hour weekday morning peak. The reduction in car trips is forecast to increase to 20 million a year by 2036
- The trip from Tallawong, Rouse Hill to Macquarie Park will take about 28 minutes, to Chatswood 37 minutes and to Wynyard (including an interchange) 57 minutes.

Web links

Sydney's Rail Future

https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/sydneys-rail-future.pdf

Sydney Metro Northwest 's *Environmental Impact Statement 2,* Project Justification and Conclusion

https://www.sydneymetro.info/sites/default/files/24_Ch_22_Project_Justification_and_Conclusion.pdf%3Fext%3D.pdf

Australian Bureau of Statistics Census data

http://www.abs.gov.au/websitedbs/D3310114.nsf/Home/Assuring%20Census%20Data%20Quality

NSW Bureau of Transport Statistics data

https://www.transport.nsw.gov.au/data-and-research

It monitors and forecasts transport usage and performance, and profiles usage patterns in suburbs and across the greater Sydney area. Explore the 'Journey to Work' feature of this site.

Further information

Department of the Environment, Water, Heritage and the Arts

https://www.environment.gov.au/science/soe/2011-report/supplementary

Syllabus links

Geography K–10

Geography Stage 4 – Place and Liveability

– the influence of accessibility to services and facilities on the liveability of places

(GE4–1) locates and describes the diverse features and characteristics of a range of places and environments

(GE4–3) explains how interactions and connections between people, places and environments result in change

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry

Geography Stage 5 – Changing places

– the causes and consequences of urbanisation

– the management and planning of Australia's urban future

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–5) assesses management strategies for places and environments for their sustainability

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

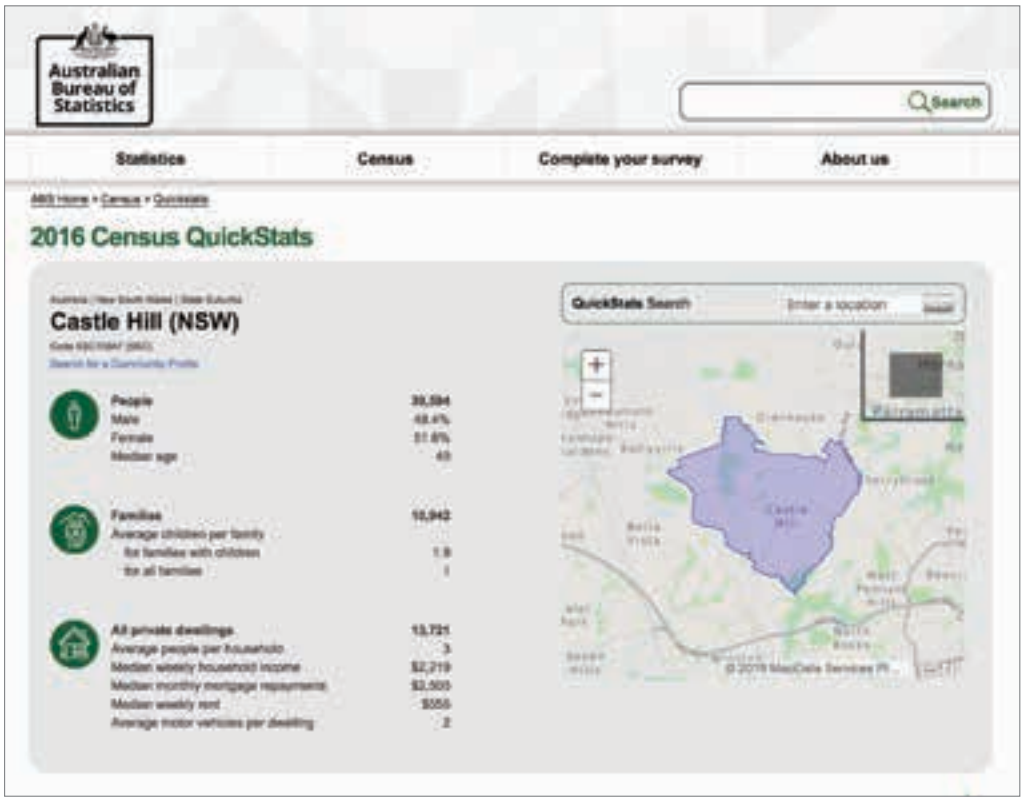


Figure 9: The Australian Bureau of Statistics, **www.abs.gov.au** provides easy access to Community Profile Census data that allows students to analyse the communities on the Sydney Metro Northwest alignment in great detail. The example shown is Castle Hill. Also refer to the NSW Bureau of Transport Statistics, **www.bts.nsw.gov.au**

Learning experiences

Step 1

Go to the Australian Bureau of Statistics census data page and select 'Community Profiles'. Select each community along the Sydney Metro Northwest alignment and download their 'Basic Community Profile'. You may like to allocate individual communities to groups of students to make the task quicker. Refer to source 1 (page 62) to locate suburbs and their communities along the Sydney Metro Northwest alignment.

Step 2

Tables B45 and B46 provide occupational and journey to work data. Make a summary of each. Repeat this exercise for the same community but for earlier censuses, e.g. 2006, 2012.

Calculate the percentage change in main occupation types and main methods of transport.

Step 3

Go to the *Australia state of the environment 2011 report*, Chapter 10, page 800, (2.1.3) Transport. Department of the Environment, Water, Heritage and the Arts.

http://155.187.2.69/soe/2011/report/index.html

Read and discuss the coverage of congestion issues in major Australian cities as outlined in Chapter 10.

Focus on the report's coverage of Sydney. What do Figures 10.6 and 10.7 tell us about current and projected levels of traffic congestion in Sydney?

Step 4

Using the information you have gathered so far, and with reference to Sources 2 and 3 (pages 62–63) answer the following questions:

- What trends can you see?
- If you extrapolated 20 years into the future, what might be the main changes in occupation and travel to work data? How might this affect travel?
- If future employment growth followed the pattern predicted in Source 2, how might this, along with population growth, affect travel time and traffic congestion?
- What implications do these predicted changes have for transport planning now, and in the future?

Teacher references and extension work

Trip times and journey to work are important aspects of urban geography and traffic congestion is a complex topic. However, the NSW Bureau of Transport Statistics has published valuable data about congestion that allows students to explore the topic in more detail.

https://data.nsw.gov.au/data/dataset

Sources

Source 1

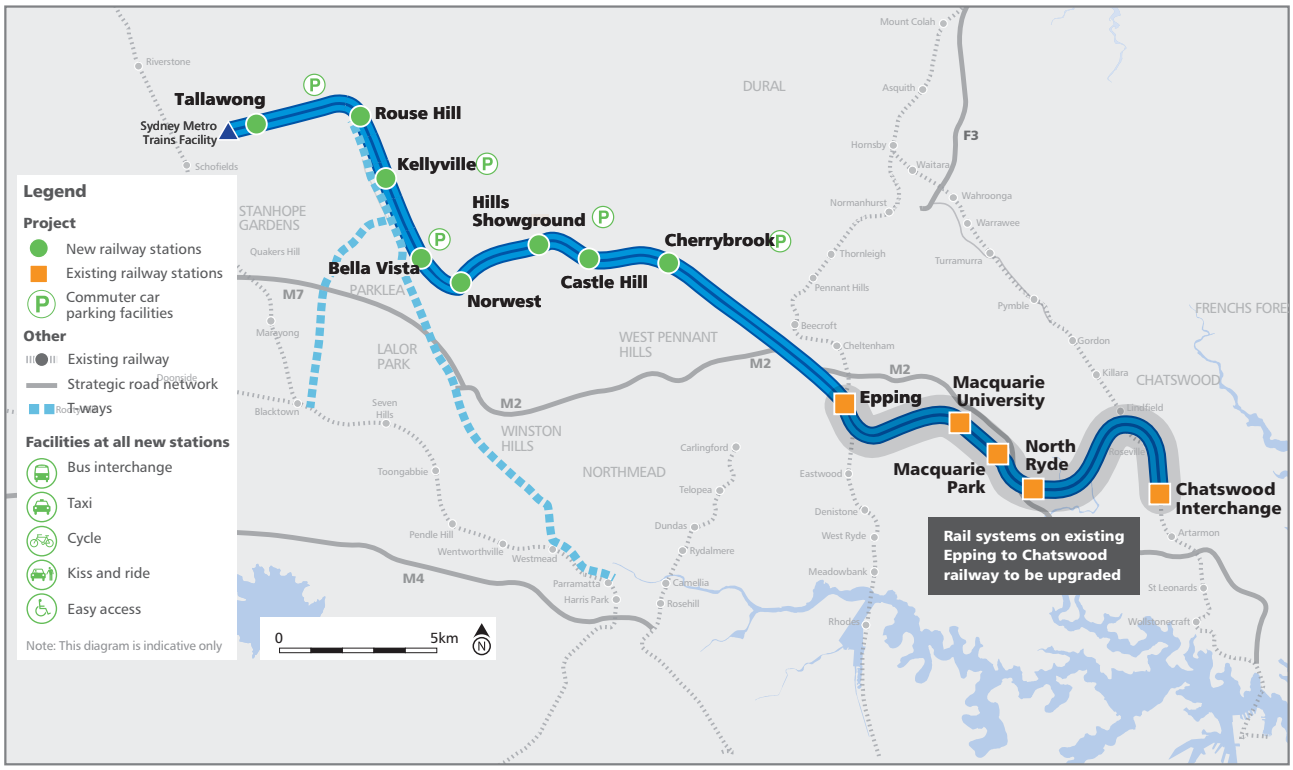


Figure 10: Suburbs on the Sydney Metro Northwest alignment.
https://www.sydneymetro.info/map/interactive-map

Source 2

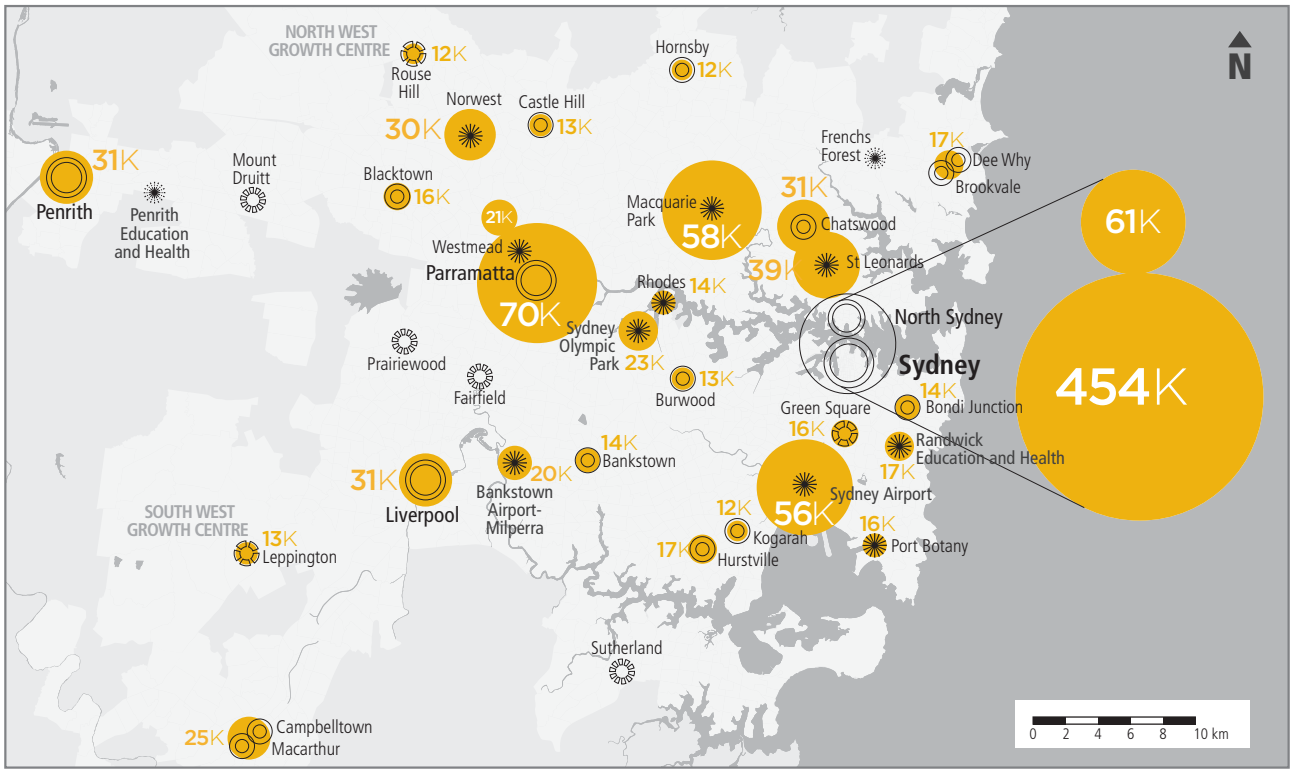


Figure 11: Major employment centres, Sydney 2031.
Source: Sydney's Rail Future, Transport for NSW.
https://www.transport.nsw.gov.au/sites/default/files/b2b/publications/sydneys-rail-future.pdf

Sources

Source 3

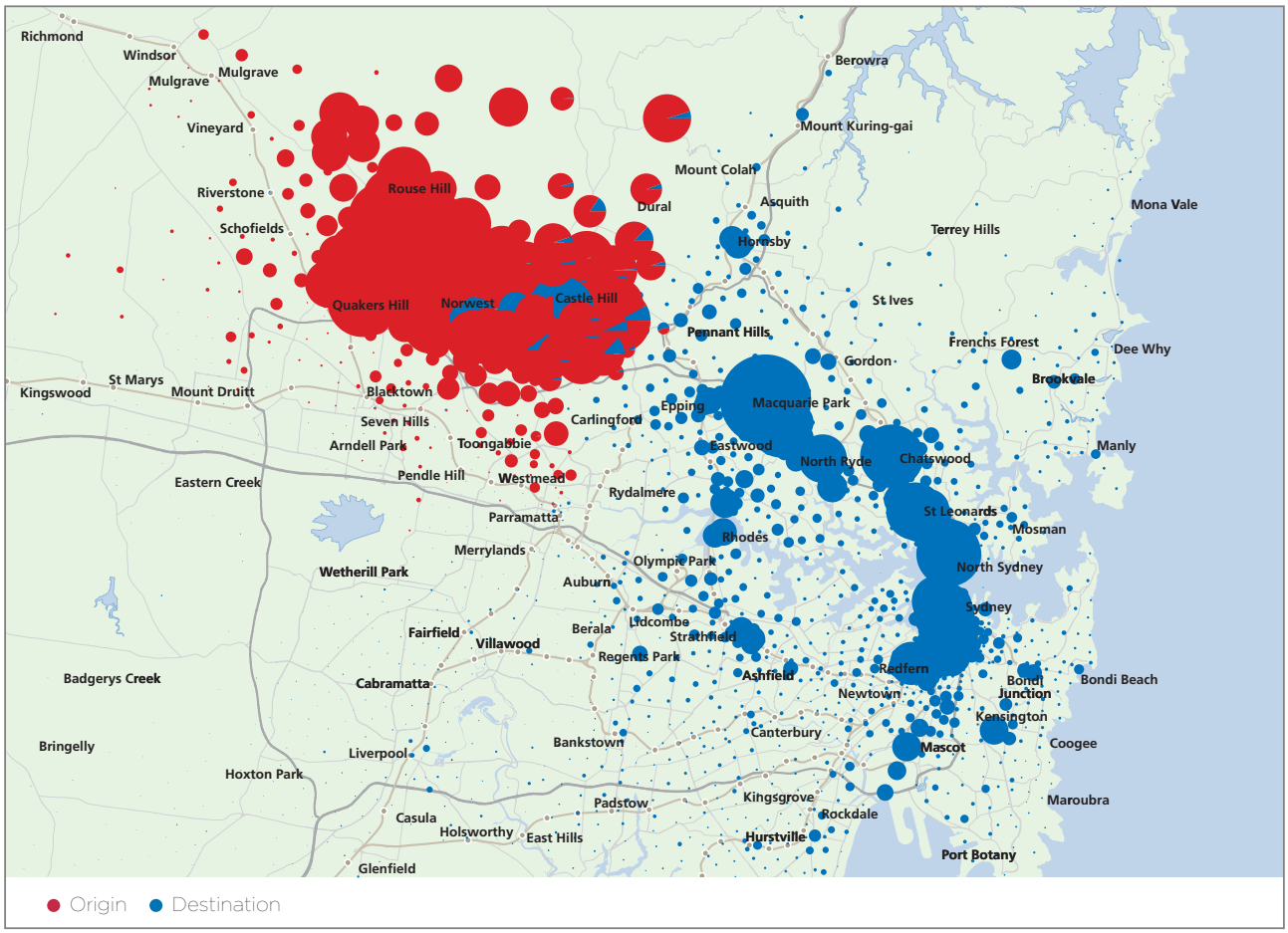


Figure 12: North West Sydney region, origins and destinations of journeys to work.

Source: Sydney Metro Northwest *Project Overview,* June 2012
https://www.sydneymetro.info/sites/default/files/Project_overview.pdf%3Fext%3D.pdf

Changes in land use in the North West region

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Changes in land use in the North West region** What are the most important land uses in the North West region today? How has land use changed over time?	**Stage 5** 2–3 lessons

Teacher briefing

Students gather land-use information from the aerial photographic land use maps of each of the station locations along the Sydney Metro Northwest. They compare these maps to the 1943 land use images, in the NSW Government GIS SixViewer. This activity provides an understanding of land use change around the station precincts over time, in addition to refining students' mapping and GIS skills.

Many stations in Sydney are already significant areas of change with older single-storey dwellings giving way to high-rise apartments, as more people seek to live close to public transport. Students will be able to discuss how these changes may happen around the planned station precincts of the Sydney Metro Northwest.

Focus questions:

- What is the current land use along the Sydney Metro Northwest alignment?
- What has changed over time?
- What effects do you think Sydney Metro Northwest will have on land use patterns?
- What might the area look like in 20 years?

Requirements for these lessons

- Computers
- Internet connection
- Printer, paper, sticky tape
- Acetate tracing sheets
- Coloured highlight pens
- Bookmarked websites (see web links).

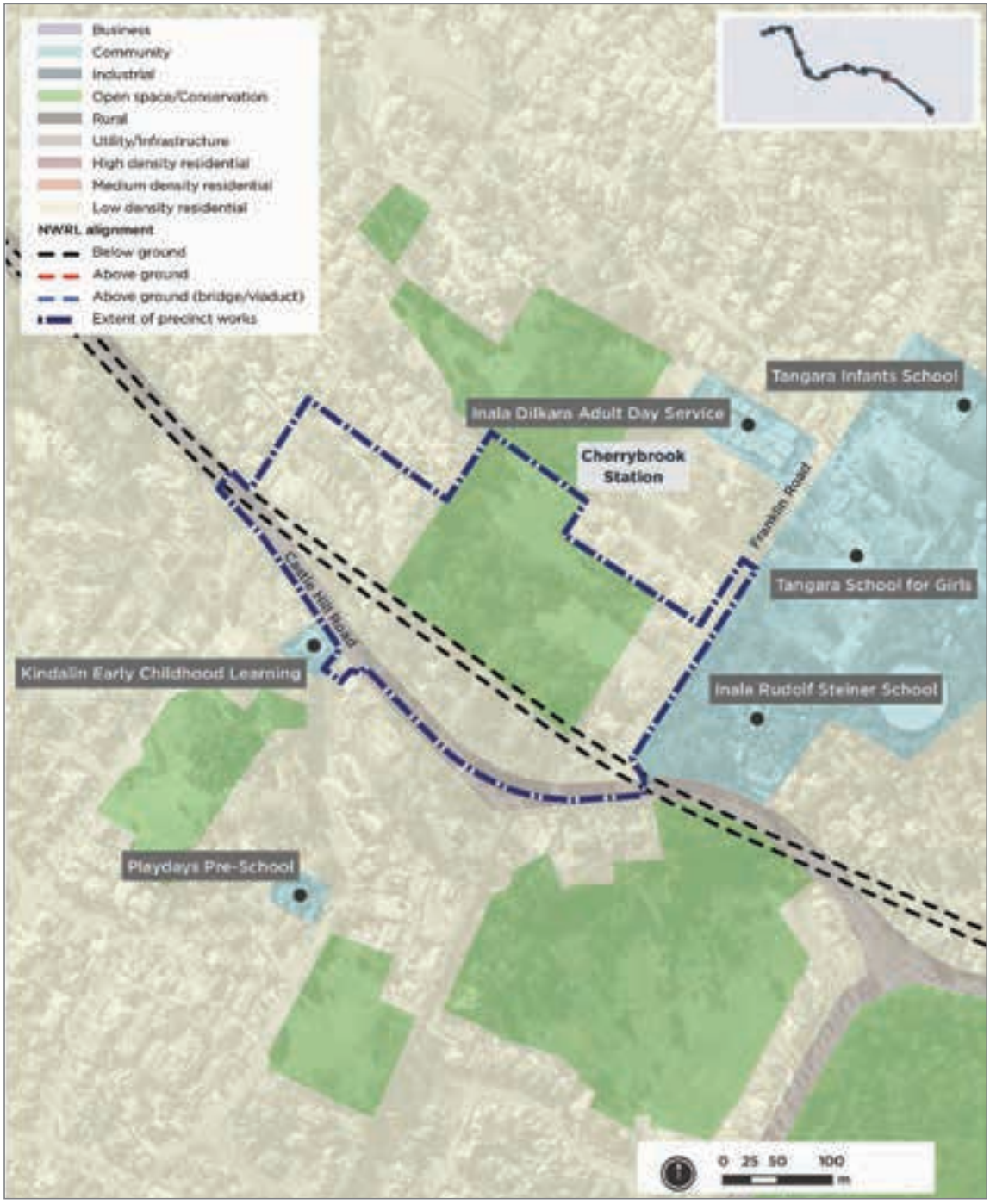


Figure 13: Today, the Cherrybrook locality is characterised by generally large, low-density dwellings predominantly built within the last 30 years, surrounded by established vegetation, green open spaces and natural corridors across the undulating topography. At the station location, the population density is currently low with only 1–25 people per hectare. How might this change over the next 20 years?

Source: Sydney Metro Northwest *Environmental Impact Statement 2,* Chapter 14 Land Use and Community Facilities.

Web links

Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 14 Land Use and Community Facilities

https://www.sydneymetro.info/sites/default/files/16_Ch_14_Landuse_and_Community_Facilities.pdf%3Fext%3D.pdf

Spatial Information Exchange, the NSW Government Geographic Information System

https://six.nsw.gov.au/wps/portal

SixViewer

https://maps.six.nsw.gov.au

Google Maps

https://maps.google.com.au

Figure 14: Aerial image of Cherrybrook Sports Ground, as shown in SixViewer.

Figure 15: Aerial image showing the same location of the Cherrybrook Sports Ground in 1943.

Source: **https://maps.six.nsw.gov.au**

Syllabus links

Geography K–10

Geography Stage 5 – changing places

– the causes and consequences of urbanisation

– urban settlement patterns in Australia

– the management and planning of Australia's urban future.

Environmental change and management

– human-induced environmental changes across a range of scales

– the causes, extent and consequences of the environmental change (selected urban environment).

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

(GE5–8) communicates geographical information to a range of audiences using a variety of strategies.

Learning experiences

Step 1

Students use Google Maps to create their own map of the station precincts along the Sydney Metro Northwest alignment.

Students zoom in to the correct scale and print off the maps or screen capture them, with about 500 m on either side. They will need to join several maps together.

Step 2

Students shade in the land uses around the planned Sydney Metro Northwest stations using information from the Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 14, Land Use and Community Facilities. Use the colour key shown in Figure 16 below. Figure 16 provides an example of what your final map should look like.

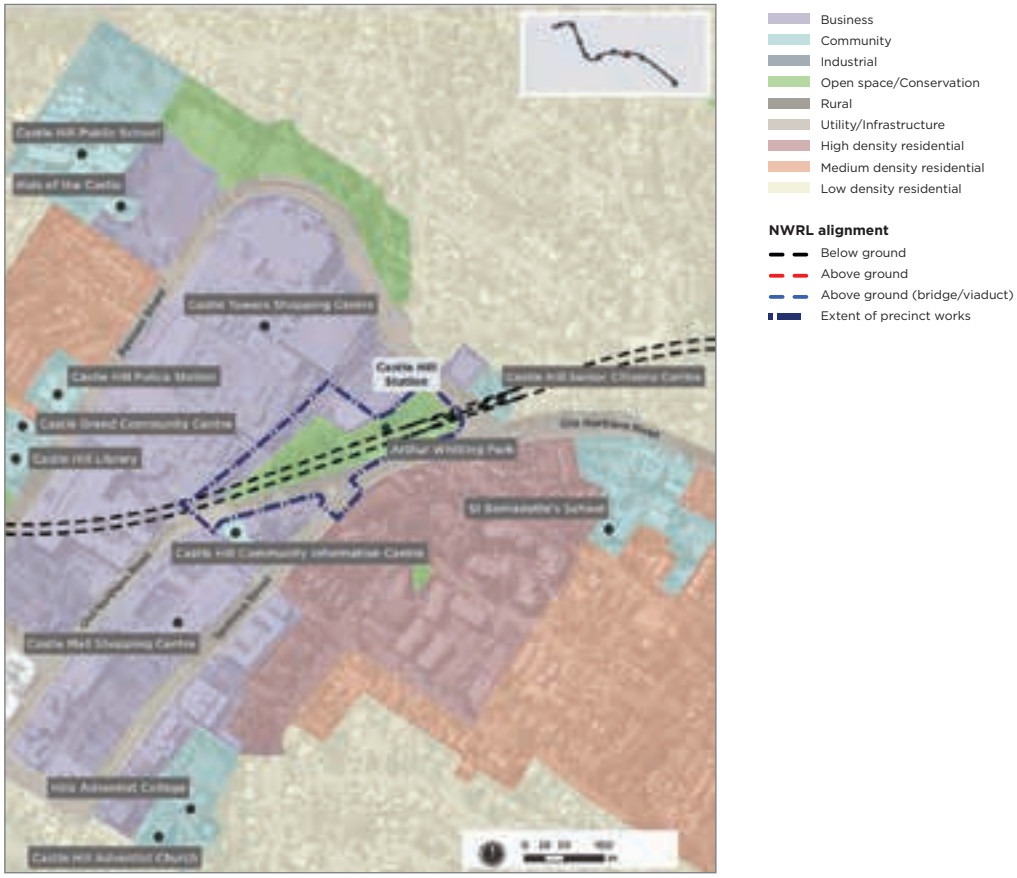


Figure 16: This example diagram from Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 14 Land Use and Community Facilities, shows the area around Castle Hill Station and the land use.

Step 3 – Open SixViewer

Instruct the class to type the name of a suburb (e.g. Cherrybrook) into the search box and adjust the zoom until it is close to the scale of the maps students have printed from Google Maps.

Starting from Epping and moving towards Rouse Hill, students mark in the land use along that route and for about 500 m either side of the line.

Step 4

Students then describe the land use pattern they see, making estimates of the proportions of land given over to each land use.

Step 5 – Instructions to the class

On the right of the SixViewer there are two boxes, one containing the image you are looking at, the other images from 1943. Adjust the slider bar so that you can see the old image clearly superimposed over the contemporary one (see Figures 14 and 15, aerial images of Cherrybrook, page 66).

Put a sheet of tracing film or acetate over the map and trace on, where possible, the land use in 1943. Describe the land use pattern and compare with the contemporary one.

Discuss the following questions:

- What changes have occurred?
- What do you notice about the differences in land use 70 years apart?

Step 6

Ask students to predict what further changes in land use might occur in the future.

Teacher references and extension work

Many students find this exercise fascinating and may want to use Google Maps and SixViewer's 1943 imagery to explore the changes over 70 years around the station precincts in more detail and also around their own homes.

The detailed plans of the station precincts included in the corridor documents will assist students to make comparisons and predictions about future changes to land use along the alignment.

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Urban-Renewal-Corridor

Train testing at Tallawong Station, May 2018.

Understanding community consultation

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Understanding community consultation** How does community consultation work? How can an understanding of geography help me participate in the consultative process?	**Stage 5** 4–6 lessons

Teacher briefing

In this sequence of lessons, students learn about community consultation and how they might participate in this process in an informed manner. They select and research an aspect of the Sydney Metro Northwest project, prepare a presentation, and deliver it to the class as if they were a member of the project team presenting to a community group.

Geography K–10 promotes values, attitudes and social skills that are essential to students' success in and beyond their schooling. These include making responsible and informed decisions, and participating in society as active and informed citizens.

Requirements for these lessons

- Computers
- Internet connection
- Bookmarked websites (see web links).

Assessment

Each student makes a short three to five minute presentation to the class, and the class ranks these according to criteria including: range, depth and relevance of the information; persuasiveness of the case; and the originality of the presentation.

Key terms and vocabulary

Community consultation, approval process, Sydney Metro Northwest *Environmental Impact Statement*, visual amenity.

Background information

Following community and business consultation in the period 2011–13, key changes and improvements to the Sydney Metro Northwest project have been made.

Discuss these with the class. Examples of change as a result of successful community consultation assist students to understand the nature and value of the process.

Changes as a result of consultation include:

- More stations, with the number changing from six to eight railway stations
- Increasing commuter car parking by 1000 spaces to a total of 4000. As a result of limited public transport options during the decades of extensive growth, the North West region has the highest density of car ownership in Australia. Understanding the planned vehicle management issues included in the proposed Sydney Metro Northwest development has been very important to many residents
- Changing the location and name of Hills Centre Station to Hills Showground Station. The railway station has been renamed Hills Showground Station, in line with a suggestion by the Castle Hill and Hills District Agricultural Society. The station construction site has been moved to the south east, further away from the Showground ring and community facilities. The trotting stables and horse amenities are also to be relocated to reduce the impact of construction. The new station will now be on the site of the former Hills Centre. Following feedback, the heavy vehicle access road will be moved. Four out of five community facilities previously proposed to be demolished have now been retained. An improved bus interchange and commuter car park will be located closer to the station
- Easing disruption to Norwest Boulevard during construction by relocating Norwest Station. Following community and business feedback from the first Sydney Metro Northwest *Environmental Impact Statement*, the location of the station has been moved slightly to the south east – significantly reducing possible disruptions to road traffic using Norwest Boulevard during construction. About 15,000 people from across Sydney work at this specialised employment centre and this is expected to grow to 30,000 by 2031. It will be an underground station integrated within Norwest Business Park. Surrounding roads and footpaths will be upgraded to provide access to the station, with the roundabout at Norwest Boulevard and Brookhollow Avenue to be replaced by traffic lights to improve pedestrian and road safety
- Reducing the size of the Cheltenham construction site by more than 2000 m^2.

Web links

Have your say

A website where people can contribute to public discussion.

https://www.haveyoursay.nsw.gov.au/

Sydney Metro Northwest *Environmental Impact Statement 2*

The second Sydney Metro Northwest *Environmental Impact Statement* was a significant part of this community consultation. It focused on elements such as: the design and operation of the eight new railway stations; commuter parking for 4000 cars; how the metro rail link will operate; transport interchanges; the areas around the railway stations; and rail infrastructure like railway tracks and signalling systems.

https://www.sydneymetro.info/sites/default/files/01_Cover__Declaration__Exec_Summary__ToC.pdf%3Fext%3D.pdf

Sydney Metro Northwest *Environment Impact Statement 1 Summary*

This document is an overview of the first Environmental Impact Statement for Sydney Metro Northwest

https://www.sydneymetro.info/sites/default/files/NWRL_EIS_No-1_overview_summary_EMAILversion.pdf%3Fext%3D.pdf

Sydney Metro Northwest

This outlines the project and shows the many reports and ideas that were used to guide its development.

https://www.sydneymetro.info/documents

Syllabus links

Geography K–10

Geography Stage 5 – Changing places

– the management and planning of Australia's urban future.

Environmental change and management

– the management of the environmental change.

(GE5–2) explains processes and influences that form and transform places and environments

(GE5–4) accounts for perspectives of people and organisations on a range of geographical issues

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

(GE5–8) communicates geographical information to a range of audiences using a variety of strategies.

Learning experiences

Step 1 – Discussion of community consultation

- What is community consultation?

Ask students to write down the types of questions Sydney Metro Northwest facilitators may have asked individuals and community groups during the consultation process. Students research and discuss the following questions:

- Why do major projects have community consultation?
- What is the approval process for major projects?

Ask students to read Sydney Metro Northwest *Environmental Impact Statement 2* Overview, Executive Summary and answer the following questions:

- What aspects of Sydney Metro Northwest were addressed in community consultation?
- How are issues of community concern dealt with during the consultation process?
- Ask students to read page 6 of the Sydney Metro Northwest *Environmental Impact Statement 2* Overview to see what government agencies need to be consulted when developing a large infrastructure project.

Students may also look up legislation such as the *Environmental Planning and Assessment Act 1979* (NSW) and the *Australian Environment Protection and Biodiversity and Conservation Act 1999* to find out what community consultation they require.

Students may also look at Sydney Metro Northwest Community Newsletters to see past consultation initiatives along the alignment. **https://www.sydneymetro.info/documents**

Step 2 – Outline the activity

Students work in groups on the following scenario:

As a member of the Sydney Metro Northwest project team you have been asked to make a presentation on an aspect of the project to help the community understand what is being planned for the region. What aspect or topic will you choose?

Instructions:

- Your task is to research your chosen topic, and find out the main issues that are important to the community
- You will need to deliver your presentation to the class in three to five minutes.

The class will vote on the group whose presentation:

- Is most informative
- Is most interesting and well-presented
- Covers the key issues of the chosen topic.

Process questions:

- What are the key issues you intend to investigate?
- Where will you locate the information?
- What are your findings? Rank the ideas and information most useful in helping the community understand what is being planned for the region. Explain your ranking
- How will you present your information?
- What is the most effective means of informing others?

Step 3 – Research and topic selection

Students may like to choose from the topics that are listed below. Students may also wish to refer to the International Association of Public Participation website. **https://www.iap2.org.au/Home**

Examples of topic selection:

Station design	Taxi ranks
Railway operating systems	Cycle storage
Construction work	Railway tracks
Transport interchanges	Signalling systems
Park-and-ride	Ventilation systems
Kiss and ride	Overhead power supplies and substations
Bus stops	Access roads and landscaping

More detailed and complex topics covered by the consultation and approval process were:

	Land use and community facilities
	Ecology (terrestrial and aquatic)
	Visual impacts
	Climate change and greenhouse gas assessment
	Surface water and flooding
	Air quality
	Waste management

Ask groups to think about and record all the aspects of their topic that need investigation. Use Sydney Metro Northwest *Environmental Impact Statement 2*, Executive Summary to assist.

Step 4 – Preparing the case and presentation method

- What method of presentation will be used?
- How can the presentation be made as interesting and as clear as possible?

Remind students they:

- Can search on the internet for ideas about 'How to make powerful presentations'
- Might use multimedia to present their case. There are animations and video clips on the Sydney Metro Northwest website
- Might examine a station location and precinct using Google Earth
- Could make a photographic slideshow or PowerPoint of their case.

Step 5 – Group presentations to the class

Possible approaches include planning the order of presentations by grouping topics together, such as those about station design, bus interchange issues, cycle storage and 'Kiss and ride' locations.

Teacher references and extension work

An alternative to using the Sydney Metro Northwest *Environmental Impact Statement 2* is to use the NSW Department of Planning and Environment's Sydney Metro Northwest *Corridor Strategy* document, September 2013.

https://www.planning.nsw.gov.au/-/media/Files/DPE/Reports/north-west-rail-link-corridor-strategy-2013-09.pdf?la=en

Students can download and read the information contained in this document and prepare their presentation using this alternative material. Below is a summary of the key characteristics on each planned station precinct.

Tallawong

Tallawong precinct will play an important role as a local village centre providing for the daily needs of residents and workers. Higher density housing is suggested around the station with low density housing replacing rural residential in other areas of the precinct. Improved pedestrian, cycle and vehicle connections will be available with the new station, and substantial open spaces will provide for recreation and wildlife habitats.

Rouse Hill

Rouse Hill precinct will become a major transport and commercial hub featuring mixed uses including retail, commercial and residential. The new train station, regional bus routes and cycle paths will improve accessibility in the precinct. Streetscapes within the precinct will be upgraded with new and widened footpaths to encourage walking as a preferred mode of transport.

Kellyville

Kellyville precinct will continue to be a major residential area for Sydney's North West region with a range of housing types to ensure affordable and appropriate housing for all members of the community. Two local centres will provide for the daily needs of residents. One will be adjacent to the train station, the other on Windsor Road.

Bella Vista

Bella Vista precinct will become more attractive and viable as a commercial hub with the addition of the new train station. Increased commercial activity in the Norwest Business Park will attract managers, professionals and other workers who will have a choice of detached houses, townhouses or apartments. Bella Vista Farm will remain a key conservation and heritage area.

Norwest

Norwest precinct will be reinforced as the major commercial hub of the North West region. Offices and light industrial, retail and community facilities will be mixed with high density residential close to the station to create a vibrant and active centre. Norwest Boulevard will be upgraded to be a green, pedestrian-friendly corridor.

Hills Showground

Hills Showground precinct will include a new local centre near the train station that could provide retail, restaurants, boutique offices, apartments and cultural facilities such as theatres and galleries. More intensive employment is predicted for some of the current industrial areas, while Victoria Avenue remains as a bulky goods retail corridor. The Showground will remain a regional recreational asset.

Castle Hill

Castle Hill precinct will continue as the major retail centre for Sydney's North West region. Castle Hill will increase its retail offerings to remain a major retailing hub, extend the amount of commercial offices, increase residential density near the station, and become a major transport hub with the train station and bus interchange at Arthur Whitling Park.

Cherrybrook

Cherrybrook precinct's new local centre near the train station will include neighbourhood shops and services to meet the daily needs of the local community. Higher residential density is suggested within walking distance of the station, while the area south of Castle Hill Road will remain low density residential.

Topic Two: Linking the nation

Communities, the economy and settlement patterns in Sydney and the North West region have been strongly influenced by developments in transport throughout the 19th century and up to the present day. Sydney Metro Northwest will continue that significant influence.

This topic examines changes and continuities in public transport, people, communities and the environment in the North West region over time.

Using an inquiry-based approach students explore the links between past and present, and find answers to the question:

How have the people, communities and environment of Sydney and the North West region been influenced by the expansion of the railway?

Figure 1: Rogans Hill Railway Station, circa 1930 by an unknown photographer. The station, near the intersection of Castle Hill Road and the Old Northern Road, opened on 24 November 1924 and closed on 1 February 1932.

Teachers are not required to complete all lessons, activities and/or units of work contained in this topic. Teachers are encouraged to select and adapt materials to complement and support their teaching and learning programs, and to suit the needs and interests of students in differing school contexts.

The topic at a glance

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons	Page
History	**North West Sydney has an ancient history** What types of sources have archaeologists unearthed and used to piece together the ancient history of the North West Sydney region? What do these sources reveal about the length and nature of Aboriginal settlement of the area? How have archaeologists, historians and Aboriginal people worked together to develop a deeper understanding of the history of the North West Sydney region?	**Stage 4** 1–2 lessons	80
	Stage 5 Mandatory site study: A complete unit of work How does the current Sydney Trains network serve the community? What is Sydney Metro Northwest? How will it affect your local area and your community? What evidence of continuity and change over time can be seen in the changing methods of transport in New South Wales and in your local area? What does your site study reveal about the general history of your local area and the significant people and events who have contributed to its development? How can you share what you have learned from this study with the wider local community?	**Stage 5** 10–12 lessons	94
Geography	**Mapping the historical Rogans Hill to Parramatta railway line** What remains of the old Rogans Hill to Parramatta railway line, closed in 1932?	**Stage 4–5** 1–2 lessons	144

North West Sydney has an ancient history

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
History	**North West Sydney has an ancient history** What types of sources have archaeologists unearthed and used to piece together the ancient history of the North West Sydney region? What do these sources reveal about the length and nature of Aboriginal settlement of the area? How have archaeologists, historians and Aboriginal people worked together to develop a deeper understanding of the history of the North West Sydney region?	**Stage 4** 1–2 lessons

Teacher briefing

Students examine the diverse roles that historians and archaeologists play in investigating our ancient Aboriginal past. Coverage focuses on several key Aboriginal sites and then narrows to examine recent archaeological finds in Sydney's North West and what they reveal about the nature and longevity of Aboriginal occupation of the region.

Requirements for these lessons

Activity sheet 1 – Scientific techniques used in archaeology

Activity sheet 2 – Narabeen Man

Activity sheet 3 – Site study

Activity sheet 4 – Pemulwuy's spear – historians and archaeologists working together.

Assessment

- Any of the learning activities in this lesson could be used for formative assessment and feedback on students' demonstration of target outcomes.
- A summative assessment activity could test students' knowledge and understanding of the features and significance of the Australian archaeological sites investigated.

Key terms

- Sources and evidence, continuity and change, significance.

Web links

Aborigines in the Hills District
https://www.thehills.nsw.gov.au/files/assets/public/library-documents/local-studies/aborigines-in-the-hills-district.pdf

Aboriginal archaeological sites recorded in the Sydney region up to 2001
https://dictionaryofsydney.org/media/4033

'Archaeological evidence of Aboriginal Life in Sydney', by Val Attenbrow, Dictionary of Sydney,
http://dictionaryofsydney.org/entry/archaeological_evidence_of_aboriginal_life_in_sydney

Indigenous Australian timeline pre-contact, Australian Museum
http://australianmuseum.net.au/indigenous-australia-timeline-pre-contact

Mungo Lady and Mungo Man
http://www.visitmungo.com.au/mungo-lady-mungo-man

Pemulwuy, Australian Dictionary of Biography
http://adb.anu.edu.au/biography/pemulwuy-13147

'Speared man unearthed after 4,000 years', Sabra Lane ABC News
For transcript go to http://www.abc.net.au/news/2007-12-21/speared-man-unearthed-after-4000-years/994510

'The Mystery of Narabeen Man', Catalyst, ABC Television
http://www.abc.net.au/catalyst/forensics/
The transcript of this interview can be found at
http://www.abc.net.au/catalyst/stories/2278381.htm

Syllabus links:

History 7–10:

Stage 4 – Depth Study 1: Investigating the Ancient Past

(HT4–1) describes the nature of history and archeology and explains their contribution to an understanding of the past

(HT4–6) uses evidence from sources to support historical narratives and explanations.

Learning experiences

This lesson would come after introductory lessons on how archaeologists work to investigate the ancient past.

Step 1 – Significance of the Lake Mungo archaeological site

- Gauge students' knowledge of Aboriginal archaeological sites in Australia. If necessary, direct students to the Mungo National Park website **http://www.visitmungo.com.au/mungo-lady-mungo-man** and ask them to locate and discuss the significance of the site, for Australia and for the world
- Explain to students how archaeologists, using a range of techniques for dating sites, estimate that Aboriginal people have been in Australia for around 60,000 years. Refer to Resource Sheet 1 – Timeline of Aboriginal occupation of the Sydney region and North West Sydney (pages 86–87)
- Display Australian Museum's Indigenous Australian timeline pre-contact, **https://australianmuseum.net.au/indigenous-australia-timeline-pre-contact**
- Ask students to discuss the climatic and environmental changes of the last 60,000 years. Have students identify which change would have been most significant for the way of life of Aboriginal people and explain how they have determined 'significance'
- Issue Activity Sheet 1 on page 88 on scientific techniques used in archaeology. This can be completed as an individual or group activity, submitted as a completed summary chart or as a digital presentation.

Step 2 – Aboriginal archaeology in the Sydney region

- Display or provide the map 'Aboriginal archaeological sites recorded in the Sydney region up to 2001' **https://dictionaryofsydney.org/media/4033**. Draw students' attention to the different types of sites indicated in the legend. If students are not familiar with these types of sites, have them access the Aboriginal Heritage Office website where there are clear photographs and descriptions of sites in the Sydney region: **http://www.aboriginalheritage.org/sites/identification/**
- Students work in groups to identify and discuss the pattern of distribution of the different types of sites recorded and possible reasons for this distribution
- Display Natural Vegetation Sydney, 1788, Figure 2 (page 83) and ask students to use that to help explain the distribution pattern of sites
- Each group shares their conclusions with the class
- An Aboriginal burial site in Narabeen does not appear on the 2001 Aboriginal sites map because it was unearthed in 2005. Students use Activity Sheet 2 on page 89 to discover the significance of the discovery of Narabeen Man for Australian archaeology and Australian history.

Step 3 – Aboriginal archaeology and the Sydney Metro Northwest

- Display satellite image of the route of the Sydney Metro Northwest and explain that for much of its route it follows ancient Aboriginal pathways along ridges and adjacent to creeks
- Explain that one of the conditions for approval of the Sydney Metro Northwest was the requirement to investigate identified Aboriginal sites within the project area before starting construction. The aim was to collect, analyse and store Aboriginal objects within the construction corridor to ensure Aboriginal heritage information is maintained for future generations
- More than 20 sites were investigated with archaeologists working alongside representatives from the local Aboriginal community. More than 15,000 artefacts were retrieved and analysed, revealing Aboriginal connections with this land over at least 4,000 years.

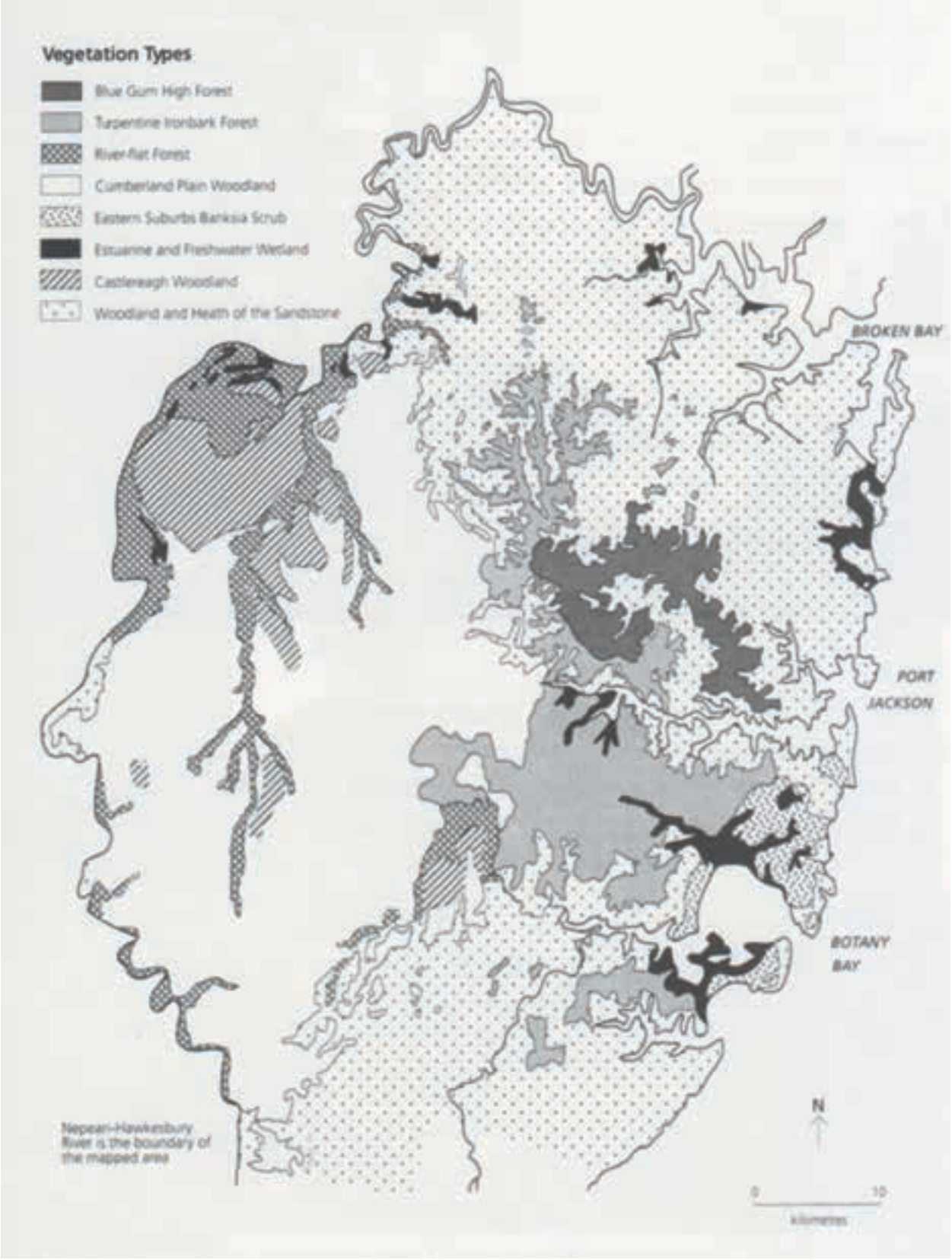


Figure 2: Natural vegetation Sydney 1788. Benson, D and Howell, J, *Taken for granted,* Royal Botanic Gardens, Sydney.

- Display photographs showing the excavation method used.

Excavation methods

Figure 3: Completed 1 x 1 metre square.

Figure 4: Completed cross extention on 1x1m.

Figure 5: Recording artefacts in situ.

Figure 6: Completed open area.

Excavation method used in excavating and recording Aboriginal sites in North West Sydney

Aboriginal archaeological sites in western Sydney are often comprised of scatters of flaked stone artefacts that were created and/or discarded at a specific place. Archaeological sites comprised of stone scatters in the Sydney region are often invisible on the ground surface because of the build-up of soil over time. For the Sydney Metro Northwest program, a methodology was developed to determine the physical extent of each site and recover significant artefacts.
A series of 1 metre x 1 metre squares were excavated by hand on a grid overlain on each site to determine the extent and condition of the archaeological resource (Figures 3 and 4).

Artefacts that were seen within the soil during the excavation (i.e. "in situ") were photographed and documented with measurements taken of their position and depth below the ground surface (Figure 5). The soil from each square was sieved though meshes to recover any artefacts that were not recovered during the excavating (Figure 5). Where concentrations of artefacts or interesting features were uncovered, the squares were expanded by excavating additional squares around them (Figure 4). This process continued until the artefact concentration or interesting features were uncovered in their entirety (Figure 6).

Sydney Metro Northwest: Archaeological Salvage Program, p. 29, November 2015
https://www.sydneymetro.info/sites/default/files/document-library/Sydney%20Metro%20Northwest%20Indigenous%20Heritage%20Archaeological%20Salvage%20Program%20Report.pdf

- Students research the main types of stone tools found in the area, providing a picture and a brief description of flaked, backed and ground-edge stone tools and how they were made. Refer to Figure 7
- One Sydney Metro Northwest site in particular produced a concentration of artefacts: a hilltop between Elizabeth Macarthur Creek and Caddies Creek. Activity Sheet 3 Site Study on page 90 is based on this site.

Figure 7: Examples of the types of stone artefacts found during Sydney Metro Northwest archaeological excavations in the North West region: (L–R) Thumbnail scraper and backed artefact, Hornfels hammerstone fragment and retouched chert flake. *Sydney Metro Northwest Archaeological Salvage Program*, Plate 36, page 96.

Step 4 – Pemulwuy's spear – historians and archaeologists working together

- Gauge students' prior knowledge of Pemulwuy, an Aboriginal warrior who fought for many years against the colonists in the Sydney region, including areas around Toongabbie, Parramatta, Kellyville and Rouse Hill. Students may have learnt about him in primary school. For those who know little about him, a brief biography is available online at **http://adb.anu.edu.au/biography/pemulwuy-13147** and a film clip from *First Australians* can be found at **https://www.youtube.com/watch?v=1Nh6TRRdmac**
- Issue Activity Sheet 4, Pemulwuy's spear on page 92 which requires students to consider how historians and archaeologists can work together to achieve a more complete understanding of the past.

Extension activities

- Students create an annotated map of the Sydney region showing the location of significant Aboriginal archaeological sites
- Survey the websites of museums in the Sydney region to compile a register of Aboriginal artefacts from the area accessible to the public
- Investigate the work of Aboriginal archaeologists. How might their approach to archaeology differ from non-Aboriginal archaeologists working on Australian sites? A good starting point is the ABC Science Program's 'Learning country through our eyes' about Aboriginal archaeologist Dave Johnston **http://www.abc.net.au/science/articles/2012/05/22/3507675.htm**

Resource sheet 1

Timeline of Aboriginal occupation of the Sydney region and North West Sydney

Years ago	Worldwide	Sydney Region	North West Sydney
15,000 to 10,000	First farming settlements arise in the Fertile Crescent in Mesopotamia and the Nile Valley – beginnings of agriculture and permanent settlements (11,000 years ago)	Shaws Creek K2 rockshelter on the western side of the Nepean River being used as a habitation shelter by Aboriginal people (14,700 years ago)	
6,000 to 5,000	The beginning of the Bronze Age (5,300 years ago) Invention of writing (5,200 years ago)	Radiocarbon date from an archaeological site near present day Doonside in western Sydney (6,000 years ago)	
5,000 to 4,000	 Construction of the pyramids at Giza, Egypt (4,600 to 4,500 years ago)	A site along Caddies Creek in Rouse Hill, close to sites excavated for Sydney Metro, is being used by Aboriginal people (4,700 years ago)	People living along the gentle slopes above Elizabeth Macarthur Creek (4,400 years ago) People living on the hilltop near present day Mungerie House (4,200 years ago)
4,000 to 3,000	Last woolly mammoths die off in Russia and the species finally becomes extinct (4,000 years ago) 	Radiocarbon date from a shell midden indicates Aboriginal people living at Balmoral Beach (3,780 years ago) 	 More archaeological evidence for people again living along Elizabeth Macarthur Creek within the Sydney Metro project area (3,600 years ago)
3,000 to 2,000	 First Olympic Games held in Olympia, Greece (2,776 years ago)	Aboriginal people living in rockshelter at Yowie Bay in Sydney's Sutherland Shire (2,670 years ago) Aboriginal people living and creating art within rockshelters near Cherrybrook (2,200 years ago)	

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Northwest

Resource sheet 1

Timeline of Aboriginal occupation of the Sydney region and North West Sydney

Years ago	Worldwide	Sydney Region	North West Sydney
2,000 to 1,000	Roman invasion of Britain (1970 years ago) Vikings invade and attack Britain and Paris (1,200 years ago)	 Occupation of a site in Parklea, near the Sydney Metro project area (1,070 years ago)	 Later date for occupation of the hilltop near Mungerie House, Sydney Metro area (1,000 years ago)
1,000 to present	 Christopher Columbus discovers America (500 years ago) Invention of the steam engine (245 years ago) ushers in the start of the Industrial Revolution	Aboriginal people living in the Second Ponds Creek Valley, Rouse Hill (650 years ago)  Arrival of the First Fleet in Sydney (Image: from Mitchell Library, State Library of NSW) (225 years ago)	We now have evidence for people living further down the slope of the same hill, closer to a tributary of Caddies Creek (900 – 570 years ago) Construction of Mungerie House (120 years ago)  Archaeological investigation of sites along the Sydney Metro corridor (1 year ago)

Source: *Sydney Metro Northwest Early Works Project, aboriginal cultural heritage interim highlight report*, pages 6-7 October 2014.

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Northwest

Activity sheet 1

Scientific techniques used in archaeology

Use information from reliable print and digital resources, to complete the summary table.

Technique	Description	Example of use in an ancient Australian site	Reference(s)
Radiocarbon or C14 dating			
Thermoluminescence dating			
Lidar or airborne laser scanning technology			
Residue analysis			

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Northwest

Activity sheet 2

Narabeen Man

Instructions

A. Read the transcript of the ABC news report on the discovery of Narabeen Man
http://www.abc.net.au/news/2007-12-21/speared-man-unearthed-after-4000-years/994510

B. View three film clips from the Catalyst program on Narrabeen Man
http://www.abc.net.au/catalyst/forensics/

'The mystery of Narabeen Man' (7 mins),

'Interview with Dr Denise Donlon' (3 mins) and

'Extended interview with Allen Madden' (3 mins)

C. Use information from the transcript and the film clips to answer the following questions in complete sentences.

1. **WHERE** was the body found and under what circumstances?

2. **WHO** led the excavation and what did archaeologists uncover?

3. **WHEN** did Narabeen Man die and how do we know this?

4. **HOW** did Narabeen Man die and what evidence supports your explanation?

5. **WHAT** theory has been offered to explain the death and what evidence supports the theory?

6. **WHY** is the discovery of Narabeen Man significant for Australian archaeology and Australian history?

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Northwest

Activity sheet 3

Site study

Instructions

Read the archaeologist's report on the Elizabeth Macarthur Creek and Caddies Creek hilltop site.

Create a poster or flow diagram to show what artefacts were found and how archaeologists interpreted those objects to explain aspects of Aboriginal life at the site over time.

Hilltop between Elizabeth Macarthur Creek and Caddies Creek

An analysis of the landform features along the route of the Sydney Metro identified a hilltop west of Old Windsor Road between Samantha Riley Drive and Windsor Road as having the potential for buried Aboriginal archaeological objects. The area is prominently situated above the banks of Caddies Creek and Elizabeth Macarthur Creek, which flows to the east and west before joining in a confluence to the north of the site. Salvage excavation conducted by archaeologists and Aboriginal community members during the Sydney Metro program uncovered a concentration of approximately 500 Aboriginal stone artefacts at the site. Artefacts were made from raw materials including silcrete, tuff, quartz and hornfels. However, it was the discovery of an elouera, a ground-edge axe and several elongated bipolar quartz flakes that made this site unique amongst the archaeological sites excavated during the Sydney Metro project.

The elouera was produced from a flake of tuff that had been shaped by the removal of multiple flakes along the left lateral margin creating a blunt backed edge. The artefact had been broken into two pieces in antiquity; however, careful excavation successfully recovered the entire artefact. Analysis of residue and usewear on eloueras from other archaeological sites have suggested that these artefacts were utilised for scraping, adzing or cutting activities.

Eloueras from other archaeological sites in the Sydney region have been dated from about 1,600 years ago and it is likely that this site was intermittently used over a similar time span.

A number of elongated bipolar quartz flakes were also discovered during the salvage excavation. Quartz artefacts are uncommon in archaeological sites of western Sydney because the material is difficult to knap and more easily flaked silcrete is readily available. The use of quartz to make elongated flakes at this site suggests that the material was intentionally selected and that the elongated form was significant. It is likely they were produced for a function specific to the utilisation of the area around the site. They were probably not made to be used as everyday tools. Based on the hilltop location, range of artefacts and ethnographic information it is possible the quartz blades were used for ceremonial activities. Further insights should be revealed as the analysis of the site continues.

The ground-edge axe uncovered at the site during the salvage excavation was constructed from a water worn pebble of hornfels. The artefact was shaped by narrowing one edge through knapping off flakes and grinding against an abrasive surface, such as exposed sandstone bedrock. Axe grinding grooves have been identified on Caddies Creek to the north of the study area.

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Figure 8: (L–R) Ground axe found at a hill top site within the Sydney Metro Northwest area and an example of Sydney Region Aborginal rock art with a mythical figure holding an axe. *Sydney Metro Northwest Archaeological Salvage Program*, Plate 10, page 22.

Several accounts of the use of ground-edge axes by Aboriginal people were documented by early British settlers in the Sydney region. Uses for ground-edge axes included: general woodworking, the removal of bark during the construction of canoes, shelters and shields and as weapons.

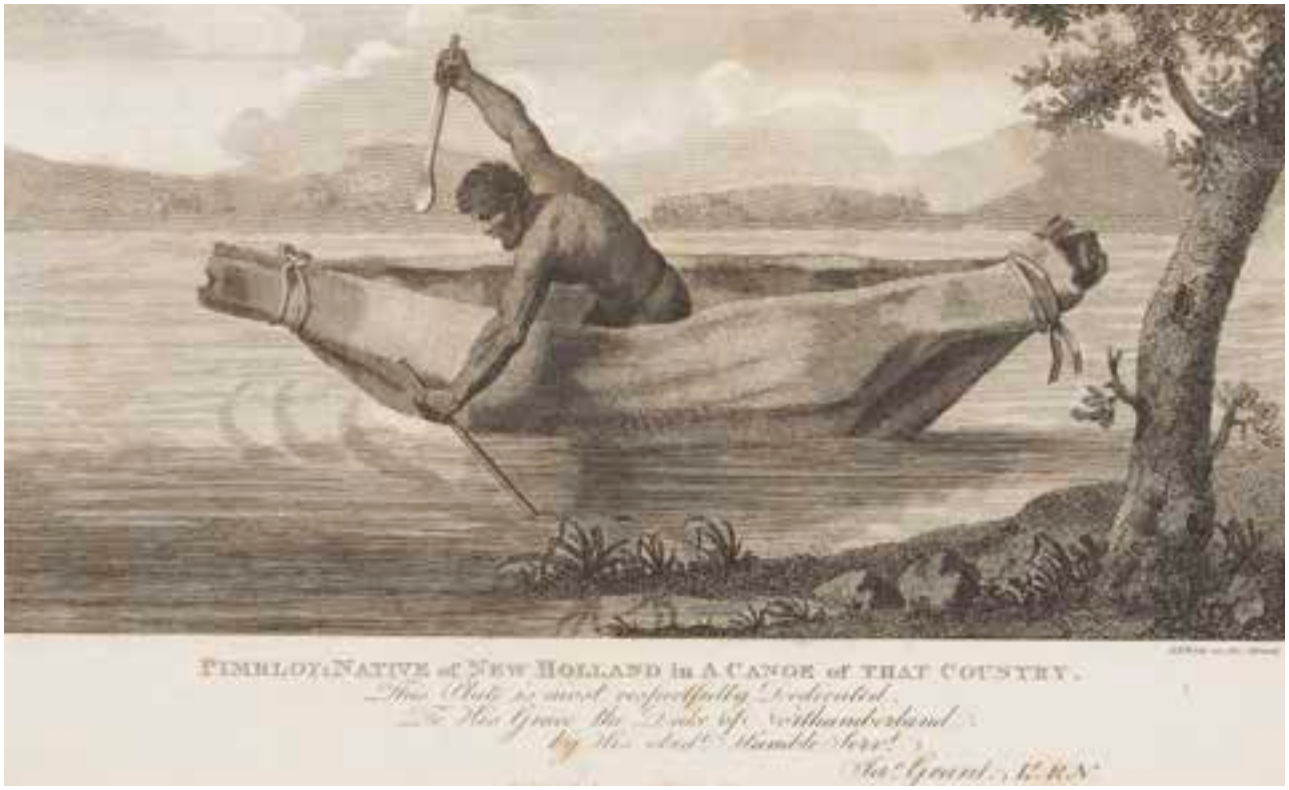
Many ground-edge axes, including the artefact found at this site, show evidence of battering and pecking opposite the ground edge. It is believed that, in addition to being used as an axe, the opposite edge was used as a hammer, making this a true multi-purpose tool. In many instances, the use of ground-edge axes as hammers resulted in the accidental removal of large flakes. The damage caused by accidental flaking to this ground-edge axe may be the reason for its discard at the site.

The artefacts uncovered at this site provide a valuable insight into the range of activities that were being conducted in the area by past Aboriginal people. Archaeological research has found that eloueras, quartz blades and ground-edge axes were used for both mundane and selective tasks. The landscape context and relatively selective array of archaeological material from the hilltop site however suggests that the place was a special location where selective activities were undertaken as opposed to utilitarian tasks. Selective activities may include leisure, initiations or ritual functions.

Source: *Sydney Metro Northwest Early Works Project, aboriginal cultural heritage interim highlight report*, October 2014

Activity sheet 4

Pemulwuy's spear – historians and archaeologists working together



Source A

Pimbloy (Pemulwuy) by Samuel Neele.

http://handle.slv.vic.gov.au/10381/255652

Source B

Description of Pemulwuy's spear, used to kill John McIntyre, Governor Phillip's Gamekeeper in 1790

"When he extracted the spearhead, Surgeon General John White found that it was barbed with 'small pieces of red stone' which confirmed that Pemulwuy belonged to one of the woods tribes."

Cited in the *Sydney Metro Northwest Interim Highlight Report*

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Activity sheet 4

Pemulwuy's spear – historians and archaeologists working together

Source C

Bi-ni-long (Bennelong) by Samuel Neele.

https://nla.gov.au/nla.obj-135681648/view

This portrait of Bennelong shows on the upper left a spear very similar to that likely used by Pemulwuy to spear John McIntyre, although this spear is barbed with shell.

Source D

"Spears used by Aboriginal people from coastal groups were barbed with pieces of shell, while spears of the inland groups were barbed with stone flakes. 'Similar red silcrete flakes asdescribed on Pemulwuy's spear, were recovered from the Sydney Metro excavations, suggesting that Bediagal (Bidjigal) people had been making their spears that way for a long time."

Sydney Metro Northwest Interim Highlight Report 2014

Instructions

After examining the four sources, write a brief explanation of how historians, who work mainly with written and pictorial remains, and archaeologists, who work mainly with physical remains, can work together to provide a more complete understanding of the past.

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Stage 5 mandatory site study: A complete unit of work

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
History	**Stage 5 mandatory site study: A complete unit of work** How does the current Sydney Trains network serve the community? What is Sydney Metro Northwest? How will it affect your local area and your community? What evidence of continuity and change over time can be seen in the changing methods of transport in New South Wales and in your local area? What does your site study reveal about the general history of your local area and the significant people and events who have contributed to its development? How can you share what you have learned from this study with the wider local community?	**Stage 5** 10–12 lessons

Teacher briefing

Students in Stage 4 and Stage 5 History are required to conduct a mandatory site study. This site study for Stage 5 students, provides students with the opportunity to explore features of change and continuity in their local area (HT5–2) and can be taught very effectively to less able students. The unit design encourages a strong emphasis on literacy skills.

Students study the plans for the railway and other sources to explore the nature of Sydney Metro Northwest, and understand how the people and places in their local area may be affected. The unit includes investigation of historical sources, including documents and photographs enabling students to learn the history of their local region and understand the significance of public transport, past, present and future for their local community (H5T–1).

Students investigate the role and contribution of significant individuals and groups in the development of their local area, together with evidence of changing population and land use and features of urban growth and development (HT5–6). This unit also assists students to develop an understanding of the different perspectives of individuals and groups who have peopled this region (HT5–7).

Teaching–learning experience sequence summary

The site study begins with five 50–60 minute face-to-face lessons over approximately six to eight weeks introducing the topic, providing background context, and establishing research timelines and protocols.

Students form small groups and choose from a range of activities to conduct their own investigations (HT5–8) across a term (or other period of time as negotiated).

A further lesson allows for monitoring student progress during the research, reporting on work in progress and further refining the research process. Other lessons can be set aside for research, discussion and preparation of the final report at the teacher's discretion.

In the final three lessons at the conclusion of their research, the groups collate and present their findings to the class (HT5–10). The finished projects may then be presented to local community groups or uploaded to the web.

Syllabus links

Mandatory site study requirements

https://syllabus.bostes.nsw.edu.au/hsie/history-k10/content/

"A site study should be integrated within each of Stages 4 and 5 as a means through which students acquire knowledge, skills, values and attitudes from experience in the field or by analysing a virtual site using ICT. Site studies enable students to understand their historical environment and participate actively in historical inquiry. They can offer a means of interpreting the past and/or recognising how human occupation and use of the site has changed over time."

What is a 'site study'?

"A site study is an inquiry-based examination of a historically significant location. Site studies may include an investigation of the local area, or a visit to an archaeological site, museum, an Aboriginal site… a specific building, a monument, a local area, an open-air museum or a virtual site available through ICT."

History K–10

(HT5–1) explains and assesses the historical forces and factors that shaped the modern world and Australia

(HT5–2) sequences and explains the significant patterns of continuity and change in the development of the modern world and Australia

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analysis of the modern world and Australia

(HT5–7) explains different contexts, perspectives and interpretations of the modern world and Australia

(HT5–8) selects and analyses a range of historical sources to locate information relevant to a historical inquiry

(HT5–10) selects and uses appropriate oral, written, visual and digital forms to communicate effectively about the past for different audiences.

Lesson sequence overview

	Lesson	Outcomes	Content
Introduce site study	1	HT5–6 HT5–8	**What is Sydney Metro Northwest?** Introduction to the Sydney Metro Northwest site study. Current and future public transport facilities in the North West region.
Historical context	2	HT5–6 HT5–7 HT5–8	**The people of the North West region** Contribution of individuals and groups to the development of the North West region – links to Sydney Metro Northwest station names.
	3	HT5–1 HT5–6 HT5–10	**Roads, convict bushrangers and the White Hart Inn** Treatment of a key issue in Sydney's colonial North West
	4	HT5–2 HT5–6	**The coming of the railway** History of transport in New South Wales during the 19th century.
	5	HT5–2 HT5–6 HT5–8	**Rogans Hill to Parramatta railway** Case study of early 20th century rail transport in the North West region.
Research protocols	6	Develop skills of historical enquiry	**Choose your own adventure** Site study research groups, topics. Research plan and research protocols.
Historical context	7	HT5–8	**Works in progress** Groups meet to report; share progress on research and/or fine tune research process.
Historical context	8	HT5–10	**Putting it all together** Group collation, planning and preparation of research.
	9 and 10	HT5–10	**Show and tell** Group presentations of research projects.

Students learn about	Students learn to
Key features of their local natural and built environment including current rail, bus and road routes. The current Sydney Trains network and the new Sydney Metro Northwest.	– Identify key features of the local environment using source provided – Identify the main routes of the current Sydney Trains network using plan – Explain the significance of Sydney Metro Northwest for the local and wider Sydney urban area.
Groups and individuals and the contributions they have made to the North West region associated with Sydney Metro Northwest.	– Use historical sources to locate relevant information – Record information in a concise and meaningful way – Communicate information to members of their home groups.
Colonial roads, convict bushrangers and the White Hart Inn in the 1830s	– Explain the emergence of convict bushrangers in Sydney's colonial North West in the 1830s – Analyse sources to locate differing perspectives on the issue – Collaborate in pairs to construct a dialogue between characters about bushrangers and the Bushranging Act, 1830
The history of transport in New South Wales during the 19th century.	– Identify various forms of 19th century transport – Select relevant information from sources – Sequence and explain changes in late 19th century transport – Explain the impact of the coming of the railway – Identify different types of historical sources.
The Rogans Hill to Parramatta railway in the North West region between 1902–1932.	– Identify key developments in the history of the Rogans Hill to Parramatta railway – Analyse sources to explain features of change and continuity in the history of the Rogans Hill to Parramatta railway.
Research process and protocols.	– Understand the nature and requirements of the site study research task – Plan historical research to suit the purpose of their investigation – Collaborate in groups to organise research and address the criteria set down in the research task.
The ongoing research process.	– Identify, locate, select and organise information from a variety of sources, including ICT and other methods – Collaborate in groups to share work in progress on their research task and to further refine the research process.
Planning to present the findings of research.	– Collaborate in groups to organise research for formal presentation – Select an appropriate communication form to communicate their research findings for different audiences.
Presenting the research: Communicating an understanding of History.	– Uses a range of appropriate oral, written, visual and digital forms to communicate their research findings.

Lesson 1: What is the Sydney Metro Northwest?

This lesson aims to

- Develop students' understanding of the transport features of the North West region
- Increase students' familiarity with Sydney Metro Northwest and its key features
- Provide students with practise in interpreting maps and plans using the legend.

Focus questions

- How is the North West region currently served by public transport?
- What is Sydney Metro Northwest and what effect might it have on the North West region?

History K–10

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analysis of the modern world and Australia

(HT5–8) selects and analyses a range of historical sources to locate information relevant to a historical inquiry.

Literacy focus

Reading: Interpreting maps and plans.

Cultural: Knowledge of Sydney's Rail network.

ICT: Accessing and using Google Earth, Sydney Trains and Sydney Metro Northwest plans.

Key terms and vocabulary

Sydney Metro Northwest, Sydney Trains, built environment.

Requirements for this lesson

- Google Earth Map
- Plan of current Sydney Trains network
- Plan of Sydney Metro Northwest
- Activity sheet 1 (page 100)
- Interactive whiteboard.

Web links

Sydney Metro Northwest project map

https://www.sydneymetro.info/map/interactive-map

Lesson 1 learning experiences

Time	Teacher activity	Student activity	Tips for teachers
10 minutes	Projects large map of North West region of Sydney on screen or interactive whiteboard via Google Earth.	Using Google Earth on their laptops, and local regional maps students locate their school and home on a map of the North West region of Sydney and identify the significant features of the natural and built environment – including present railway, bus and major road routes.	
5 minutes	Leads/moderates discussion. Creates a mind map on board to collate responses.	Students describe their use of current modes of transport for different purposes, for example how they get to or from school and before and after school activities. Students consider what patterns of transport use can be seen from the responses of the whole group. For example, private car or bus.	Students can compare their current modes of transport in pairs or small groups and report to the class.
20 minutes	Distributes copies of current Sydney Trains suburban network with questions. Displays plan of Sydney Trains network on screen or interactive whiteboard.	In pairs or small groups, choose one of the lines of the current network and identify: Name of the line, its colour, where it begins and ends, interchanges and overview of suburbs passed through. Using the network map, students explain how they would travel on the current network to places of interest, for example the city, Olympic Park or Bondi Beach.	Ensure all routes are covered. Call on groups to use the interactive whiteboard to explain their chosen route to the class. Students realise they are not served by existing network. This is a segue for introduction of the Sydney Metro Northwest.
15–20 minutes	Questions class to ascertain prior knowledge of Sydney Metro Northwest. Displays Sydney Metro Northwest plan on screen. Distributes Activity sheet 1 (page 86).	General discussion to establish what students already know about Sydney Metro Northwest. Study the Sydney Metro Northwest map to answer questions on Activity sheet 1 about key features of the Sydney Metro Northwest. Compare the Sydney Metro Northwest map with the Sydney Trains Network plan to understand how it relates to the entire Sydney Trains network. Plot a journey using the Sydney Metro Northwest map. Explain the significance of Sydney Metro Northwest for the North West region.	Activity sheet 1. Students access the Sydney Metro Northwest plan (see web links). Class discussion: How will Sydney Metro Northwest affect you and your family?

Assessment

Informal question and answer session to gauge students' understanding.

Follow-up activity

Students take home Sydney Metro Northwest plans (or access them on their computer) and share their learning about the project with their families.

Activity sheet 1

The map of Sydney Metro Northwest.

Students access the map of the Sydney Metro Northwest on their laptops or iPads.

https://www.sydneymetro.info/map/sydney-metro-interactive-train-map

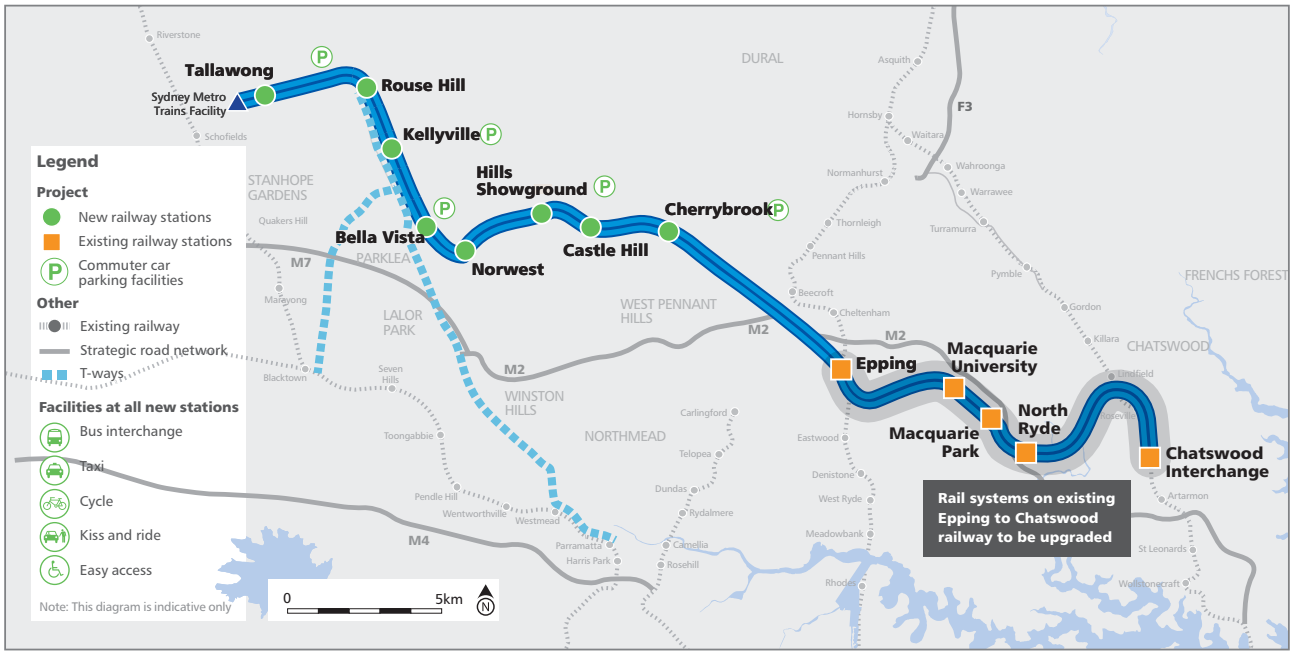

Figure 9: Sydney Metro Northwest route map.

In pairs or small groups, students study the Sydney Metro Northwest route map.

Using the information in the plan, including the legend, answer the following questions:

1. Follow the Sydney Metro Northwest from east to west. Where does Sydney Metro Northwest start in the east? Where does it finish?
2. List the stations along Sydney Metro Northwest beginning with Tallawong. Indicate which are new and which already exist.
3. Which stations will have commuter car parking facilities?
4. Describe the facilities proposed at all the new Sydney Metro Northwest stations.
5. Identify the other existing railways in the region.
6. What east-west transport options other than rail are available?
7. How could a commuter travel from Parramatta to Rouse Hill?
8. Without Sydney Metro Northwest, explain the different ways a Macquarie University student could get home to Kellyville.
9. Explain the importance of Epping and Chatswood stations to Sydney Metro Northwest.

NSW GOVERNMENT | sydney METRO Northwest

Lesson 2: People of the North West region of Sydney

This lesson aims to

- Engage students with sources that identify different groups and individuals who have played a role in the history of the North West region
- Use the expert jigsaw technique so that students share the information they have found with peers.

Focus questions

- Who has lived in the North West region of Sydney in the past?
- What contribution have they made to the local area?

History K–10

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analyses of the modern world and Australia

(HT5–7) explains different contexts, perspectives and interpretations of the modern world and Australia

(HT5–8) selects and analyses a range of historical sources to locate information relevant to a historical inquiry.

Literacy focus

Reading: Reading and interpreting sources.

ICT: Accessing and using designated websites.

Oral: Peer teaching of home groups by experts.

Key terms and vocabulary

Ticket-of-leave, emancipist, free settler, rebellion, uprising, loyalist, proclamation, martial law, infamy, lash, tribe, clan, sustainability.

Requirements for this lesson

- Activity sheet 2A – Expert activity sheet – People of the North West region: Aboriginal peoples (page 104)
- Activity sheet 2B – Expert activity sheet – People of the region: Convicts and the Castle Hill Rebellion (page 105)
- Activity sheet 2C – Expert activity sheet – People of the North West region: Free settlers and ex-convicts (page 106)
- Activity sheet 2D – Graphic organiser for home groups (page 107).

Web links

The Hills Shire Council site

https://www.thehills.nsw.gov.au

Teacher tip: How to run an expert jigsaw

https://www.jigsaw.org/

Students researching Aboriginal peoples can use the following websites

https://www.thehills.nsw.gov.au/About-The-Sydney-Hills/History-of-The-Hills-Shire/A-Brief-History-of-the-Shire#Aboriginal

Students researching the Castle Hill Rebellion

https://www.thehills.nsw.gov.au/Library/Library-e-Resources/Hills-Voices-Online/Heritage-Sites/Death-or-Liberty

Students researching Richard Rouse

https://sydneylivingmuseums.com.au/rouse-hill-house-farm

Lesson 2 learning experiences

Time	Teacher activity	Student activity	Tips for teachers
10 minutes	Introduces the topic and the expert jigsaw technique.	Students form home groups under teacher direction and select experts who will research the following topics: – Aboriginal peoples – Convicts and the Castle Hill Rebellion – Free settlers and ex-convicts (x2).	Due to the large number of free settlers in the region it is recommended that two groups work on this topic. See web links for tips on conducting an expert jigsaw.
5 minutes	Distributes Activity sheets 2a, 2b, 2c.	Experts research the given topic using the web resources provided and record their information on a summary sheet.	See web links.
20 minutes	Distribute Activity sheet 2d.	Experts return to their home groups and teach their members about their topic using their summary sheets. Home members record what they have been taught using their graphic organisers.	Graphic organisers (if distributed as hard copies should be printed on A3 paper). Teacher monitors home group activity to ensure students can effectively process the information from the expert groups.
15–20 minutes	Facilitates some concluding class discussion.	Students select and share some of the interesting aspects of their research. Students compare and contrast the experiences of different individuals and groups to explain the different perspectives represented in their research.	Students should be encouraged to identify the different perspectives of individuals or groups and explain how these were shaped by their contexts or experiences. For example, the different viewpoints of Indigenous people, convicts and free settlers.

Assessment

Informal question and answer session to gauge students' understanding. Informal completion of expert summary sheets and graphic organisers.

Follow-up activity

Students use the information compiled in their graphic organiser to construct a short summary or narrative outlining the roles played by the different groups in the development of the North West region. They retain these notes as a basis for the group research activities they will conduct for their site study.

Activity sheet 2A

Expert activity sheet – People of the North West region: Aboriginal peoples

1. Which local tribe did the Aboriginal people of this region belong to?
2. What were the three main clan groups and what land did they occupy? What do their names mean?
3. What different kinds of evidence of Aboriginal occupation have been found in caves in The Hills Shire?
4. What activities did the local Aboriginal people engage in?
5. List the main foods hunted and collected by the local Aboriginal people.
6. What did they do to ensure the sustainability of their food supply?
7. How were the following natural resources used by the Aboriginal people in this region?
   a. Plants and grasses
   b. Animals
   c. Creeks and rocks
   d. Forests
8. What forms of body decoration did the Aboriginal people practise and why?
9. Describe the impact of European settlement on the Aboriginal people of this region.
10. What forms did Aboriginal resistance to European settlement take?
11. What evidence is there that the Darug language has survived?

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Northwest

Activity sheet 2B

Expert activity sheet – People of the region: Convicts and the Castle Hill Rebellion

1. What was the cause of the Battle of Vinegar Hill?
2. When did it happen?
3. What role did Irish convicts play in the rebellion?
4. Who was their leader?
5. Who was the Governor of the colony at the time?
6. What role did Major George Johnston play?
7. Briefly outline the main developments in the Castle Hill Rebellion.
8. Why did the rebellion fail?
9. How were the rebels and their leaders punished?
10. Where is Vinegar Hill in relation to Sydney Metro Northwest? Why is it called Vinegar Hill?

11. Is there any debate about the location that you can find?

Figure 10: Convict uprising at Castle Hill 1804, artist unknown, National Library of Australia an5577479.

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Northwest

Activity sheet 2C

Expert activity sheet – People of the North West region: Free settlers and ex-convicts

Choose TWO of the following and use The Hills Shire Council website to find out about them:

1. William Joyce
2. Matthew Pearce and family
3. Joseph and Mary Ann Harrison
4. Andrew and Elizabeth McDougall
5. George and Sarah Suttor
6. Richard and Jane Gilbert
7. Hugh Kelly
8. Pierre Lalouette de Vernicourt (Baron de Clambe)
9. Richard Rouse

For researching Richard Rouse

https://sydneylivingmuseums.com.au/rouse-hill-house-farm

Questions to answer about people you have chosen:

1. When did they arrive in the colony?
2. Where did they settle?
3. What activities did they engage in on their properties?
4. How did they interact with other people of the region?
5. What contribution did they make to the history of the region?
6. What physical evidence of their presence in this region remains?
7. With which new Sydney Metro Northwest station are they associated?

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Activity sheet 2D

This pro forma is reproduced to provide an outline of a way of making your own activity sheet. If printed, use A3 paper.

Graphic organiser for home groups

WHO?

WHAT?

WHEN?

TOPIC?

WHERE?

WHY?

Lesson 3: Roads, convict bushrangers and the White Hart Inn

This lesson aims to

- Explore reasons behind the emergence of bushrangers in the 1830s and their effect on Sydney's North West using the White Hart Inn as the context for the investigation
- Use a range of sources to establish reasons behind the bushranging outbreak and examine differing perspectives on the issue at the time.

Focus questions

- What do the remains of the White Hart Inn reveal about the experiences of people living in colonial Sydney's North West?
- Why were bushrangers so prevalent on the Cumberland Plain in the 1830s?
- How did the colonial authorities deal with the bushranging crisis and what was the public response?

History K–10

(HT5–1) explains and assesses the historical forces and factors that shaped the modern world and Australia

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analyses of the modern world and Australia

(HT5–10) selects and uses appropriate oral, written, visual and digital forms to communicate effectively about the past for different audiences.

Literacy focus

Historical literacy: Interpretation of visual and written sources, and understanding of historical concepts.

Communicate: Oral and written forms.

Writing: Construction of a historical dialogue.

ICT: Access information from the web.

Key terms and vocabulary

Archaeology, convict, bushranger, penal system, Cumberland Plain, legend, hero, villain, perspective, cause and effect.

Requirements for this lesson

- Activity Sheet 3 – Source study: 'Bushrangers: A hot topic of conversation at the White Hart Inn' (pages 117–122).

Web links

Hidden heart: The unfolding mystery of Kellyville's White Hart Inn

https://www.sydneymetro.info/white-hart-inn

Background information

Figure 11: Artist's impression of the White Hart Inn (circa 1840s). Original illustration by I. Golka 2014.

Figure 12: After the archaeological excavation began, it became clear that one of the piers for the viaduct design would impact the excavation site and the remains of the inn. The position of the pier was adjusted to conserve the site. https://www.sydneymetro.info/white-hart-inn

The story of the White Hart Inn is part of the unfolding narrative of life in Sydney's North West. The earliest chapter involves the Aboriginal people of the Bidjigal clan who occupied the land around Kellyville before and after European settlement. The building of inns and granting of land on the Windsor Road forms part of the subsequent chapter which deals with the rapid spread of settlement to the North West as colonists searched for farming land and economic opportunities.

Roads in the colonial North West

Windsor and Old Windsor Roads were initially laid out in 1794 and later realigned in 1812–1813. Parts of the old alignment still survive. Both played a central role in colonial development and in the settlement of The Hills District. The roads retain features that capture the historic and rural character of the Cumberland Plain.

Figure 13: Remnant of the Old Windsor Road, Stanhope Farm alignment, Stanhope Gardens, Blacktown. Colonial roads were narrow, constructed of dirt and stone and lined with dense bush. Trees and scrub were later cleared as settlers moved into Sydney's west in search of farming land and commercial opportunities. NSW Office of Environment and Heritage **http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=4301011**.

Roads were lifelines and the focus for activity in the early colony. As roads rolled out across the North West settlers acquired land, farmed, and built homes and inns. Inns were local landmarks situated on the fringes of these byways. They functioned as local meeting points and provided rest stops for bullock drays and coaches transporting merchandise and passengers to various destinations. Convicts, built and maintained these colonial highways, and worked for landowners and innkeepers. Convict escapees also roamed the bush in search of a living. When unsuccessful, many took to the road and bushranging.

Convict bushrangers

The construction of the White Hart in the late 1820s and arrival of its first publican William Cross, coincided with the outbreak of the bushranging crisis. 'Bushranger,' in the early colony, referred to any criminal living in the bush and subsisting by robbery and violence. Whether heroes or villains, bushrangers were integral to the Australian story from the settlement of New South Wales in 1788 to the hanging of Aboriginal bushranger Jimmy Governor in 1901. Reported instances of robbery and violence carried out by individuals purported to be bushrangers were high, particularly in the period to 1840 when the transportation of new convicts to New South Wales ceased.

Colonial newspapers were full of reports about bushrangers plundering drays and robbing unsuspecting travellers across the Cumberland Plain. Bushrangers came from different backgrounds, operated in different ways, and drew varying degrees of public acclamation and censure. Many assumed legendary status even during their lifetimes. However, most robbed indiscriminately and boasted about the fact. Because the houses of the rich were well protected, bushrangers generally targeted travellers journeying along the network of roads connecting colonial towns and settlements.

Opinions about what caused this spate of robberies and lawlessness were divided. One colonial newspaper attributed blame to an increasingly repressive penal system and failure of the police to solve the law and order crisis. Certainly, by 1816 the government had introduced draconian measures to reduce convicts' independence and opportunities to earn extra money. The newly built Hyde Park Barracks was a place of hardship.

Figure 14: Bushranger stealthily robbing a traveller sleeping in the bush,' Nicholas Chevalier, *Punch* Vol.1, p. 21, 1855. State Library of Victoria MP00/00/56/2.

Convict clothing was introduced. As the boundaries of settlement grew, convicts were assigned to settlers as labourers and servants. With few controls over their treatment many were flogged and subjected to long periods of labour in road gangs. The vast majority of bushrangers were run away convicts who had taken to the bush. The sparsely settled countryside interspersed with tracts of wilderness proved attractive. Robbing travellers was preferable to hard labour and definitely more lucrative.

By the late 1820s bushrangers were pursued by police runners, search parties accompanied by Aboriginal trackers and finally the mounted police who scoured isolated bush areas. The approach was unsuccessful. In an attempt to establish order, the Legislative Council introduced the Bushranging Act, an 'Act to Suppress Robbery and Housebreaking and the Harbouring of Robbers and Housebreaking' in 1830. Special powers were given to the police to arrest on suspicion, search for stolen goods and seek out evidence of concealment. Certain sections of colonial society resented the Act. Governor Burke and Justice Burton questioned its legality and regarded it as an assault on civil liberties. Others regarded it as the only solution to a situation that was beyond control.

Figure 15: Map of the Cumberland Plain 1824 showing the extent of settlement and districts where bushrangers operated during the 1820s and 1830s. W.H. Lizars. National Library of Australia **http://nla.gov.au/nla.map-nk2456-106.**

Convict associations with the White Hart Inn

James Gough and John Donohoe were both ex-convicts. Gough is historically connected to the White Hart Inn. Donohue worked the Windsor Road as a bushranger in the early years of the Inn's history. Both had an acquaintance in common – the Reverend Samuel Marsden. Marsden was one of Donohoe's roadside victims, and a celebrant at Gough's marriage to Sarah Cain. James Gough was the builder employed by William Cox to construct the White Hart Inn. Born in 1790, Gough worked as a joiner until his arrest for burglary. He was convicted at Middlesex Gaol, sentenced to life and sent to New South Wales aboard the 'Earl Spencer' in 1813. According to the 1828 census Gough, then 38 years old, was a builder who resided at Cambridge Street, Sydney. He died in 1876 aged 86 years.

Bold Jack Donohoe

Unlike James Gough, John Donohoe's life story was certainly more troubled. Born in 1806 in Dublin Ireland, Donohoe worked as an errand boy. He was convicted of felony, sentenced to life and transported to New South Wales aboard the 'Ann and Amelia' in 1824. On arrival, he was assigned to John Pagan of Parramatta and then Major West a Parramatta surgeon who owned property at Quaker's Hill. By 1825 Donohoe had arrived in Hunter Valley and was working on the estate of Leslie Dugout, a young man with a 2000 acre land grant and convicts to farm it.

Donohoe's short but notorious bushranging career began in 1827. Operating on foot with accomplices George Kilray and William Smith, he robbed bullock drays on the Windsor Road. All three were arrested and tried for highway robbery in the Supreme Court before Judge John Stephen. They were found guilty. Kilray and Smith were hanged, but Donohoe made a daring escape from custody while on route to the Sussex Street gaol. Brazen escapes and exploits of this nature became the talk of the town, and fired conversations in inns and around campfires.

Figure 16: Bullock dray and drivers resting circa 1854, Charles Lyall. Loaded bullock drays were constantly under threat from bushrangers on the Windsor Road. State Library of Victoria.

Now an escapee, Donohoe led a gang of bushrangers for the next two years. During this time, Jack Donohoe, William Webber and John Walmsley plundered the country from Sydney to Liverpool and Campbelltown, down to the Illawarra. In search of further booty they headed to Bathurst and Yass, and then north to the Hunter Valley. In 1829 Walmsley killed and robbed a Mr. Clementson on his way to Sydney. Clementson knew Walmsley when he had worked as a sawyer in the Hunter River. Soon after, Donohoe, Walmsley and Webber ambushed Mr. McQuade, a Windsor shopkeeper travelling on the Windsor Road. They stole print and calico cloth and abused the dray drivers for not carrying tobacco. According to witnesses, the gang was well armed; each member equipped with pistols hung in holsters on leather belts strapped across his chest. The witnesses also remarked on how clean and well dressed their assailants were, recalling that Donohoe wore 'a black hat, superfine blue cloth coat lined with silk, surtout fashion, plaited shirt (good quality), laced boots rather worn at the toes and snuff coloured trousers...' Find the full version of the McQuade robbery at:

Charles White, *History of Australian Bushranging, Vol.1 The Early Days to 1862* (1900). Sydney Angus and Robertson:
http://gutenberg.net.au/ebooks12/1201961h.html

On arrival at Winsdor, the dray drivers reported the robbery to the chief constable who with Black Jemmy, an Aboriginal tracker, followed the men until dark and then watched for fire during the night. Donohoe and his accomplices found buyers for the print and calico cloth. Justice John Stephens in the Supreme Criminal Court later tried the O'Hara family, ex-convicts living at Seven Hills, for receiving stolen property. On the afternoon of September 1, 1830 soldiers and police scouring the Bringelly scrub near Campbelltown cornered Donohoe. A ball fired by Trooper Muggleton killed him. His accomplices, Weber and Walmsley, ran leaving behind a packhorse and baggage containing flour, meat, clothes, transfers, land grant deeds and a watch. The papers had been stolen from a Mr. Pegley, settler at Prospect. The Australian newspaper in its coverage of Donohoe's death stated that 'the reputed Donohoe, was reckoned only to be 23 years of age, when he received the fatal ball, low of stature...and [had] a countenance bearing the impression of strong passions and a determined spirit.'

The Australian, Friday 10 September 1830, p.2
http://nla.gov.au/nla.news-article36865041

Donohoe became the subject of ballads recounting his bushranging deeds. Judgments vary – hero or villain? Legend suggests he discriminated in his choice of victim, robbing only the rich and sparing the poor.

Lesson 3 learning experiences

Time	Teacher activity	Student activity	Tips for teachers
5 minutes	Shows You Tube clip: 'White Hart Inn heritage find' on screen **https://www.youtube.com/watch?v=6Byjn2qiI9w**	Views and compiles notes on the location and construction of the White Hart Inn, artefacts retrieved and what they reveal about life in colonial Sydney's North West.	Ensure students are aware of White Hart Inn's location on the Windsor Road, and understand the importance of that road as the main thoroughfare transporting people, merchandise, valuables and food supplies between Parramatta and Windsor
5 minutes	Leads discussion on key points raised by archaeologists in the 'White Hart Inn heritage find.' Constructs a mind map on the board and collates students' responses. Highlights the significance of the White Hart Inn site in informing our understanding of colonial society and transport in Sydney's North West	Reviews and augments notes with reference to the mind map	Emphasise the importance of archaeological evidence in peeling back the history of the White Hart Inn. Highlight the speculative nature of archaeological investigation and the various methods used by historical archaeologists to piece together the story of a site.
20 minutes	Projects a Google satellite image of Windsor Road Kellyville onto the interactive whiteboard. Locates the capped remains of the White Hart Inn on the right of the Windsor Road, just beyond the intersection of the Old Windsor Road and Windsor Road. Travels along the Windsor Road noting examples of change and continuity. Reviews the penal system and convict life in the early colony with reference to events in Sydney's South West such as the Vinegar Hill Rebellion and its consequences Introduces the bushranger epidemic of the 1830s and links to the severity of the penal system Focuses on the story of Bold Jack Donohoe ex-convict and bushranger, and his possible connection to the White Hart Inn Introduces the Bushranging Act, 1830 with reference to Source 1, Activity Sheet 3 (page 117) Discusses the consequences of the Act for certain groups and individuals	Discusses the location of the White Hart Inn, types of vehicles used on the Windsor Road and dangers confronting travellers Lists key points about the increasing severity of the penal system during the 1820s and 1830s, and develops a case linking this to the appearance of convict bushrangers	Project visual sources on the interactive whiteboard to support discussion and topic coverage

Time	Teacher activity	Student activity	Tips for teachers
20 minutes	Distributes Activity Sheet 3, (page 117–122). Reviews students' understanding of the historical concept of 'perspective taking' Reads and discusses sources contained in Activity Sheet 1 Explains dialogue task	In pairs, students select two historical characters and construct a dialogue representative of various colonial viewpoints on bushrangers and the Bushranging Act, 1830 In pairs, students draw up a list of individuals who may have witnessed such a conversation at the White Hart Inn following the death of Bold Jack Donohoe	Ensure students select their characters from a cross-section of colonial society Encourage students to identify differing perspectives and explain how these were shaped by beliefs, values and life experiences Encourage students to note the language used in colonial sources and to reflect linguistic differences between past and present in their dialogues. Draw a link between 'perspective taking,' and differing historical interpretations of events, issues and individuals
10 minutes	Reviews students' progress on dialogue task Organises a schedule for dialogue presentations Highlights key content and issues addressed during the lesson Revisits the White Hart Inn and underlines its significance as a cultural heritage site	Students explain choice of characters with peers, and outline their characters' viewpoints on bushranging and the Bushranging Act	Dialogue could be completed as a homework activity. Presentations could be scheduled for delivery at various stages during the mandatory site study.

Web links

Convicts

https://sydneylivingmuseums.com.au/convict-sydney/convicts-colony

Early Australian bushrangers

https://www.nma.gov.au/exhibitions/irish_in_australia/bushrangers

Transportation and the Windsor roads:

Hidden heart: The unfolding mystery of Kellyville's White Hart Inn

https://www.sydneymetro.info/white-hart-inn

Old Windsor Road and Windsor Road Heritage NSW Office of Environment and Heritage

http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=4301011

Walker, F. (1921). Some famous roadside inns, Sydney Mail (NSW: 192–1938), Wednesday 1921, pp. 8–30

http://trove.nla.gov.au/newspaper/article/162034124?searchTerm=some%20famous%20roadside%20inns&searchLimits=

Walker, F. (1921). Australian roadside inns, Windsor and Richmond Gazette (NSW: 1888–1954), Friday 4 November 1921

http://trove.nla.gov.au/work/212588637?q=roadside+inns&c=article&versionId=233450946

Activity sheet 3: Source study

Bushrangers and the Bushranging Act: A hot topic of conversation at the White Hart Inn

Context

No doubt, bushranging was a constant topic of conversation among patrons congregating at the White Hart Inn. One Sydney newspaper estimated that around 150 bushrangers worked the Cumberland Plain in the 1830s. Most of these were 'runaways from convict gangs and road gangs...many driven by starvation and ill usage, to take to the bush.' (The Australian, Friday, 16 April, 1830). Officials became so concerned about lawlessness in the colony that the Legislative Council introduced the 'Bushranging Act: Act to Suppress Robbery and Housebreaking and the Harbouring of Robbers and Housebreakers.' The Act, drafted by Chief Justice Forbes, was passed on 21 April, 1830.

Public opinion was deeply divided over the Act. Governor Burke questioned its legality and considered it an assault on civil liberties. Others recommended a raft of alternatives to restore law and order. These alternatives included new approaches to policing, granting clemency to escapees who had experienced harsh treatment and increasing convict rations. While John Macarthur, pastoralist and entrepreneur, had reservations about the Act, he viewed it as the only course of action open to authorities to stem the mounting crime wave.

Members of the community reacted differently. Certainly, many convicts and poor emancipists were sympathetic to the outlaw cause and willing to conceal bushrangers. Evidence suggests that settlers living around Pennant Hills and Castle Hill in the North West harboured bushrangers at various times. However, fear of reprisals from local gangs may explain their actions.

Within a short period of time, the consequences of the Bushranger Act became apparent. Innocent people, some new emigrants without documentation were arrested and detained. The first executions under the Act occurred in June 1830 with the hanging deaths of Smith and McCormick at the Sydney gaol. Despite its severity, the Act was not an immediate success.

Source 1: Extracts from the Bushranging Act and its consequences

1. 'Be it therefore enacted that it shall be lawful for any person whatsoever, having reasonable cause to suspect ...any other person to be a transported felon, unlawfully at large...without a warrant...to apprehend every such suspected person...
2. Every suspected person taken before the Justice of the Peace shall be obliged to prove... that he is not a felon under sentence of transportation...
3. Every person whatsoever shall be found on the road...with firearms or other instruments of a violent nature in his possession...shall be liable to be apprehended and taken before the Justice of the Peace...
4. And be it further enacted that it shall be lawful for any Justice of the Peace having credible information that any robbers...are harboured in the country or district to grant a general search warrant...to constables to research any dwelling
5. All persons who shall be committed for the crime of robbing or of entering and plundering any dwelling house, with arms and violence, shall be brought to trial as speedily as possible. And being lawfully convicted and sentenced to suffer death [and] executed...on the day next but two after sentence has been passed...'

Charles White (1900) *History of Australian Bushranging, Vol.1 The Early Days to 1862.* Sydney Angus and Robertson **http://gutenberg.net.au/ebooks12/1201961h.html**

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Northwest

Activity sheet 3

continued

Source 2: Views expressed in *The Australian* newspaper, concerning the Bushrangers Act

"Bushrangers – Many of those wretches who now prefer a precarious and miserable life of outlawry to labour in the service of the government, or in the services of certain private persons, would never have taken to the bush, had they not conceived they were exchanging one state of...misery for another not quite extreme...with the prospect of enjoying that wild freedom which the beast indulges as it roams the forest, or lurks in its lair.

...if treated fairly and impartially, fed sufficiently, yet worked hard, the miscreant who would cut and run from his gang, to plunder of the highway, could meet but little compassion from any honest part of the community."

Source: *The Australian,* Sydney, Friday 16 April, 1830.
http://nla.gov.au/nla.news-article36867904

Source 3: Letter written by John Macarthur, pastoralist and entrepreneur, to his son John about the Bushranging Act following the executions of Smith and McCormick, first deaths under the new Act.

"Opposed as we are known to be to the system of capital punishment in every case except those of murder and a few other crimes of violence, we cannot but lament the existence of a state of things in this Colony which compels us to admit that the law...was not only called for, but that, with any regard to the safety of the lives and properties of the people, the Council could not refrain from passing it. Crimes...of violence had arrived at a fearful extent; property, nay life itself, was not safe even in the streets of Sydney, and to strike terror–the extreme terror-was the only chance left by which security could be anticipated."

http://www.law.mq.edu.au/research/colonial_case_law/nsw/cases/case_index/1830/r_v_smith_and_mccormick/

Source 4: Obituary for Bold Jack Donohoe

"This daring marauder has at length been met by that untimely fate which he so long contrived to avoid. On Wednesday evening, at dusk, as a party of the Mounted Police were riding through the bush at Reiby, near Campbell Town, they came up with three bushrangers, one of whom was Donohoe; on being called upon to stand, they threw away their hats and shoes, and ran off, when the Police fired, and killed Donohoe on the spot, one ball entering his neck and another his forehead. Favoured by the dusk, the others made their escape, and in defiance of the dreadful fate of their comrade, that very night broke into a hut and carried off what they wanted. The body of Donohoe was removed to Liverpool, and will be brought to Sydney this morning. Thus is the Colony rid of one of the most dangerous spirits that ever infested it, and happy would it be were those of a like disposition to take warning by his awful fate."

Source: *The Sydney Gazette*, 4 September 1830, p.2.
Obituaries Australia, Australian Centre of Biography, Australian National University.
http://oa.anu.edu.au/obituary/donhoe-john-jack-1985/text24877
http://trove.nla.gov.au/ndp/del/article/2195957

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Northwest

Activity sheet 3

continued

Source 5: Findings of the inquest into the death of Jack Donohoe

"On Monday the Inquest was convened by Major Smeathman Coroner, at the Fox and Hounds kept by Henry Ball, Castlereagh Street, on the body of John Donohoe.

The Jury returned a verdict of Justifiable Homicide, with reference to the identity. But from a wound in the cheek, and another under the cheek arising from scrophula, there is little doubt but that the deceased is the notorious outlaw Donohoe.

Donohoe's life has no doubt been harassing. But at the same time, it must be allowed that in comparison of the lives of the wretches at Moreton Bay, it was a happy life, and his death much less painful than those of scores who have deceased in that horrible settlement... It is fit and proper, that cruelty should be visited on the nation which practices it with retribution. God is just."

Source: *Sydney Monitor*, 11 September 1830, p.4 Full findings and text: Australian Dictionary of Biography at: **http://oa.anu.edu.au/obituary/donohoe-john-jack-1985/text24879**

Source 6

Figure 17: Skirmish between bushrangers and constables, Illawarra. It was reported that Jack Donohoe operated in the area. Created by Augustus Earle, 1827. National Library of Australia **http://nla.gov.au/nla.obj-134500811**

Source 7

Figure 18: Portrait of Bold Jack Donohoe following his death at Bringelly as the result of a ball shoot wound, September 1830. Sir Thomas Mitchell, colonial explorer and surveyor. National library of Australia **http://trove.nla.gov.au/version/17739832**

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Source analysis chart:

Bushrangers and the Bushranging Act: A hot topic of conversation at the White Hart Inn

What issues do Sources 1-7 address? Complete the following chart.		
Source – Type of source (newspaper report, personal letter etc.) – Author/creator – Role or position in society – Date	Author's/creator's viewpoint about bushrangers and Bushranger Act, 1830	Evidence used to support the author's/creator's viewpoint (key words, phrases, incidents, references to particular groups and/or individuals)
Extracts from the Bushranging Act and its consequences		
Views expressed in *The Australian* newspaper concerning the Bushrangers Act		
Letter written by John Macarthur		
Obituary for Bold Jack Donohoe		

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Source analysis chart:

Bushrangers and the Bushranging Act: A hot topic of conversation at the White Hart Inn

What issues do Sources 1-7 address?		
Source – Type of source (newspaper report, personal letter etc.) – Author/creator – Role or position in society – Date	Author's/creator's viewpoint about bushrangers and Bushranger Act, 1830	Evidence used to support the author's/creator's viewpoint (key words, phrases, incidents, references to particular groups and/or individuals)
Findings of the inquest into the death of Jack Donohoe		
Skirmish between bushranger and constables, Illawarra		
Portrait of Bold Jack Donohoe		

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Thinking further

In pairs, students use the evidence gathered from Sources 1–7 to respond to the following questions:

1. Can you suggest why these individuals held such views about bushrangers and the Bushranging Act? (Think about their position in society, beliefs, values, occupation and experiences. Consider events and circumstances in the early colony that may have influenced their thinking on the issue)
2. What groups and individuals may have shared these views?
3. Speculate on what other views may have been circulating at the time.

Concluding task: Historical dialogue

Using the evidence you have gathered from this Source Study and working with a partner, construct a dialogue between two characters about their views on the bushranger crisis and Bushranger Act.

Use the following scenario as the setting for your dialogue.

> On a September evening in 1830 patrons gather in the front parlour of the White Hart Inn to dine and discuss the state of the colony. Some are local, either ex-convicts or free settlers. Others are travelling magistrates, members of the military and mounted police. Merchants and dray drivers have just arrived after transacting business in Parramatta and Windsor. William Cross the publican is busy arranging accommodation for the night and stabling animals. Assigned convicts wait on tables and prepare food. Patrons are seated at tables scattered around the room. After exchanging pleasantries, the topic of bushrangers and the Bushranging Act quickly becomes a hot topic of conversation.
>
> Ground plan of the White Hart at
> **https://www.sydneymetro.info/white-hart-inn**

Dialogue guideline:

- Dialogue must be 7 minutes in duration
- Dialogue must be supported by evidence drawn from the Source Study
- Language used in the dialogue must reflect the historical context of the task
- Dialogue may be presented as either a script or report in one of the colonial newspapers of the time, such as *The Australian*, *The Sydney Monitor* or *The Sydney Gazette*.

Lesson 4: The coming of the railway

This lesson aims to

- Introduce students to the history of transport in New South Wales during the 19th century
- Develop students' understanding of changing forms of transport and the historical context in which these changes occurred.

Focus questions

- What forms of transport were used in New South Wales during the 19th century?
- What do they reveal about change and development over time?
- What effects did the coming of the railway have on social and economic development in this period?

History K–10

(HT5–2) sequences and explains the significant patterns of continuity and change in the development of the modern world and Australia.

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analyses of the modern world and Australia.

Literacy focus

Historical literacy: Understand the nature of different visual and written sources.

Reading: Understanding and extracting relevant information from sources.

Writing: Construction of a historical recount.

ICT: Access information via the web.

Key terms and vocabulary

Port Jackson, emporium, carriage, tandem, barouche, chaise, gig, dray, equestrian, steam bridge, horse train, rolling stock.

Requirements for this lesson

- Activity sheet 4A – Transport in the 19th century: Library or online research (page 125)
- Activity sheet 4B – Source study: A tramway incident, 'Steam Fiend' and fatal collision at Emu Plains (pages 126–129).

Web links

A summary of Sydney's transport history

http://dictionaryofsydney.org/entry/transport?zoom_highlight=transport

Lesson 4 learning experiences

Time	Teacher activity	Student activity	Tips for teachers
10 minutes	Conducts brainstorm activity to establish students' prior knowledge of early forms of transport in New South Wales. Records and sequences forms of transport based on student responses on interactive whiteboard.	In pairs, students create a list of as many kinds of early forms of transport in New South Wales as they can. Arrange these in chronological sequence.	Due to the large number of free settlers in the region it is recommended that two groups work on this topic. See web links for tips on conducting an expert jigsaw.
30 minutes	Distributes Activity sheet 4A and explains nature and purpose of activity. Mediates class discussion/response to questions 1–4 on activity sheet. Creates a mind map on board to record suggestions for question 4.	Working in pairs, students either web research or use Australian history library books or texts. Students study sources and complete the questions on the activity sheet.	Students can share their responses and compare their answers. Students may need some prompting with suggestions for question 4. For example, late 19th century developments could include: population increase, spread of settlement, increased agricultural production, gold rushes, urban growth.
10 minutes	Gives instructions for writing activity: Historical recount.	Construct half page historical recount summarising development of transport in New South Wales during 19th century.	Students use a timeline summary and their notes to structure their recount. Alternatively, this could be completed as a homework activity for discussion at beginning of Lesson 5.

Assessment

Informal assessment of timeline activity based on students' written and oral responses.

Follow-up activity

Activity sheet 4B is a study of several historical sources about change and continuity in reaction to new transport technology and the way in which the media report events. The teacher can place this lesson within the learning sequence or postpone it until the end of the unit.

Activity sheet 4A

Transport in the 19th century: Library or online research

The online *Dictionary of Sydney* contains a good selection of images.

http://dictionaryofsydney.org/entry/transport?zoom_highlight=transport

Students can take note of the modes of transport available in Sydney:

1. Which forms of transport are no longer used in New South Wales today? Why have these become obsolete?

2. Briefly explain how transport in New South Wales changed during the 19th century.

3. Suggest some reasons for these changes.

4. What developments in the second half of the 19th century could help to explain these changes? Use sources and your own knowledge to answer this question.

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Activity sheet 4B

Study: A tramway incident, 'Steam Fiend' and fatal collision at Emu Plains

These illustrations and articles come from the *Illustrated Sydney News* and *Sydney Punch* in the 1870s and 1880s. Find the original two *Illustrated Sydney News* stories on the Trove (digitised newspapers) website.

1. According to the newspaper article entitled 'Fatal collision at Emu Plains on the Great Western Railway' (Source 1) what research did the illustrator of that event do to create his sketch of the Emu Plains collision?
2. According to the newspaper article entitled 'Our Government Tramways' (Source 3) what research did the illustrator of that event do to create his sketch of a tramway incident in the streets of Sydney in 1887?
3. How are these stories both similar and different from those featured in today's newspapers?
4. Why illustrations? How are they different from photographs?
5. What do the newspaper articles and their accompanying illustrations (Sources 1, 2 and 3) suggest about attitudes to these new forms of transport?
6. What aspects of change and continuity are highlighted in these sources?

Source 1

Figure 19: Illustration: Fatal Collision at Emu Plains on the Great Western Railway.

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Activity sheet 4B

continued

Source 1 (continued)

The full text of the article is available at **http://trove.nla.gov.au/ndp/del/page/5452976**

Fatal collision at Emu Plains on the Great Western Railway

"On our first page we give an accurate sketch of the late dreadful accident at Emu Plains, the harrowing details of which have been so fully given by the daily newspapers. It appears that on Wednesday night, 30 January [1878]. a special goods train of nine loaded trucks of kerosene shale left Bowenfels in charge of George Purdue (the guard), John Egan (driver), and John Larkins (stoker). Passing the regular stations at its due time, it arrived at Blue Mountain station, where the signal "all right" was shown; but the station-master called to the guard as the train was passing that he was late, to which Purdue returned the remark that he had "plenty of time for the Plains," where he would cross the goods train with Sydney merchandise. At this point of the narrative some confusion prevails as to the exact place of crossing mentioned by the guard. The goods train referred to was duly started, and the two doomed trains hastened to destruction, both being involved in utter ruin. The combustible matters with which the trains were freighted took fire, and in addition to the horrors of the collision, came the calamity of a conflagration. Three men, Wiggins, Egan, and Brady, were killed, the others escaping with but little injury – a verdict of manslaughter being returned against Purdue, the guard. We are indebted to Mr. Alliband, the station-master at Emu Plains, for his courteous attention to our artist on his visit to the scene."

Source: *Illustrated Sydney News*, Saturday, 23 February 1878.

THE LATE FATAL COLLISION AT EMU PLAINS.

On our first page we give an accurate sketch of the late dreadful accident at Emu Plains, the harrowing details of which have been so fully given by the daily newspapers. It appears that on Wednesday night, 30th January, a special goods train of nine loaded trucks of kerosene shale left Bowenfels in charge of George Purdue (the guard), John Egan (driver), and John Larkins (stoker). Passing the regular stations at its due time, it arrived at Blue Mountain station, where the signal "all right" was shown; but the station-master called to the guard, as the train was passing, that he was late, to which Purdue returned the remark that he had "plenty of time for the Plains," where he would cross the goods train with Sydney merchandise. At this point of the narrative some confusion prevails as to the exact place of crossing mentioned by the guard. The goods train referred to was duly started, and the two doomed trains hastened to destruction, both being involved in utter ruin. The combustible matters with which the trains were freighted took fire, and, in addition to the horrors of the collision, came the calamity of a conflagration. Three men —Wiggins, Egan, and Brady, were killed, the others escaping with but little injury—a verdict of manslaughter being returned against Purdue, the guard. We are indebted to Mr. Alliband, the station-master at Emu Plains, for his courteous attention to our artist on his visit to the scene.

Figure 20: How the article appeared in the *Illustrated Sydney News,* Saturday 23 February 1878.

Source: http://trove.nla.gov.au/ndp/del/page/5452976

Figure 21: How the illustration appeared on the cover of the *Illustrated Sydney News,* Saturday 23 February 1878.

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Activity sheet 4B

continued

Source 2

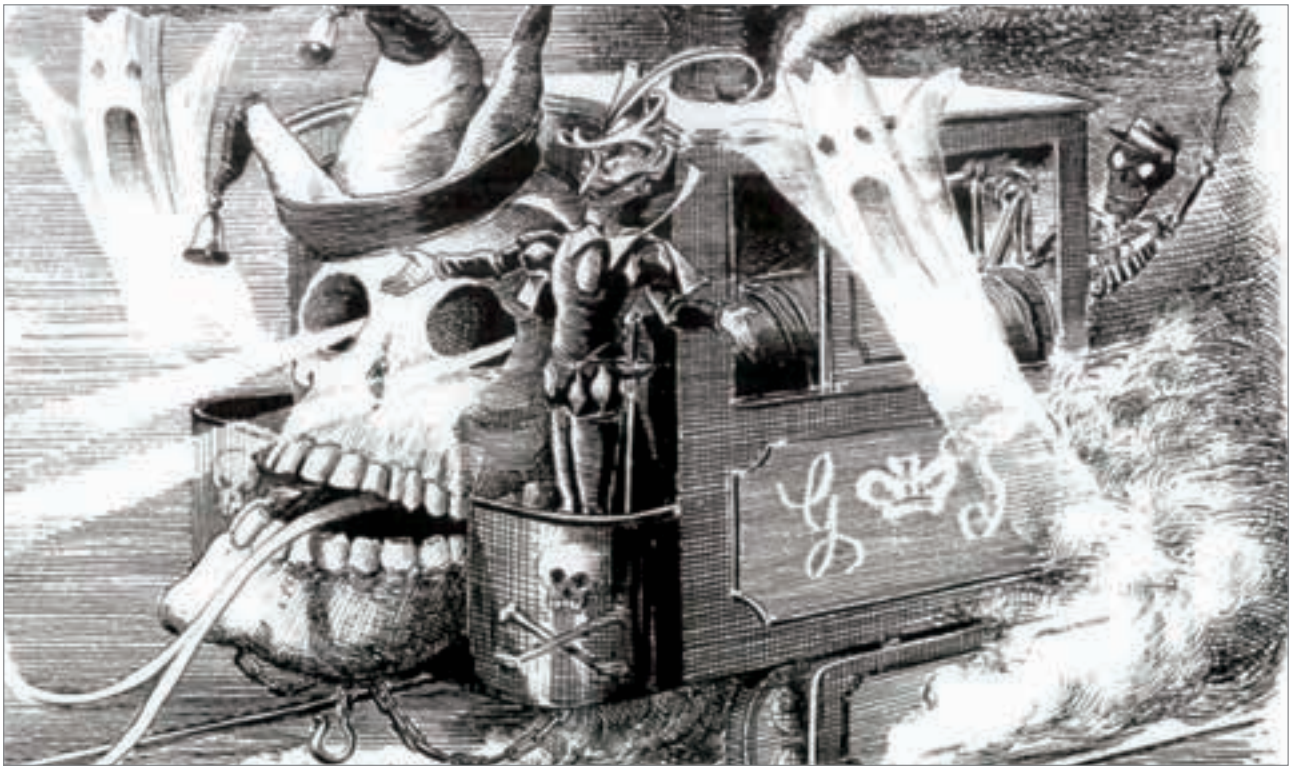

Figure 22: Cartoon – 'The Steam Fiend', Montagu Scott, *Sydney Punch,* 1881.

Source: Harold Finch-Hatton, *Advance Australia,* 1885.

Sydney's steam powered trams

Steam powered trams were introduced to Sydney in 1879 to coincide with the International Exhibition. Four Baldwin trams were imported from the United States and ran on tracks laid from Hunter Street along Elizabeth Street to the Devonshire Street Station. The system was cheap, efficient and relatively simple to install because the steam trams each carried their own source of power. During the next few years the service was extended to Woollahra, Waverley, Glebe, Forest Lodge, Camperdown, Leichhardt and Annandale.

Apart from noise and dirt, a major disadvantage of the small heavy machines was their inability to stop quickly. This meant they often ran down pedestrians with tragic results. One commentator said that they 'rush down the most crowded thoroughfares, terrifying horses and killing on an average, about two foot-passengers a week.' The same sentiment is expressed in this contemporary cartoon and within a decade the steam trams were referred to by the people of Sydney as the 'murderers'.

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Activity sheet 4B

continued

Source 3

Figure 23: Illustration – A tramway incident, Otto Fischer, *Illustrated Sydney News,* 15 March 1887.
Source: Trove, National Library of Australia.

The full text of the article can be found at

http://trove.nla.gov.au/newspaper/page/5788558?zoomLevel=1

The author of the editorial accompanying this illustration in the *Illustrated Sydney News* wrote:

Our Government Tramways

"In the ordinary street traffic of all large cities the traveller is constantly surrounded by unsuspected dangers. In Sydney, for example, scarcely a week passes that does not furnish some evidence of the perils that beset pedestrians and all kinds of travellers by every means of locomotion…

Take, for example, the tramway system of Sydney. The danger, discomfort, and utter inconvenience of the system, is a serious reflection on the common sense of the community, and we doubt if public opinion, in any other part of Her Majesty's dominions, would tolerate the continuance of such a nuisance as these cars are, both to the travelling and resident public, in the districts through which they pass.

The artist has here realised one of the many scenes that have occurred in the past, and which at any time in the future may form the subject of a sensational report in one of the daily newspapers, A lady with her infant child has just alighted from the tram car, the guard is in the act of blowing his whistle as an indication to the engine driver to steam ahead, with his living freight, when a cab dashes along and intercepts the progress to the footpath so that she is in imminent danger of being trampled under foot by the excited horse, maddened by the noise and confusion surrounding him. The illustration gives a very spirited and life-like portrayal of the situation, the terror of the unfortunate woman, the indignation of the crowd on the tram car, the characteristically cool indifference of the guard, and the efforts of the cabman to rein up his horse and thus avoid the impending catastrophe".

Source: *Illustrated Sydney News,* 15 March 1887.

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Northwest

Lesson 5: Case study – Rogans Hill to Parramatta railway

This lesson aims to:

- Survey the establishment and development of the Rogans Hill to Parramatta railway
- Draw conclusions about the impact of the Rogans Hill to Parramatta railway on the North West region.

Focus questions

- What was the Rogans Hill to Parramatta railway?
- What does this case study reveal about change and continuity in the North West region over time?

History K–10

(HT5–2) sequences and explains the significant patterns of continuity and change in the development of the modern world and Australia.

(HT5–6) uses relevant evidence from sources to support historical narratives, explanations and analyses of the modern world and Australia.

(HT5–8) selects and analyses a range of historical sources to locate information relevant to a historical inquiry.

Literacy focus

Historical literacy: Demonstrate an understanding of change and continuity.

Listening skills.

Writing: Note-making practise.

ICT: Access information from relevant web based resources.

Key terms and vocabulary

Tramway, locomotive, commuter, orchardist, entrepreneur, £.s.d (pounds, shillings and pence), commissioner, lobbying, depot, petition, Great Depression.

Requirements for this lesson

- Activity sheet 5A – 'The first rail link in the North West region' (page 132–133)
- Activity sheet 5B – 'Change and continuity' (page 134).

Web links

The Hills Shire website: Oral History ('Hills Voices' Online – Bruce Irwin)

https://www.thehills.nsw.gov.au/Library/Library-e-Resources/Hills-Voices-Online/Changing-Shire/Bruce-Irwin

Lesson 5 learning experiences

Time	Teacher activity	Student activity	Tips for teachers
5 minutes	Distributes Activity sheet 5A and the Rogans Hill to Parramatta railway timetable. Explains nature and purpose of activity.	Listen to instructions and form pairs for the activity. Students access The Hills Shire website (see web links).	
25 minutes	Monitors students' use of the internet resource and completion of the timeline activity and questions.	Listen to Bruce Irwin's oral history account of the Rogans Hill to Parramatta railway. Complete the timeline on the activity sheet and answer the questions given.	This account is a useful activity for developing students' listening skills. They can also follow the text provided and view the images and embedded video.
10 minutes	Ascertains students' prior knowledge of the concepts of change and continuity to introduce the next activity.	Engage in the teacher-led discussion.	Time needed for this activity will depend on students' level of understanding of the concepts. Concrete examples from students' own experiences are recommended.
20 minutes	Distributes Activity sheet 5B. Monitors pair and group activities. Moderates the whole class discussion on change and continuity.	Use the information gained from the earlier activities to draw conclusions about aspects of change and continuity. Record their findings on the mind map provided. Pairs form groups of four and discuss one of the four questions provided. Each group reports to the whole class on its discussion.	The teacher will need to facilitate small group and whole group discussion to support students' analysis.

Assessment

Formative. The teacher assesses students' understanding of key developments in the history of the Rogans Hill to Parramatta railway and the concepts of change and continuity.

Follow-up activity

Site study to be conducted by students in groups.

Activity sheet 5A

The first rail link in the North West region

Complete the timeline and answer the questions below.

Use the video clip and accompanying text of the Rogans Hill to Parramatta railway at the following website:

https://www.thehills.nsw.gov.au/Library/Library-e-Resources/Hills-Voices-Online/Changing-Shire/Bruce-Irwin

Timeline of developments affecting the Rogans Hill tram/railway (30 minutes).

	Date	Development
Tram	1902	
	1906	
	1915	
Rail	1923	
	1929	
	1932	

Questions

1. Why was the tramway converted to a railway?
2. Why did commuters regard the railway service as inferior to the tram service?
3. How were both commuters and citrus growers (orchardists) better served by other forms of transport in the 1920s? What were the advantages of these other modes of transport?

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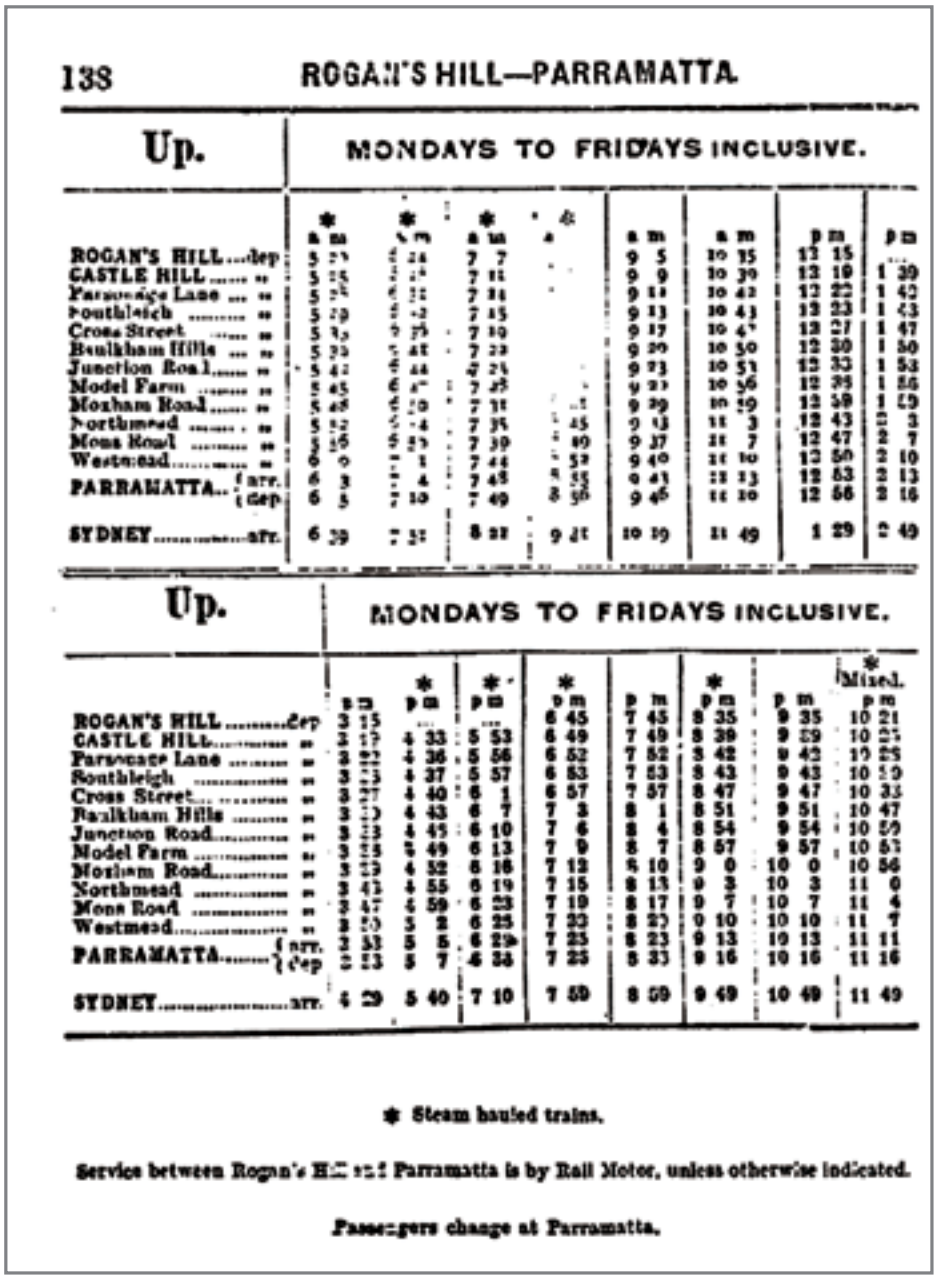
Activity sheet 5A

Rogans Hill to Parramatta railway timetable

Study the timetable below and answer the following questions:

1. Where did the service begin and terminate?
2. How long did the journey take on a weekday morning?
3. How did a commuter travel to Sydney?



138 ROGAN'S HILL—PARRAMATTA.

Up. MONDAYS TO FRIDAYS INCLUSIVE.

	*	*	*	*				
	a m	a m	a m	a	a m	a m	p m	p m
ROGAN'S HILL ....dep	5 [illegible]	[illegible]	7 7		9 5	10 35	12 15	
CASTLE HILL ..... "	5 [illegible]	[illegible]	7 [illegible]		9 9	10 39	12 19	1 39
Parsonage Lane ... "	5 [illegible]	[illegible]	7 [illegible]		9 [illegible]	10 42	12 22	1 42
Southleigh ..... "	5 [illegible]	[illegible]	7 15		9 13	10 43	12 23	1 43
Cross Street ..... "	5 [illegible]	[illegible]	7 19		9 17	10 47	12 27	1 47
Baulkham Hills ... "	5 [illegible]	[illegible]	7 22		9 20	10 50	12 30	1 50
Junction Road..... "	5 [illegible]	[illegible]	7 24		9 23	10 53	12 33	1 53
Model Farm ..... "	[illegible]	[illegible]	7 [illegible]		9 [illegible]	10 56	12 36	1 56
Merham Road..... "	5 [illegible]	[illegible]	7 [illegible]		9 29	10 59	12 39	1 59
Northmead ..... "	5 [illegible]	[illegible]	7 35		9 33	11 3	12 43	2 3
Mons Road ..... "	[illegible]	[illegible]	7 39		9 37	11 7	12 47	2 7
Westmead..... "	6 9	[illegible]	7 44		9 40	11 10	12 50	2 10
PARRAMATTA.. {arr.	6 3	[illegible]	7 48		9 43	11 13	12 53	2 13
{dep	6 5	7 10	7 49		9 46	11 20	12 56	2 16
SYDNEY.....arr.	6 39	[illegible]	8 [illegible]	9 [illegible]	10 19	11 49	1 29	2 49

Up. MONDAYS TO FRIDAYS INCLUSIVE.

		*	*	*		*		* Mixed.
	p m	p m	p m	p m	p m	p m	p m	p m
ROGAN'S HILL .....dep	3 15	...	...	6 45	7 45	8 35	9 35	10 21
CASTLE HILL..... "	3 [illegible]	4 33	5 53	6 49	7 49	8 39	9 39	10 25
Parsonage Lane ..... "	3 [illegible]	4 36	5 56	6 52	7 52	8 42	9 42	10 28
Southleigh ..... "	3 [illegible]	4 37	5 57	6 53	7 53	8 43	9 43	10 29
Cross Street..... "	3 [illegible]	4 40	6 1	6 57	7 57	8 47	9 47	10 33
Baulkham Hills ..... "	3 [illegible]	4 43	6 7	7 3	8 1	8 51	9 51	10 47
Junction Road..... "	3 [illegible]	4 45	6 10	7 6	8 4	8 54	9 54	10 50
Model Farm ..... "	3 [illegible]	4 49	6 13	7 9	8 7	8 57	9 57	10 53
Merham Road..... "	3 [illegible]	4 52	6 16	7 12	8 10	9 0	10 0	10 56
Northmead ..... "	3 41	4 55	6 19	7 15	8 13	9 3	10 3	11 0
Mons Road ..... "	3 47	4 59	6 23	7 19	8 17	9 7	10 7	11 4
Westmead..... "	3 [illegible]	5 2	6 25	7 23	8 20	9 10	10 10	11 7
PARRAMATTA..... {arr.	3 53	5 5	6 29	7 25	8 23	9 13	10 13	11 11
{dep	3 53	5 7	6 34	7 25	8 33	9 16	10 16	11 16
SYDNEY.....arr.	4 29	5 40	7 10	7 59	8 59	9 49	10 49	11 49

* Steam hauled trains.

Service between Rogan's Hill and Parramatta is by Rail Motor, unless otherwise indicated.

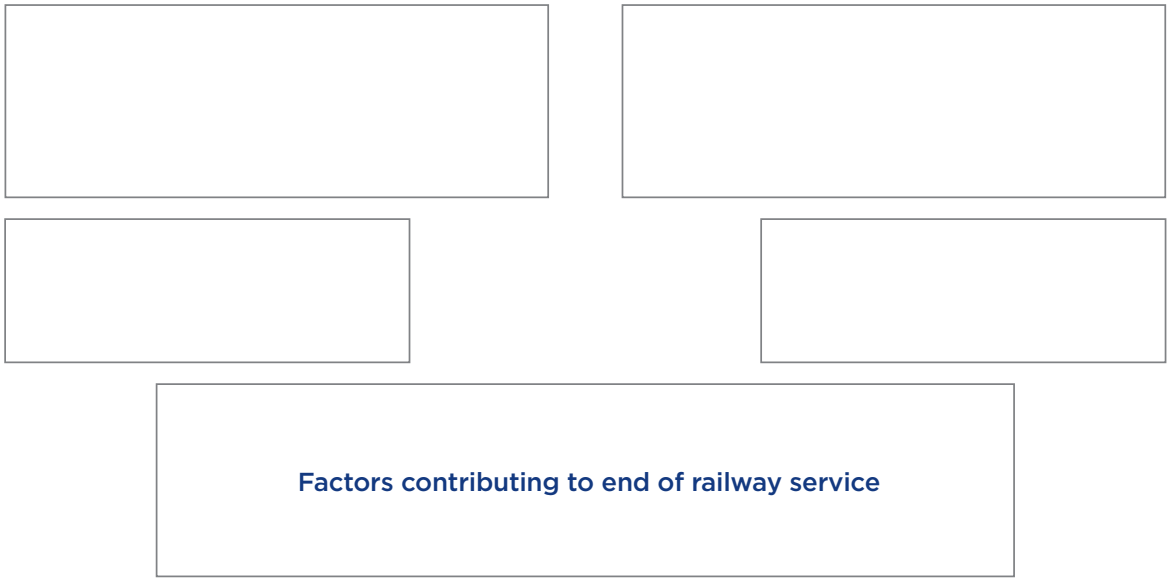
Passengers change at Parramatta.

Figure 24: The Rogans Hill to Parramatta railway timetable.

Activity sheet 5B

Change and continuity

The teacher can easily create a mind map template that looks like the following example. Print on A3 paper. Students use the mind map to record the factors that contributed to the end of the first rail service in the North West region.



Alternatively, use the brainstorming mind mapping site **https://bubbl.us/**

For discussion

1. List the main examples of change you have observed in your study of the Rogans Hill to Parramatta railway, e.g. social, economic, technological. (Teacher tip: ensure class understands these important concepts).
2. Identify features of continuity that you have observed in this study, for example, people's expectations.
3. What do you think is more obvious from this study: change or continuity?

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Northwest

Lesson 6: Choose your own adventure

This lesson is devoted to the allocation and discussion of a research task and research protocols. Students form research groups, and choose their site study research topics from those listed below. The teacher ensures they understand the nature of the research task (Activity sheet 6, pages 138–141) and students begin collaborating on their research activities.

Note: Students research and present their site study topic over a sequence of five lessons (Lessons 6–10). Refer back to 'Lesson sequence overview' (pages 96–97) for details concerning the content and teaching learning activities specified for Lessons 6–10.

Outcomes

Historical skill: Research – Plan historical research to suit the purpose of an investigation.

Site study research topic examples

1. Research the names of Sydney Metro Northwest stations. Consider other research about people and events of the area which may be relevant. Prepare an interactive display (for example five to six PowerPoint frames or a short YouTube video-clip) featuring key historical information for display at each Sydney Metro Northwest station.
2. Investigate the early history of public transport in the North West region and produce a five to ten minute video outlining this history, including the Rogans Hill to Parramatta railway. Imagine that this may be shown where people wait for buses or other important transport locations.
3. Investigate major changes over time – from pre-colonial times to the present – in population, land use and urban development in the North West region. Identify key turning points in the history of the North West region. Present your findings as an interactive timeline.
4. Create some artworks or artefacts to represent key personalities or events in the history of the North West region that might be displayed at Sydney Metro Northwest stations or other public buildings or places.
5. Design and conduct a survey on community knowledge about Sydney Metro Northwest. How much do people know about some of the main features, such as the number of stations, where it starts and finishes and other elements? Collate the findings of your research and represent it in pie charts, or column graphs as a display. Use a mobile device to record short interviews to upload to YouTube or MovieMaker.
6. Design and produce a YouTube promotional 90 second advertising campaign commercial to let people in your local community know more about the Sydney Metro Northwest. It is important to think about your target audience: Is it youth (e.g. easy travel to the beach with a surfboard and no car)? Is it adults (e.g. faster and cheaper journey to work)? Is it mothers with children (e.g. easy to go shopping and to the doctor with a pram)?

Requirements for this lesson

- Activity sheet 6 – 'Sydney Metro Northwest site study research task' (pages 138–141)
- Distributes and discusses Assessment schedules and guidelines for oral, digital and other formats

Web links

The Hills Shire Council website

https://www.thehills.nsw.gov.au/

https://www.thehills.nsw.gov.au/About-The-Sydney-Hills/History-of-The-Hills-Shire

Lesson 6 sequence

Time	Teacher activity	Student activity	Tips for teachers
15 minutes	Distributes Activity sheet 6 with research topics and directions. Explains nature and purpose of the site study. Elaborates on research topics. Monitors group discussions and answers students' questions.	When the teacher has finished explaining the task and clarifying research topics, students form small groups of four or five. Each group chooses one site study from the topics provided and has preliminary discussion on their task.	Teacher either negotiates with groups on choice of task or allocates tasks based on knowledge of students' interests, abilities, learning styles. Suggest each group appoint a group leader to co-ordinate activities.
15–20 minutes	Draws attention to research activities, including: – Allocation of activities – Time frame for research and target dates – Compilation of research material – Use of research log.	After the teacher's explanations students in their groups discuss research process and requirements and construct a template for their research log under teacher direction.	
15–20 minutes	Directs students to relevant resources for beginning research and navigates The Hills Shire Council website to demonstrate.	Students follow the teacher's explanation and pose relevant questions for clarification. Students offer suggestions for research resources based on their study of this topic in previous lessons and their own knowledge of their local area.	

Assessment

Formative: Teacher assesses students' understanding of the research task – from small group and whole class discussions, question and answer session and from monitoring sessions conducted during the research period.

Summative assessment of student research is conducted at the end of unit.
See Assessment task and marking guidelines (pages 142–143).

Follow up activity

The Foxfire approach to teaching and learning promotes a sense of place and appreciation of local people, community and culture as essential educational tools.

https://www.foxfire.org/teaching.html

Activity sheet 6

Sydney Metro Northwest site study research task

Your task

In this research task, you and your group will conduct a local history site study with a focus on Sydney Metro Northwest, which is under construction and scheduled for completion mid–2019. You will explore a topic related to the local history of the area that will be served by the Sydney Metro Northwest and prepare an ICT or other presentation format to present your findings.

Your study should draw on a range of different sources and highlight aspects of change and continuity in your local area over time.

Your target audience for this research will be the travelling public of the North West region. Imagine that your research and site study will be an information resource to be shown at the various stations along the Sydney Metro Northwest when they are built.

Organisation

- EIGHT WEEKS – your group will have eight weeks to carry out this task
- ONE LESSON – during the research period will be set aside for you to share your work in progress, consult with your teacher and refine your research
- ONE LESSON – at the conclusion of your research to put the finishing touches to your task in preparation for your presentation. However, most of this work needs to have been completed ahead of this lesson
- TWO LESSONS – for group presentations to the rest of the class.

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Activity sheet 6

Site study research topic examples – choose one of the following

1. Research the names of the Sydney Metro Northwest stations. Consider other relevant research of people and events of the area. Prepare an interactive display (for example five to six PowerPoint frames or a short YouTube video-clip) featuring key historical information for display at each Sydney Metro Northwest station.
2. Investigate the early history of public transport in the North West region and produce a five to ten minute video outlining this history, including Rogans Hill to Parramatta railway. Imagine that this may be shown where people wait for buses or other important transport locations.
3. Investigate major changes over time – from pre-colonial times to the present – in population, land use and urban development in the North West region. Identify key turning points in the history of the North West region. Present your findings as an interactive timeline.
4. Create some artworks or artefacts to represent key personalities or events in the history of the North West region that may be displayed at Sydney Metro Northwest stations or other public buildings or places in the region.
5. Design and conduct a survey on community knowledge about Sydney Metro Northwest. How much do people know about some of the main features, such as the number of stations, where it starts and finishes and other elements. Collate the findings of your research and represent it in pie charts, or column graphs as a display. Use a mobile device to record short interviews to upload to YouTube or MovieMaker.
6. Design and produce a YouTube promotional 90 second advertising campaign commercial to let people in your local community know more about Sydney Metro Northwest. It is important to think about your target audience: Is it youth (e.g. easy travel to the beach with a surfboard and no car)? Is it adults (e.g. faster and cheaper journey to work)? Is it mothers with children (e.g. easy to go shopping and to the doctor with a pram)?

Part 1: Group research

You will need to collaborate on this task by:

- Setting research goals and timelines (keep a research log for your group on the school's intranet)
- Allocating tasks to different members of the group
- Visiting sites relevant to your research, conducting interviews (where relevant), collecting and analysing sources and making notes
- Making judgments about the most reliable and useful sources and which to include in your final presentation
- Collating and refining your findings during the course of your research (you will need to collaborate at times other than during your History lessons to accomplish this).

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Activity sheet 6

Part 2 (a) Group presentation

In groups prepare a 10 minute presentation of your research task

- Introduction including (i) an explanation of your research methods: organisation, allocation of tasks, summary of major activities; (ii) evaluation, e.g. most effective/least effective methods; and (iii) any problems you encountered in the research
- Presentation of the task e.g. PowerPoint, Movie, YouTube clip
- Evaluation of sources used. Which were most/least reliable? Which were most useful? Why?
- Explanation of what you have learned from this site study about change and continuity over time in your local area.

Group presentation – Criteria for assessment

You will be assessed on how well you

- Explain and evaluate your research methods in your introduction
- Make judgments about the reliability and usefulness of your sources
- Explain features of change and continuity over time in your local area
- Demonstrate evidence of effective communication skills and teamwork.

Part 2 (b) The task

Your group's task will be assessed on the following criteria

- Relevant and accurate information/historical detail
- Logical, well-structured presentation of texts/images etc
- Originality in the design of the task.

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Northwest

Activity sheet 6

Suggested resources

The Hills Shire Council website

https://www.thehills.nsw.gov.au/Library/Library-e-Resources/Local-Studies-Family-History

Local libraries

The Hills Shire Library Service

https://www.thehills.nsw.gov.au/Library/About-Our-Libraries

Local historical societies and persons

Search for these sites by name and get contact details.

For example:

The Hills District Historical Society

https://sites.google.com/site/hillsdistricthistoricalsociety/

Sydney Metro Northwest resources

https://www.sydneymetro.info/documents

Sydney Metro Northwest Project Overview June 2014 (5MB, pdf)

https://www.sydneymetro.info/sites/default/files/ProjectOverview2014.pdf%3Fext%3D.pdf

Environmental Impact Statement 2

Executive Summary (1MB, pdf)

https://www.sydneymetro.info/sites/default/files/01_Cover__Declaration__Exec_Summary__ToC.pdf%3Fext%3D.pdf

Chapter 11 European Heritage (2MB, pdf)

https://www.sydneymetro.info/sites/default/files/13_Ch_11_European_Heritage.pdf%3Fext%3D.pdf

Chapter 12 Indigenous Heritage (652KB, pdf)

https://www.sydneymetro.info/sites/default/files/document-library/Sydney%20Metro%20Northwest%20Indigenous%20Heritage%20Archaeological%20Salvage%20Program%20Report.pdf

NSW GOVERNMENT | sydney METRO Northwest

Assessment schedule and guidelines

Assessment task and marking guidelines

Group presentation – oral

Criteria	Grade
– Provides a clear and detailed explanation and evaluation of research methods – Makes valid and sustained judgments about the reliability and usefulness of a range of sources – Identifies significant features of change and continuity and provides a thorough explanation of them – Demonstrates highly effective communication skills and teamwork in the presentation.	A
– Provides a clear explanation and evaluation of research methods – Makes valid judgments about the reliability and usefulness of a range of sources – Identifies significant features of change and continuity and provides a sound explanation of them – Demonstrates effective communication skills and teamwork in the presentation.	B
– Provides a satisfactory explanation of research methods with some evaluation – Makes some judgments about the reliability and/or usefulness of sources – Identifies some relevant features of change and continuity and provides some explanation of them – Demonstrates satisfactory communication skills and teamwork in the presentation.	C
– Provides a basic explanation of research methods; may include evaluation – Describes sources, may attempt some judgment about their reliability or usefulness – May describe one or two features of change and/or continuity – Demonstrates basic skills of communication and teamwork in the presentation.	D
– Provides a limited explanation of research methods – Limited or no judgment about reliability and usefulness of sources – Demonstrates limited understanding of change and/or continuity – Demonstrates limited communication skills and teamwork.	E

Assessment schedule and guidelines

Assessment task and marking guidelines

The task – digital or other format

Criteria	Grade
– Provides a clear and detailed explanation and evaluation of research methods – Makes valid and sustained judgments about the reliability and usefulness of a range of sources – Identifies significant features of change and continuity and provides a thorough explanation of them – Demonstrates highly effective communication skills and teamwork in the presentation.	A
– Provides a clear explanation and evaluation of research methods – Makes valid judgments about the reliability and usefulness of a range of sources – Identifies significant features of change and continuity and provides a sound explanation of them – Demonstrates effective communication skills and teamwork in the presentation.	B
– Provides a satisfactory explanation of research methods with some evaluation – Makes some judgments about the reliability and/or usefulness of sources – Identifies some relevant features of change and continuity and provides some explanation of them – Demonstrates satisfactory communication skills and teamwork in the presentation.	C
– Provides a basic explanation of research methods; may include evaluation – Describes sources, may attempt some judgment about their reliability or usefulness – May describe one or two features of change and/or continuity – Demonstrates basic skills of communication and teamwork in the presentation.	D
– Provides a limited explanation of research methods – Limited or no judgment about reliability and usefulness of sources – Demonstrates limited understanding of change and/or continuity – Demonstrates limited communication skills and teamwork.	E

Mapping the historical Rogans Hill to Parramatta railway line

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Mapping the historical Rogans Hill to Parramatta railway line** What remains of the old Rogans Hill to Parramatta railway line, closed in 1932?	**Stage 4–5** 1–2 lessons

Teacher briefing

This geographic and historical research activity is appropriate for either Stage 4 or 5, and can be included in a History class as an extension to the previous unit.

Students enter latitude and longitude into Google Maps and view the most likely remnant locations of the historic Rogans Hill to Parramatta railway. They discuss the likely orientation of the platforms, by viewing the surrounding roads and directions to the stations.

Requirements for these lessons

- Information on the Rogans Hill to Parramatta railway line from Rolfe Bozier's website **http://www.nswrail.net/**

  http://www.nswrail.net/lines/show.php?name=NSW:rogans_hill
- Computers, internet connection
- Google Maps.

Assessment

Informally assess students on their ability to understand instructions on how to enter latitude and longitude into Google Maps. Assess their ability to identify how the station may have been oriented at the location given and the depth of their understanding of how change has occurred.

Background information

A steam tramway opened between Parramatta and Baulkham Hills in 1902, and was extended to Castle Hill in 1910, carrying passengers and produce to and from the area. In 1919, the NSW Government decided to convert the tramway into a railway to encourage the subdivision of estates for residential use. The new section between Westmead and Northmead was built in 1922, and the line opened to traffic to Castle Hill in 1923. It was extended to Rogans Hill in 1924. The line was single track throughout, and ran alongside Windsor and Old Northern roads between Northmead and Castle Hill. It was closed on 1 February 1932.

Web links

https://maps.google.com.au

A link to the most likely location of each station is given in the table on page 146. Students can type the latitude and longitude into Google Maps. For example:

Rogans Hill Station location: -33.72396, +151.01961

When entering latitude and longitude into Google Maps, it should be in the following order: latitude, longitude (separated by a comma). Do not forget the minus sign that precedes the latitude.

Alternatively, using the digital version of this file, click on the links provided. The following link, for example, will immediately show the map location in close-up view.

https://maps.google.com.au/maps?q=-33.72396,+151.01961&z=18

Syllabus links

Geography K–10

Geography Stage 4 – Interconnections

– the way transportation and information and communication technologies are used to connect people to services, information and people in other places

(GE4–2) describes processes and influences that form and transform places and environments

(GE4–3) explains how interactions and connections between people, places and environments result in change

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry.

Geography Stage 5 – Changing places

– the causes and consequences of urbanisation

(GE 5–2) explains processes and influences that form and transform places and environments

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry.

Learning experiences

Students use Google Maps to identify each location on the satellite image and find what is there now. Discuss the likely orientation of the platform and rail line.

Students draw a map and attempt to connect the stations using the existing roads as a guide. They should be aware that almost no evidence remains today of the actual rail line, so it is a speculative exercise. There is no known 'correct' answer.

Station name	Approximate latitude and longitude
Westmead Junction	-33.8081,+150.9865
Mons Road	-33.8026,+150.9831
Northmead	-33.7914,+150.9971
Moxham Road	-33.7859,+150.9954
Model Farms Road	-33.7772,+150.9996
Junction Road	-33.7672,+150.9975
Baulkham Hills	-33.7614,+150.9932
Cross Street	-33.7525,+150.9943
Southleigh	-33.7437,+150.9986
Parsonage Lane	-33.7383,+151.0011
Castle Hill	-33.7314,+151.0083
Rogans Hill	-33.72396,+151.01961

The table above shows the most likely locations of the Rogans Hill Line stations.

Figure 25: Model Farms Road. Copyright Google Maps 2018. A platform and loop siding were located just to the south of the intersection with Model Farms Road. The location is now the Model Farms Siding Reserve. The park probably encompasses the loading/unloading area. The location is latitude -33.7772, longitude: +150.9996.

Background information

This simple mapping exercise can be extended by 'virtually visiting' the sites, using Google Street View, or actually visiting the sites and photographing them.

The latitudes and longitudes of the locations given below are 'best guesses'.

The following information is principally compiled from Rolfe Bozier's website NSWRail.net

http://www.nswrail.net/lines/show.php?name=NSW:rogans_hill

Rogans Hill Line station locations

Westmead Junction opened 28 January 1923, closed 31 January 1932.

The Line began here.

Location map: **https://maps.google.com.au/maps?q=-33.8081,+150.9865&z=18**

Mons Road opened 28 January 1923, closed 1 February 1932.

Mons Road was a platform situated near the intersection of Mons Road and Old Windsor Road. It opened with the Line.

Location map: **https://maps.google.com.au/maps?q=-33.8026,+150.9831&z=18**

What's left?

The bridge over Toongabbie Creek between Mons Road and Northmead Stations – two sandstone piers remain at the bridge site. The steel girder superstructure had been removed before 1943.

Northmead opened as Woollen Mills 28 January 1923, renamed Northmead 1 August 1923, closed 1 February 1932.

Situated adjacent to the intersection of Briens Road and Windsor Road, this platform opened with the Line with the name 'Woollen Mills'. It was renamed in 1923.

Location map: **https://maps.google.com.au/maps?q=-33.7914,+150.9971&z=18**

Moxham Road opened 28 January 1823, closed 1 February 1932.

A wooden platform located on the western side of Windsor Road, at the northern side of the intersection of Moxham Road.

Location map: **https://maps.google.com.au/maps?q=-33.7859,+150.9954&z=18**

Model Farms Road opened as Model Farms Road 28 January 1923, renamed Model Farms 1 February 1923, closed 1 February 1932.

A platform and loop siding located just to the south of the intersection with Model Farms Road. The location is now the Model Farms Siding Reserve.

Location map: **https://maps.google.com.au/maps?q=-33.7772,+150.9996&z=18**

What's left?

The park probably encompasses the loading/unloading area as it is some way below the former track level.

Junction Road opened 28 January 1923, closed 1 February 1932.

A wooden platform and shed located just to the south of the Windsor Road intersection with Junction Road.

Location map: **https://maps.google.com.au/maps?q=-33.7672,+150.9975&z=18**

Baulkham Hills opened 28 January 1923, closed 1 February 1932.

A platform and crossing loop located between Railway Road and Old Northern Road. The location is now a car park, a small park and a bowling green.

Location map: **https://maps.google.com.au/maps?q=-33.7614,+150.9932&z=18**

What's left?

There is evidence of the cutting where the rail line left the road alignment and passed through what is now the bowling club.

Cross Street opened 28 January 1923, closed 1 February 1932.

A platform located opposite the intersection with Cross Street.

Location map: **https://maps.google.com.au/maps?q=-33.7525,+150.9943&z=18**

Southleigh opened as Excelsior Avenue 28 January 1923, renamed Southleigh, June 1923, closed 1 February 1932.

A platform located just to the north of the intersection with Excelsior Avenue.

Location map: **https://maps.google.com.au/maps?q=-33.7437,+150.9986&z=18**

Parsonage Lane opened December 1923, closed 1 February 1932.

A platform located just to the north of the intersection with Parsonage Road.

Location map: **https://maps.google.com.au/maps?q=-33.7383,+151.0011&z=18**

Castle Hill opened 28 January 1923, closed 1 February 1932.

The original terminus, which consisted of a platform and a pair of sidings located between Old Castle Hill Road and the Old Northern Road. The location is now the Castle Hill Park.

Location map: **https://maps.google.com.au/maps?q=-33.7314,+151.0083&z=18**

Rogans Hill opened 24 November 1924, closed 1 February 1932.

This was located close to the intersection of Castle Hill Road and the Old Northern Road.

Location map: **https://maps.google.com.au/maps?q=-33.72396,+151.01961&z=18**

What's left?

The station site now has unit blocks built on it, although one section of formation on approach to the station is still discernible as a driveway.

> "In 1921 Strang's Garthowen Estate was subdivided and an auction sale held on 9 April. The NSW Government Railways acquired the park site for construction of the Castle Hill Railway Station. From 1910 a tramway had operated from the Woollen Mills to Castle Hill. This was converted to a railway with the Castle Hill Station opened on 28 January 1923 and an extension to Rogans Hill opened on 24 November 1924. Castle Hill Railway Station was not manned so the junior porter sold tickets on the steam train. Due to financial difficulties and increased vehicle traffic on the roads, the railway was closed on 31 January 1932. By June 1934 all tracks had been removed. The site became Castle Hill Park. A new plaque commemorating the railway was erected in Heritage Week April 2002. There is also an old railway signal from the era."

Source: **http://www.thehills.nsw.gov.au/Library/Library-e-Resources/Hills-Voices-Online/Heritage-Sites/Arthur-Whitling-Castle-Hill-Park**

Teacher reference and extension work

The following passage about the closure of the Rogans Hill to Parramatta Line during the Great Depression provides an insight into the growth of car traffic and roads in the North West Region.

This source can be used in diverse teaching-learning contexts and as a discussion starter.

Railway Losses

Westmead to Rogans Hill line

Fearing that the Government may decide to remove the railway line from Parramatta to Rogans Hill, the Baulkham Hills Shire Council has appealed to the Blacktown Shire Council and the Holroyd Council for support in opposing any such move.

In a letter to the Shire Council, the Minister for Railways (Mr. Stevens) said that the loss on the operation of the line In 1923 was £12,593. This loss had steadily increased yearly, and it had now reached £27,203.

"In these circumstances the service cannot be continued long unless there is a guarantee of increased public support," Mr. Stevens wrote "It seems that the remedy is with the residents of the district served, who are at present patronising motor services to the detriment of the railway. I propose, however, to take up with the Commissioners the question of continuing the service for the time being, and to have the whole of the question reviewed in the light of the results of the current year's workings."

The letter added that one of the main reasons for the construction of the line was to provide fruit growers with adequate facilities to enable them to forward their products to market. With the development of motor traffic and the provision of good roads, the fruit was to a considerable extent being forwarded direct to Sydney by road, and the department had lost the major portion of the traffic anticipated. In addition, there had been a considerable falling-off in the passenger traffic.

Source: The *Sydney Morning Herald*, Thursday 12 December 1929.

http://trove.nla.gov.au/ndp/del/article/16609515

Discussion questions

- How much did the rail line lose in 1923?
- How much did the rail line lose in 1929?
- What was the main reason the rail line was opened?
- What did Mr Stevens, the Minister of Railways in 1929, conclude was one of the primary reasons for the falling-off of railway traffic?
- What historical travel patterns may have had an impact in the area?

First look at Bella Vista Station, October 2018.

Topic Three: Planning, designing and building a railway

In this topic, students investigate how railways are planned, designed and constructed.

Students consider how designers visualise a new station in the environment, calculate how many tonnes of rock have to be excavated to make the tunnels, find out how engineers measure sound and how to build a population pyramid of their local region.

They can reflect on how the knowledge and skills they are learning in the classroom have a place and value in the world around them.

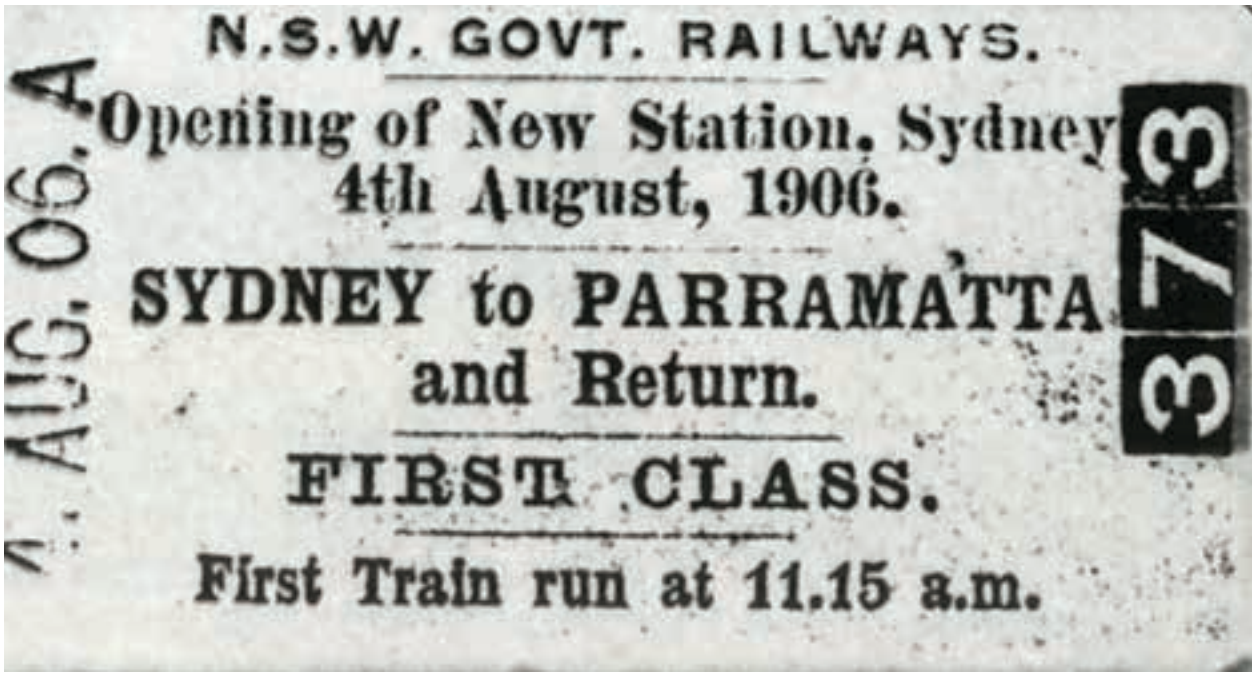


Figure 1: A rail ticket from Sydney to Parramatta on 4 August 1906 from the new Sydney Station. On a typical weekday in 2012 there were one million people travelling on Sydney's trains, 110,000 in the busiest morning peak hour. **Source:** Transport for NSW.

Teachers are not required to complete all lessons, activities and/or units of work contained in this topic. Teachers are encouraged to select and adapt materials to complement and support their teaching and learning programs, and to suit the needs and interests of students in differing school contexts.

The topic at a glance

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons	Page
Science Geography	**Minimising environmental impact: Air quality** How will Sydney Metro Northwest be good for the environmental air quality of Sydney?	**Stage 4** 2–3 lessons **Stage 4–5**	154
Science	**Rail expansion and contraction** How do engineers allow for expansion and contraction of railway tracks?	**Stage 4** 1–2 lessons	160
Science Mathematics	**Calculating and graphing vehicle speeds** How fast is my train?	**Stage 4** 1–2 lessons	164
English	**Persuasive writing: Making a railway poster** What is a good railway poster message that will attract the attention of passers by?	**Stage 4** 1–2 lessons	168
Geography	**How to plan community development: Doing a population survey** What is the average age and population structure of The Hills Shire community?	**Stage 5** 2–3 lessons	174
Geography	**How to plan community development: Meeting the needs of a growing population** How is the community changing? How might Sydney Metro Northwest help solve the needs of a growing population?	**Stage 5** 3–5 lessons	180
Mathematics	**Calculating the volume of the tunnels** How much rock material has to be excavated to make the rail tunnels?	**Stage 5** 1–2 lessons	194
Geography	**Landscapes, rocks and tunnels: Practical considerations in transport geography** What landscapes and rock types does the railway cross, both underground and over ground?	**Stage 5** 1–3 lessons	198

Minimising environmental impact: Air quality

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Science	**Minimising environmental impact: Air quality in Sydney** How will Sydney Metro Northwest be good for the environmental air quality of Sydney?	**Stage 4** 2–3 lessons
Geography		**Stage 4–5**

Teacher briefing

Students explore how Sydney Metro Northwest will enhance the environment. They calculate the approximate efficiency of catching a train versus the bus or driving a private car.

Requirements for these lessons

- Internet connected computers
- Tally sheets
- MS Excel or any spreadsheet software
- Station design images from Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation. (See web links).

Key terms and vocabulary

Environmental impact, carbon footprint, emissions, air quality, beneficial, detrimental.

Web links

Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation

https://www.sydneymetro.info/sites/default/files/07_Ch_6_Project_Description_-_Operation_-_Part_1_of_2.pdf%3Fext%3D.pdf

Sydney Trains website: 'Why is rail travel a better choice for the environment?'

https://www.transport.nsw.gov.au/projects/environment-and-safety/sydney-trains-environment-and-sustainability/why-rail-travel-a

Syllabus links

Science 7–10

SC4–10PW describes the action of unbalanced forces in every day situations.

(PW4) Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations.

Students:

(b) research ways in which scientific knowledge and technological developments have led to finding a solution to a contemporary issue, e.g. improvements in devices to increase the efficiency of energy transfers or conversions.

Geography K–10

Geography Stage 4 – Place and liveability

– the impact of environmental quality on the liveability of places
– strategies used to enhance the liveability of places.

(GE 4–1) locates and describes the diverse features and characteristics of a range of places and environments

(GE4–2) describes processes and influences that form and transform places

(GE4–3) explains how interactions and connections between people, places and environments results in change

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry.

Geography stage 5 – Changing places:

– the causes and consequences of urbanisation
– the management and planning of Australia's urban future.

Environmental change and management (urban environments)

– human-induced environmental changes across a range of scales
– the causes, extent and consequences of the environmental change
– the management of the environmental change.

(GE5–2) explains processes and influences that form and transform places and environments

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry.

Learning experiences

Step 1 – Class activity

Review the design of the Sydney Metro Northwest station shown in Figure 2. The diagram can be found in the pdf, Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation.

https://www.sydneymetro.info/sites/default/files/07_Ch_6_Project_Description_-_Operation_-_Part_1_of_2.pdf%3Fext%3D.pdf

Students identify those design features that will contribute positively to the environment and reduce the visual impact of the rail network on the environment.

The above ground station is planned with state of the art technology. Students describe the positive aspects of the station feature in a table with the headings as shown below.

Design feature	Positive impact
Bicycle parking	Encourages riding to the station improving health and fitness of citizens.

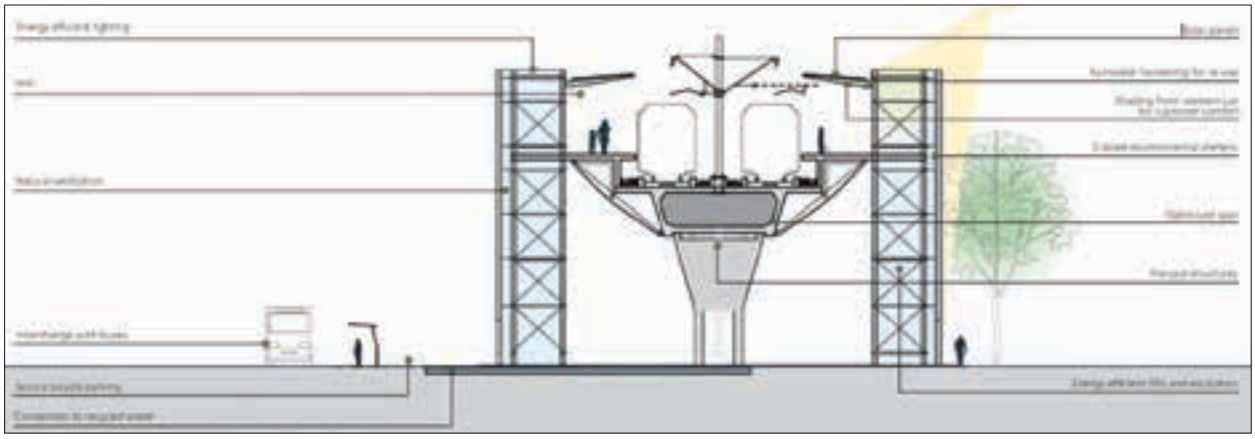


Figure 2: A generic railway station on the skytrain viaduct.

Source: Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation, page 21. (See web links).

Step 2 – Class activity

Teacher prints copies, displays on the interactive whiteboard or directs students to the Sydney Trains website.

Students use the information in the chart to determine the approximate efficiency of catching a train versus the bus or driving. Why do you think the number of cars can vary between 250 and 1000?

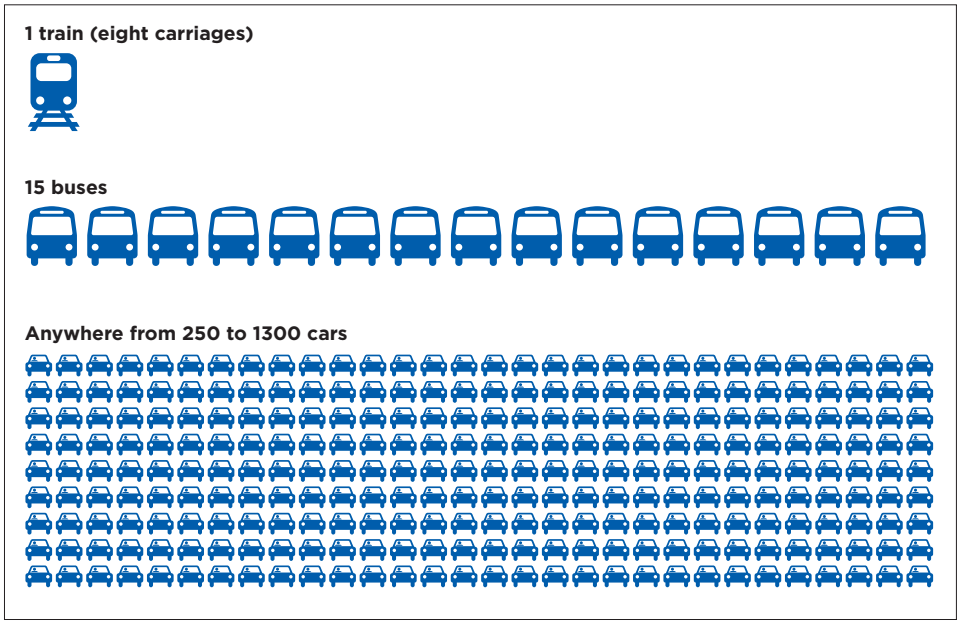


Figure 3: What does it take to move 1000 people?

Source: Sydney Trains website.

Step 3 – Homework: Data collection

Students conduct a survey of the number of passengers in cars on a nearby road. They should take a sample of 50 cars and try and record the passenger numbers. They might have some trouble determining passenger numbers per car, but encourage them to make their determination as accurate as possible. This exercise should only take about 15 minutes if it is a main road.

N.B. All New South Wales road safety rules must be obeyed at all times.

Record data in a tally table like the following:

Cars	1	2	3	4	5	6	7
Passengers							

Step 4 – Record and discuss data

Students copy their data to a spreadsheet program such as Excel and draw a chart to demonstrate the frequency of passenger numbers they recorded.

- What was the most common number of passengers in a car?
- Ask students to explain again why the number of cars can vary between 250 and 1000 in the diagram. (Answer: Because of the wide variation in numbers of people per car).

Step 5 – Individual activity

Go to the website **https://tripgo.com/**

TripGo shows door-to-door transport options across Greater Sydney as well as how to get to places in the fastest, cheapest and most environmentally friendly way.

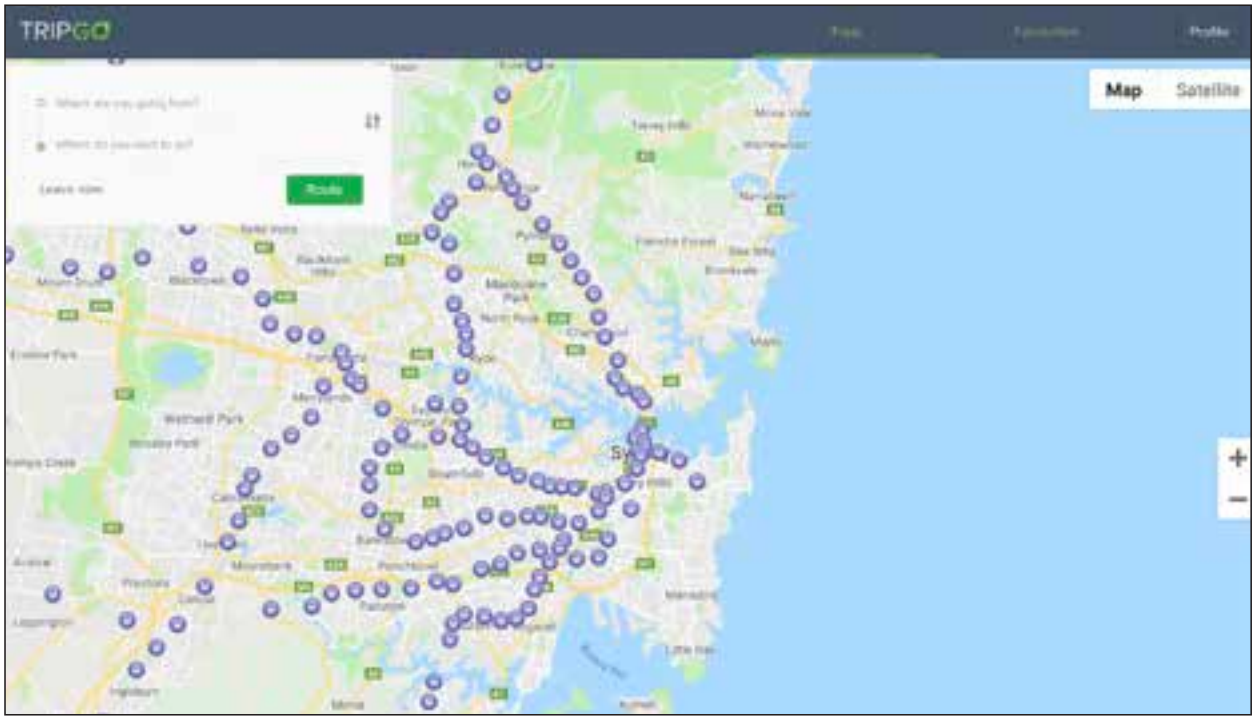


Figure 4: Transport for NSW Tripgo carbon calculator.

Instructions to students

- Identify a journey you are likely to make by car in the next few months. Compare the carbon footprint made by your journey with that of a train covering the same route.
  Use the calculator at **https://tripgo.com/**
- How does the amount of fuel consumed and the emissions produced compare to those generated by the train?
- Identify the real benefits to the environment that individual train use can provide as opposed to other types of transport. Individual benefits might include things such as reduced cost of the journey
- In performing your calculation on the website, identify the inputs that you can vary.
  List these inputs
- What assumptions are made in the 'How to calculate' section of the website when comparing journey emissions and costs?
- Look at the sample journey from Blacktown to Central Station and compare these journeys if made by the transport modes shown. Describe the advantages and disadvantages of travelling by each mode of transport for the environment and the individual
- List the things that might encourage people to catch a train or bus rather than travel by private vehicle
- Identify the reasons as to why some people would still travel by private car rather than travel by train
- Describe the benefits that Sydney Metro Northwest will bring to the greater city of Sydney
- Can you think of other personal advantages of rail travel? Hint: Reading, doing homework.

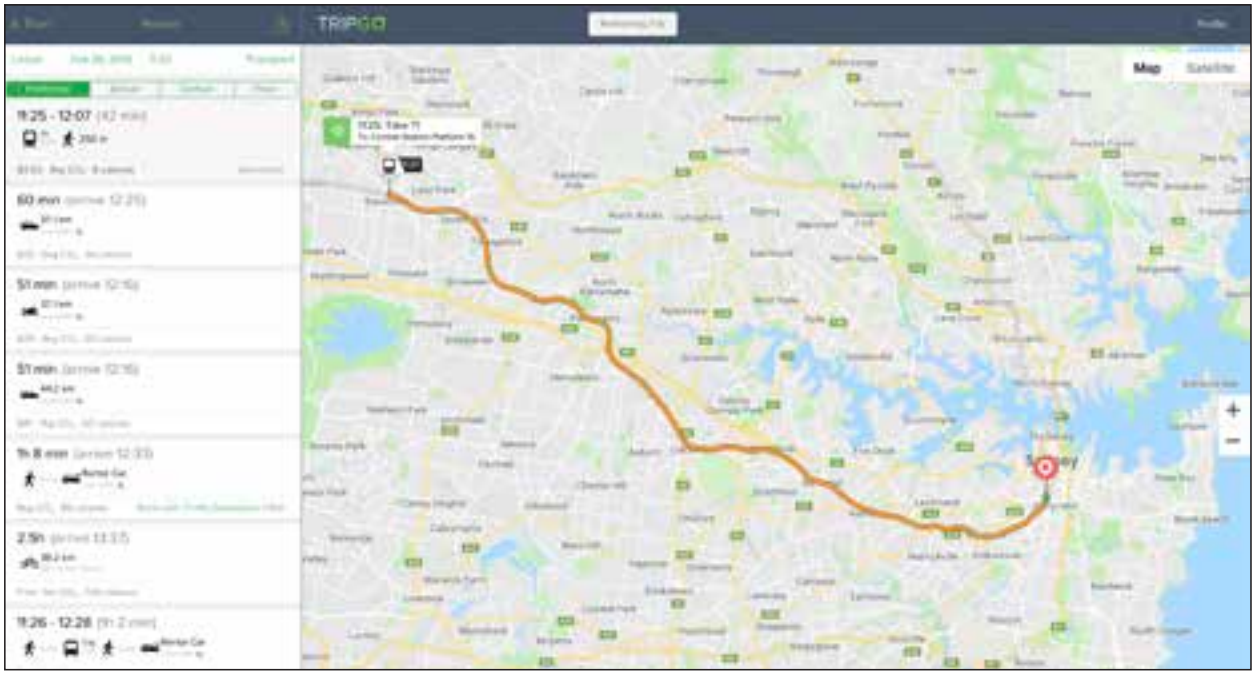
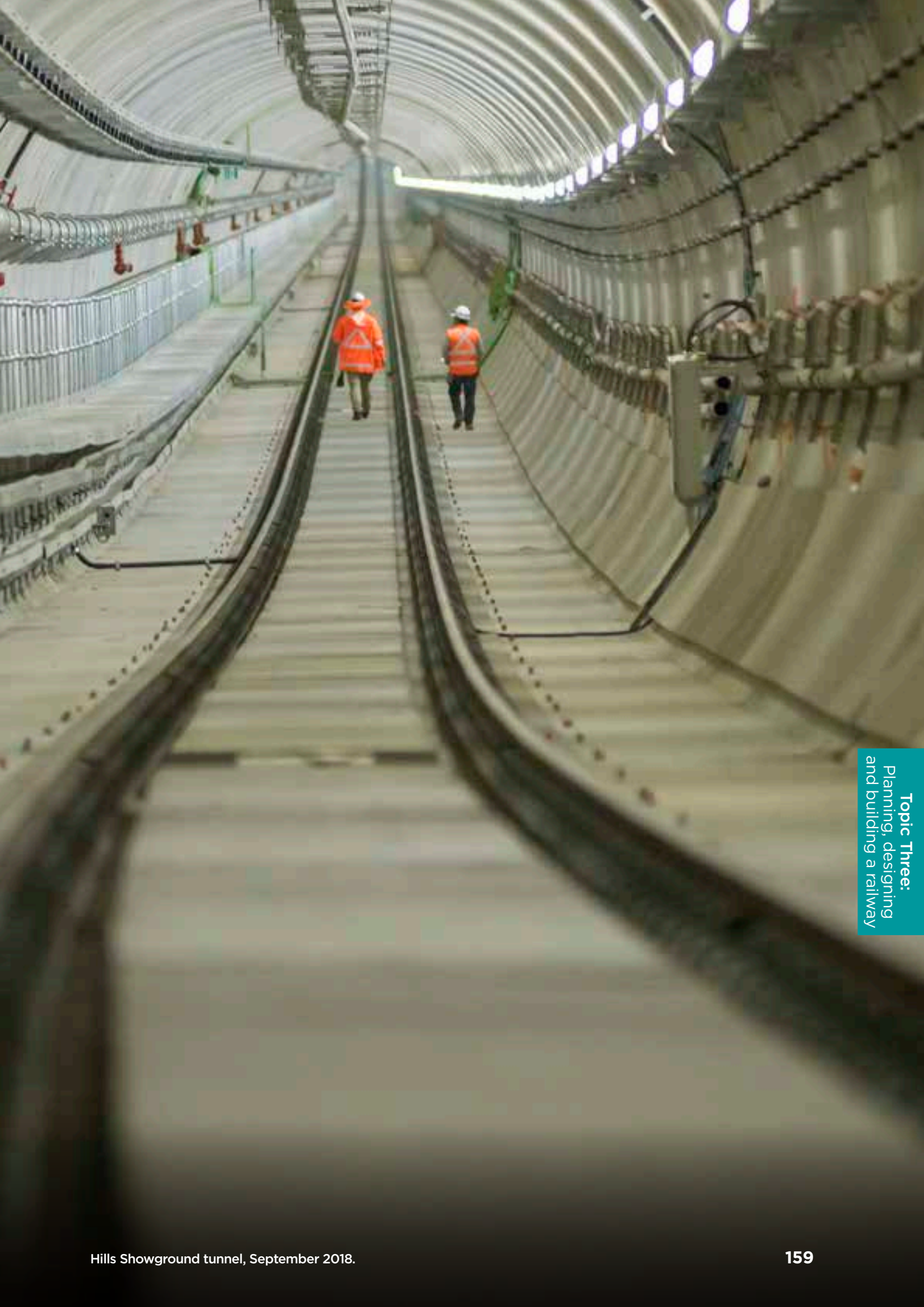


Figure 5: A journey from Blacktown to Central is comparable to a journey from the North West region to the city.
Source: Transport for NSW Tripgo carbon calculator.

https://transportnsw.info/apps/tripgo



Hills Showground tunnel, September 2018.

Rail expansion and contraction

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Science	**Rail expansion and contraction** How do engineers allow for expansion and contraction of railway tracks?	**Stage 4** 1–2 lessons

Teacher briefing

Students learn about why steel expands or contracts when it rises or falls in temperature and design an experiment to observe this expansion and contraction. This experiment is placed in the context of the 15 kilometre of track inside Sydney Metro Northwest tunnels where the temperature is controlled, and the remainder of the track exposed to more extreme Sydney temperature changes.

Requirements for these lessons

Students plan a laboratory experiment. Teachers must be satisfied that their investigation can be performed safely.

Key terms and vocabulary

Temperature range, temperature fluctuations, expansion, contraction, continuously welded track, slab track and fasteners, the effect of adding or removing heat on different states of matter.

Background information

- Most of the existing Sydney rail network runs on surface tracks. These tracks are exposed to the full range of climatic elements. The temperature range in Greater Sydney can be significant. Air temperature can vary over the year from -3 degrees Centigrade to up around 46 degrees Centigrade
- The railway tracks exposed to these temperature fluctuations are made of steel and will undergo expansion and contraction. Allowances must be made to cater for this expansion and contraction
- These allowances are made during the construction of the railway tracks
- Steel used in railway tracks either expands or contracts as a coefficient temperature change
- For steel, the coefficient of thermal expansion is 13×10^{-6} per degree Centigrade. That amount is really small. A metre of steel railway track only expands/contracts 0.013 mm for every degree of temperature change
- Over 100 metres of track, however, this represents 1.3 mm expansion or contraction for every degree Centigrade of temperature change

- When train wheels contact joints in railway track, this produces noise. To enable smoother running, the tracks on Sydney Metro Northwest will be continuously welded. This means they do not have many expansion/contraction joints
- Sydney Metro Northwest will connect the North West region to the Greater Sydney rail network through 15 km twin tunnels and the existing 13 km Epping to Chatswood Rail Link
- Inside the tunnels, the temperature range will be naturally below that experienced by tracks exposed to the elements. The temperature in the tunnels can also be more reliably predicted than surface track sections exposed to the elements
- The amount of expansion and contraction of the steel rail track can be easily calculated if the temperature range is known
- Modern welded track design usually means the steel track is heated to the midrange temperature point that it will be exposed to. It is then laid in around 100 m lengths on slab track in the floor of the tunnel.

Web links

An imaginative demonstration of the expansion and contraction of a steel bar

https://www.youtube.com/watch?v=kDktat01G_E

A photograph of extreme rail expansion in a Melbourne heat wave illustrates expansion to the class in a dramatic manner

http://www.telegraph.co.uk/news/picturegalleries/worldnews/4360255/Heatwave-in-Melbourne-plays-havoc-with-the-Australian-Open.html

Syllabus links

Science 7–10

SC4-16CW describes the observed properties and behaviour of matter, using scientific models and theories about the motion and arrangement of particles.

(CW1) The properties of the different states of matter can be explained in terms of the motion and arrangement of particles.

Students:

- (b) relate an increase or decrease in the amount of heat energy possessed by particles to changes in particle movement
- (c) use a simple particle model to predict the effect of adding or removing heat on different states of matter.

Learning experiences

Activity 1

Discuss the information about the tunnel and rail track in Background information (page 160–161) with students and ask them to answer the following questions:

- Describe why steel expands or contracts when it rises or falls in temperature. In your answer make sure you refer to the behaviour of the particles that make up steel
- The length of new track in the tunnels of Sydney Metro Northwest west of Epping is 15 km. If the temperature in the tunnels changed by 2.5 degrees Centigrade, how much would the length of track expand if left to do so?
- Modern welded track design usually means the track is heated to the midrange temperature point the steel could be expected to be exposed to 100 m lengths of track are then laid on concrete slab track and held in place to the floor of the tunnel by rail fasteners. Identify the advantages of this technique as a means of minimising the effect of expansion or contraction
- Assume the lengths of track not in a tunnel are exposed to the full range of temperatures typical for the North West region of Sydney. What is the maximum difference in length a 1000 m length of steel railway track could experience due to expansion and contraction assuming a minimum temperature of 2.5 degrees Centigrade and a maximum temperature of 45.5 degrees Centigrade?

Activity 2

Students design their own experiment that will enable them to observe expansion and contraction of steel in their school laboratory. Hint: A retort stand bar makes a good model for a steel railway track.

View the Youtube clip below to see an imaginative way of demonstrating the expansion and contraction of a steel bar.

https://www.youtube.com/watch?v=kDktat01G_E

The metal bar in the video expands when heated by a bunsen burner and contracts when tap water is poured on it. The rotation of the white straw amplifies the expansion of the metal bar. (Published 25 October 2012.)

Important: Ensure that students describe their planned experiment to you in some detail first. You must be satisfied that their investigation can be performed safely.

The final track laid on Sydney Metro, April 2018.

Calculating and graphing vehicle speeds

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Science	Calculating and graphing vehicle speeds How fast is my train?	Stage 4
Mathematics		1–2 lessons

Teacher briefing

Extracting information from diagrams, flowcharts, tables and graphs is an important skill. In this lesson sequence, students investigate a graph of train speeds, visually showing the journey along Sydney Metro Northwest where maximum train speeds reach up to 100 km/h within the tunnel section and up to 110 km/h on the surface track section. All major transport infrastructure projects analyse the speed vehicles will achieve throughout their journey. The following activities provide students with an opportunity to model the analytic skills of transport engineers.

Requirements for these lessons

A copy of the chart from Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 10 Noise and Vibration, page 5.

Web links

Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 10 – Noise and Vibration

https://www.sydneymetro.info/sites/default/files/document-library/05_NWRL%20EIS%20Stage%202_%20Chapters%2010%20to%2013.pdf

Syllabus links

Science 7–10

SC4-7WS processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions.

(WS7.1) students process data and information by:

(a) summarising data from students' own investigations and secondary sources

(b) extracting information from diagrams, flowcharts, tables, databases, other texts, multimedia resources and graphs including histograms and column, sector and line graphs.

Mathematics K–10

(MA4-19SP) collects, represents and interprets single sets of data, using appropriate statistical displays.

Learning experiences

Step 1 – Class discussion

Examine the graph shown below with students. The journey of trains on Sydney Metro Northwest is described graphically. The maximum train speeds are up to 100 km/h within the tunnel section and up to 110 km/h on the surface track section.

Note: In the case of roads or other linear infrastructure, the term 'chainage' is used for distance. It is derived from Gunter's chain, a very old measuring device used for land surveying. 1 chain is equal to 66 feet or 100 links. Today, distance is measured in metres and kilometres.

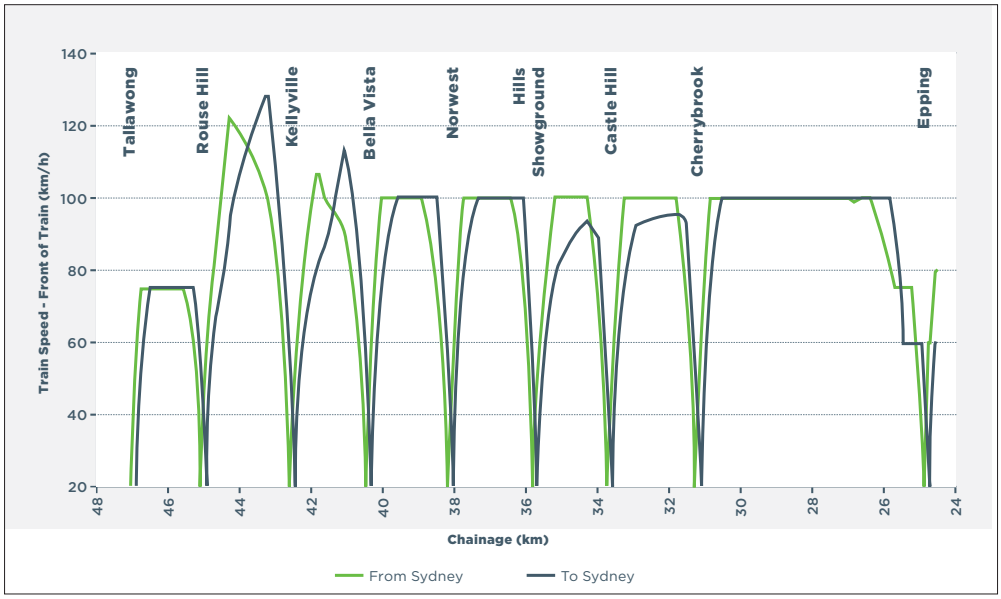


Figure 6: Chart from Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 10 Noise and Vibration.

Step 2 – Questions for analysis and discussion

- Read the key for the graph. Why is there a green and a blue line for this journey?
- What is the train speed at each station?
- Why do you think the journey between stations such as Rouse Hill and Kellyville, and Kellyville and Bella Vista, appear to mirror each other?
- Between which stations do you think there will be extensive use of tunnels? Give reasons for your answer
- How can you use the graph to estimate the acceleration of the train?
- Where on the journey do you think the train will be most easily (or clearly) heard aside from at stations? Give reasons for your answer.

Teacher references and extension work

Instructions for students

Download or copy a timetable from an existing rail service. If you travel by train choose a journey you make regularly.

Use the timetable to determine the time between stations, then use a computer application such as Google Earth or Google Maps to estimate the distance between stations.

Now construct your own graph modelled on the one above. You may need to estimate changes in velocity over parts of the journey.

A link to lessons on noise and sound

This lesson may be integrated into a sequence that includes the lesson in Topic One on measuring sound levels (page 44).

Trains travelling on Sydney Metro Northwest will provide passengers with a faster way to travel to the city and return home. Estimating the speed of the train is important because there is a direct connection between the speed of the train and the noise it creates. The extensive use of tunnels in Sydney Metro Northwest is also important because it means noise is effectively reduced.

Download links

Download an App for a Smart phone such as 'runtastic roadbike' or 'map my ride'. These free Apps allow an actual journey to be recorded and the map showing the journey can be downloaded.

Runtastic roadbike

https://www.runtastic.com/en/apps/roadbike

Map my ride

https://www.mapmyride.com

These Apps may graph the journey and provide data such as average speed, maximum speed, distance travelled and elevation changes over the journey. Individual journeys can be saved.

Using an App such as this can provide large amounts of data for analysis. If you travel by train for some of your weekend activities, these Apps can provide you with interesting insights into your journey.

Kellyville station pedestrian bridge lift, November 2018.

Persuasive writing: Making a railway poster

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
English	**Persuasive writing: Making a railway poster** What is a good railway poster message that will attract the attention of passers by?	**Stage 4** 1–2 lessons

Teacher briefing

Students will be familiar with the informational posters that share wall space with other advertising on railway stations. Students choose an aspect of the new Sydney Metro Northwest under construction and create their own poster informing people about the features of the new railway, progress with construction, transport safety, or the environmental advantages of using public transport.

This is a suitable activity for all levels of English, using iPad or computer Apps to quickly blend a photograph and text message, and discuss the use of persuasive language.

Requirements for these lessons

- Computers, iPads or laptops
- Appropriate design software. On iPads, Phoster is a recommended poster-creating App
- Alternatively, MS Word or PowerPoint can be used
- A4 paper, photocopies of photographs, glue and marker pens can be used
- Printer optional.

Assessment

Assess the skills and strategies used in creating persuasive language and images for posters, and the manner in which students respond to the texts created by the class.

Web links

Examples of historic NSW Railway posters
https://gallery.records.nsw.gov.au/index.php/galleries/travel/

Coping with competition: a short history of NSW Railways
https://www.records.nsw.gov.au/activity/155

Syllabus links

English K–10

(EN4–2A) effectively uses a widening range of processes, skills, strategies and knowledge for responding to and composing texts in different media and technologies.

Learning experiences

Step 1 – What is a poster?

Initiate class discussion by showing images of posters on the interactive whiteboard.

Focus questions:

- What is a poster?
- What is the purpose of a poster?
- What could be the purpose of a railway poster?

What is a poster? Ideas to discuss with students

A poster is a public sheet of paper conveying information through text (words) and/or graphic images (symbols or pictures). Its main target audience is the person walking by. A poster must convey its message with immediacy and purpose, because people on the street are often in a hurry.

A successful poster conveys a clear message with high-impact visual information and a minimum of text.

They may ask people to rally or celebrate, alert people to hazards, take precautions, be on the lookout, buy a ticket or attend an event. They must grab your attention, entice you to read them and present the information clearly so that you are persuaded by the poster's message.

Why a railway poster?

There is a long history to railway posters around the world. Effective posters convey their message with immediacy. Railway posters have many purposes: passenger safety; information about changes in service; new features and services; important information about the line; and marketing of destinations.

Discuss the following passage with students:

The New South Wales Department of Railways and Tramways Annual Report, 30 June 1930.

"Attention has been drawn by the Commissioners in their Annual Reports for some years past to the effects of motor competition on the earning powers of this State's railway system. The use of private cars for excursions, for long distance travel, and even for daily suburban travel, has greatly increased during the last five or six years ... so that today the private car is the railway's most serious competitor for passenger travel."

[To meet this challenge an extensive publicity campaign was undertaken which involved newspaper, magazine and radio advertisements supported by booklets and coloured folders.]

"A pictorial poster campaign, previously confined to single sheet displays, was continued with posters of larger sizes up to 24 sheet posters – 20 ft by 10 ft – with the slogan 'Go by Train'. The Departmental posters made a striking display on hoardings alongside the best commercial advertising on railway premises."

Notes on the passage above:

- A hoarding was another name for a billboard
- Posters were pasted on billboards in sheets
- In the 1930s, an advertising 'one-sheet' or 'single sheet' poster was typically 27 inches by 41 inches (68.6 cm by 104 cm)
- Multiple 'one-sheets' were used to assemble larger advertisements, which are referred to by their sheet count, including 24-sheet billboards, 20ft by 10 ft = 609 cm by 300 cm.

For further information about NSW Railways coping with competition, see a short history of NSW Railways on the State Records NSW site:

https://www.records.nsw.gov.au/activity/155

Step 2 – Class activity

Display examples of historic NSW Railway posters, either on the interactive whiteboard (see web links), or as print-outs.

Explore other railway posters online. Search Google for 'railway posters', for many examples to analyse and discuss.

https://www.google.com.au/search?q=railway+posters

Use these questions to review each poster:

- What is the poster asking or telling the audience or observer?
- Is the poster's message clear?
- Is the poster's message readable at a glance?
- Are the graphics and text well matched?
- Is it striking or attention-grabbing? Will people remember the poster message?
- Is it persuasive?

Ask students to look at the posters and signs around their local bus stops and when they visit Sydney Trains railway stations.

Step 3 – Design a poster

Ensure that students have access to various images and appropriate design software, or alternatively, photocopies of images, blank sheets of paper, glue and marker pens. Use the following pointers to begin designing a poster:

- Decide what you want people to know
- Select a message
- Design a slogan around your message.

When completed, students' work can be viewed for discussion as a slideshow on the interactive whiteboard, or printed.

Here are some examples of the types of messages students may want to convey:

Did you know?

- Sydney Metro Northwest – You can go to the airport from Castle Hill by train
- There will be a train every four minutes! You won't need a timetable
- Park and Ride: Turn Up and Go
- It will take you less than an hour to go from Rouse Hill to Wynyard.

Why don't you?

- Use the train to go to the beach – you can take your surfboard with you
- Read a book on your way to work or school: reduce your stress – don't drive.

Rail safety messages

- Warning: Trains move rapidly in and out of stations
- Stand behind the Yellow Line on the platform until the train has stopped.

Progress with construction

What will happen here? Similar to 'Did you know?', but letting people know about a construction activity at that location.

- Tunnelling is beginning here in 2014
- Your new railway station is going to be right under your feet.

Changes are coming

- Read on the train, don't drive to work
- Sleep in this morning: Catch the train to get to the city in under an hour.

Teacher references

These albums of posters and brochures are part of NSW State Records, NRS 16410 – Albums of Travel and Advertising Brochures, 1938–1957.

https://www.records.nsw.gov.au/series/16410

They promote the services provided by the New South Wales Railways such as helping you move house by railway, delivering parcels, refreshment rooms, sleeping berths and the all round benefits of using the NSW train services.

Figure 7: Let the railways solve all your transport trouble. Digital ID: 16410_a111_54a_000017_p1. State Records NSW.

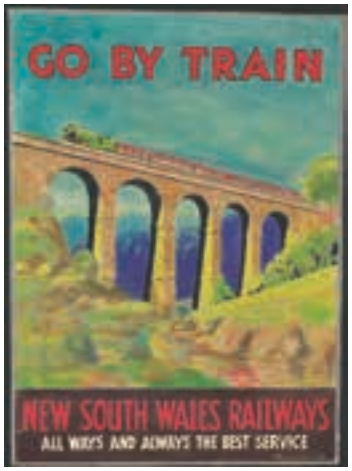


Figure 8: All Ways and Always the Best Service. Digital ID: 16410_a111_54a_000022a. State Records NSW.

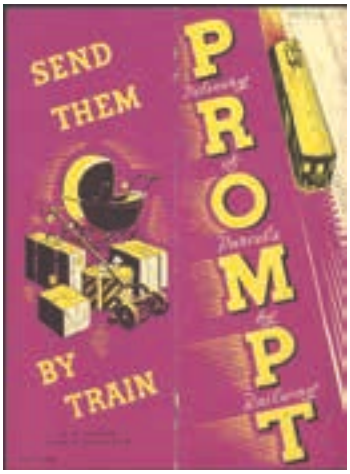
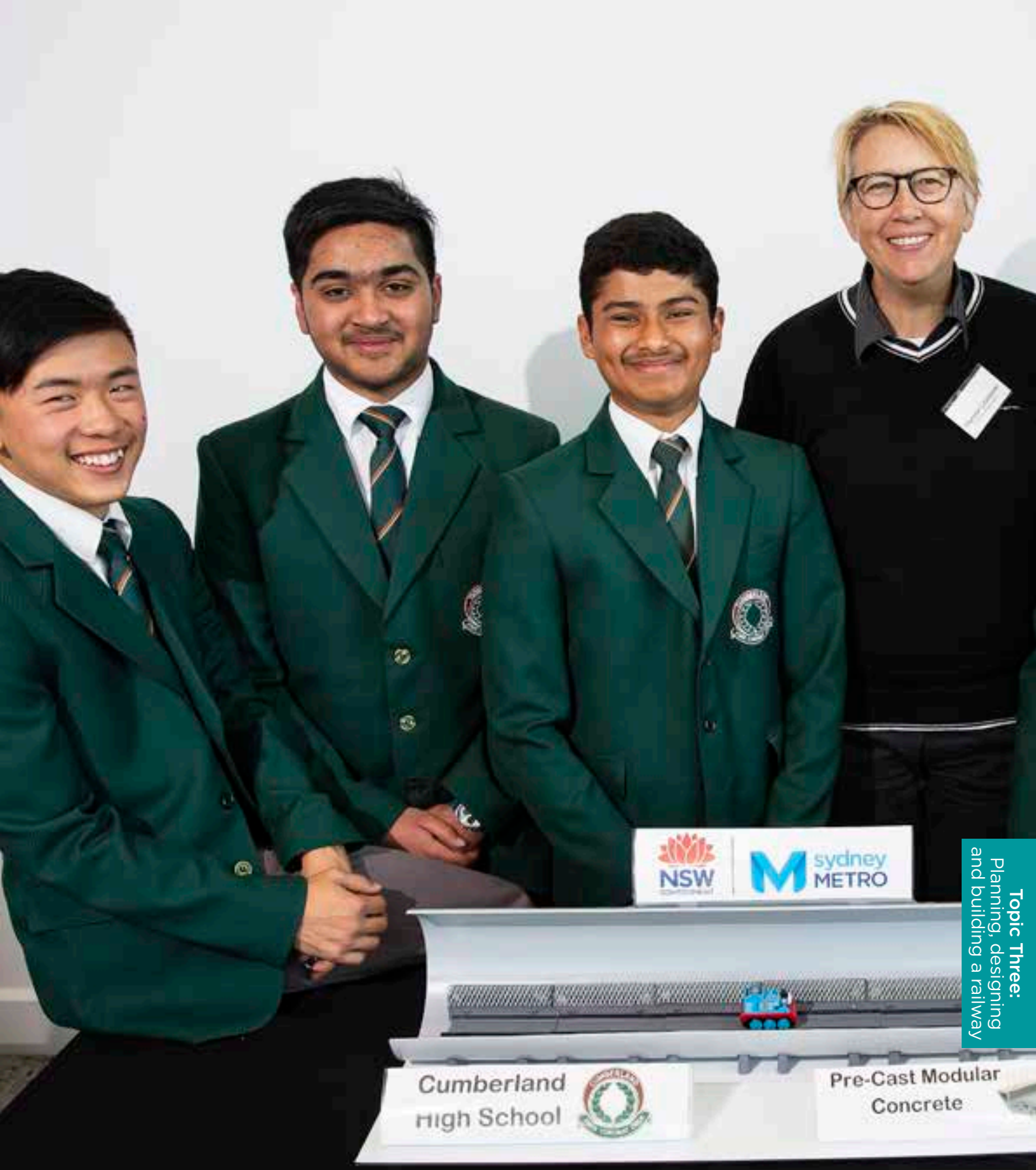


Figure 9: Prompt delivery of parcels by railway. Digital ID: 16410_a111_54a_000019_p1. State Records NSW.



Sydney Metro Minds STEAM challenge final held at the Sydney ICC, August 2018.

How to plan community development: Doing a population survey

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**How to plan community development: Doing a population survey** What is the average age and population structure of The Hills Shire community?	**Stage 5** 2–3 lessons

Teacher briefing

Population change in the North West region is rapid and is forecast to increase further. That growth is expected to include many more families with children. This predicted population growth is one of the main reasons for the development of Sydney Metro Northwest. The railway will also influence the nature of that growth. In this sequence of lessons students learn more about their local population and how it is changing. Students learn how to gather data by conducting a small survey and building a population pyramid.

Requirement for the lesson

- Computer with internet access
- Activity sheet 1.

Assessment

Students are assessed on their capacity to collect, record, present and interpret geographical data.

Key terms and vocabulary

Population pyramid, survey, questionnaire, age and sex distribution.

Web links

Public Health Information Unit Population Pyramid Generator.

An online tool for creating population pyramids
http://phidu.torrens.edu.au/tools/population-pyramid-generator

Australian Bureau of Statistics interactive Population Pyramid of Australia
https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Population%20Pyramid%20-%20Australia/

Nation Master – Population Pyramids for Australia
http://www.nationmaster.com/country/as-australia/Age_distribution

Collecting Survey Data – Australian Privacy Principles
https://www.oaic.gov.au/privacy-law/

Syllabus links

Geography K–10

Geography Stage 5 – Changing places

– the management and planning of Australia's urban future.

Environmental change and management

– the causes, extent and consequences of the environmental change (urban environments).

(GE5–1) explains the diverse features and characteristics of a range of places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry.

Learning experiences

Step 1 – Class discussion

Population pyramids are an important geographic tool in the study of development and change. They are the most effective way to graphically depict the age and gender distribution of a population.

The teacher leads discussion on population pyramids and uses information provided in web links to demonstrate their uses and how to interpret them.

Step 2 – Options

There are several options for conducting this lesson sequence:

- Students create a local population survey in their own time and survey residents living near the school in a double period
- The teacher hands out pre-prepared survey, (Activity sheet 1, page 178–179) and the surveys are conducted in class time. The data is then recorded in the next lesson and students create the population pyramid
- The teacher distributes the survey forms to students and asks them to collect the data with a friend on weekends or after school.

Step 3 – Write a survey

Students may need assistance with constructing a survey. Discuss items in Activity sheet 1 (page 178–179).

Privacy and data collection via surveys should be discussed. All researchers must be aware of what they can and cannot do with collected information. For more on Australian Privacy Principles:

https://www.oaic.gov.au/privacy-law/privacy-archive/privacy-resources-archive/privacy-fact-sheet-2-national-privacy-principles

Step 4 – Create a population pyramid

Devise a quick way of collating and recording survey findings in class, such as a show of hands, as the teacher reads out the different age groups and gender.

Explore changes in population. Compare students' population pyramids to other examples from the local area or state or national locations. These can found on the Australian Bureau of Statistics website (see web links).

Step 5 – Class discussion

Use questions such as these to lead the discussion:

- What is the shape of your pyramid?
- Does it match the Australian population as a whole?
- Does it match the official population pyramid of your local area?
- Is population growth the main driver of change? What other factors are there?
- What has happened in the North West region?
- How has the population changed?
- How might population change suggest the need for a rail line in the North West region?

Teacher references

How to make population pyramids with your data, a pen and a ruler:

- Write the total number of people in each age group separated by gender (total for your class)
- Fill your total information into a table like Figure 10
- Get a blank population template and mark the vertical and horizontal axes
- Create a bar graph for each gender and each age group like Figure 11.

Age	Male	Female
0–7 years		
8–13 years		
14–19 years		
20–25 years		
26–30 years		
31–35 years		
36–40 years		
41–45 years		
46–50 years		
51–55 years		
56–60 years		
61–65 years		
66–70 years		
71–75 years		
76–80 years		
81–85 years		
86 years plus		

Figure 10: Sample population pyramid table.

How to make population pyramids in Excel:

http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/2A20C4E754A463D6CA2579AB000E8CBD#Anchor5

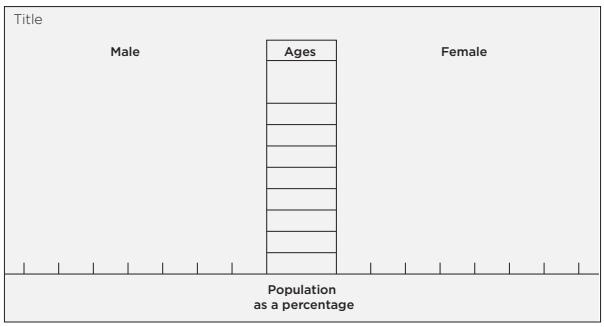


Figure 11: Typical population pyramid.

Activity sheet 1

Survey for _____ Geography class

Introduce yourself and why you are there: Hi, my name is _____ and this is _____. We are here from the local _____ High School and we are trying to discover the average age and population structure of The Hills community. Would it be OK for us to ask you some questions?

(Show them the questions and let them fill the sheet out themselves if they prefer).

Question 1: In this household, how many people are of the following age groups? Circle the appropriate ranges below and write how many people in the household fit in that age range.

Age	Male	Female
0–7 years		
8–13 years		
14–19 years		
20–25 years		
26–30 years		
31–35 years		
36–40 years		
41–45 years		
46–50 years		
51–55 years		
56–60 years		
61–65 years		
66–70 years		
71–75 years		
76–80 years		
81–85 years		
86 years plus		

This information will be used in class to create a population pyramid for The Hills area. Please answer these questions but you do not have to answer any if you don't want to.

Question 2: How long have you lived in The Hills area?

_____

_____

_____

_____

_____

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

Question 3: Does anyone in this house work or study in the following locations? More than one can be ticked.

Sydney Central Business District	
North Sydney	
Parramatta	
Norwest Business Park	
Macquarie Park	
Chatswood	
Epping	
Other	

Question 4: What effect do you think the population growth of the North West region will have on Sydney Metro Northwest?

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Northwest

How to plan community development: Meeting the needs of a growing population

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**How to plan community development: Meeting the needs of a growing population** How is the community changing? How might Sydney Metro Northwest help solve the needs of a growing population?	**Stage 5** 3–5 lessons

Teacher briefing

Students investigate changes occurring in the North West and South West Sydney Growth Centres. They understand why Sydney Metro Northwest is important to meet the needs of a growing population.

This lesson follows the previous lesson on building population pyramids and selecting and applying appropriate geographical tools to aid in the understanding of population change.

Most students should finish this task in one 50 minute lesson, depending on their familiarity with internet search techniques and their efficiency at following instructions.

Requirements for these lessons

- Activity sheet 1
- Computer with internet access.

Assessment

The answers to the questions in Activity sheet 1 are included (pages 190–192). The teacher may choose to mark students' worksheets or alternatively students can mark their own responses using the answers provided.

Key terms and vocabulary

Growth Centre, precinct planning, infrastructure planning, Local Government Areas (LGA), Business Districts, suburbanisation.

Web links

NSW Department of Planning and Environment

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts

Metropolitan Plan for Sydney 2036 PDF (17.3MB)

http://pandora.nla.gov.au/pan/124897/20110202-1450/1_METRO2036_1_INTRO.pdf

Syllabus links

Geography K–10

Geography Stage 5 – Changing places

– the management and planning of Australia's urban future.

Environmental change and management

– the causes, extent and consequences of the environmental change (urban environments)

– management of the environmental change.

(GE5–2) explains the processes and influences that form and transform places and environments

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

(GE5–8) communicates geographical information to a range of audiences using a variety of strategies.

Learning experiences

Students work individually or in pairs on computers. The teacher can email Activity sheet 1 (page 183–189) to students or print and distribute it.

Teacher references and extension work

Students can go beyond this example and explore other precincts in the North West Growth Centre.

https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Urban-Renewal-Corridor

There are a number of steps involved in developing farmland or vacant land for housing. Students can extend their study of suburbanisation by investigating this process.

Study questions

1. What is a Greenfield development site?
2. Describe the geographical processes causing the development of the Greenfield site.
3. Which level of government is responsible for the release of the land?
4. Which level of government is responsible for overseeing the development of new suburbs?

Quick answers to the above questions

1. A site on a previously non-developed area that is now being worked on.
2. The State Government releases the land for inclusion in the metropolitan development program. Before being rezoned by the local council the area is then serviced with water, power and phones. Construction can be approved and land is sub divided and put up for sale.
3. State Government.
4. Local Council in consultation with the State Government.

Activity sheet 1

CONFIDENTIAL: For Year 10's eyes only

You have been given the position as chief planner of The Hills Shire Council. You need to investigate where to plan the new suburbs in the future to accommodate the growing population and enable as many new residents as possible to have easy access to the new Sydney Metro Northwest.

Go to **https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts**

View the video for the North West Growth area at **https://www.youtube.com/watch?v=xTUbrL2NLNY**

Read the information, explore the site and complete this task.

Passage 1

The growth areas are located in Sydney's _____ and _____. In the North West region this will provide _____ new homes to _____ people by the year _____. There will be _____ new precincts built.

Passage 2

The NSW Government established the North West region and South West Region Growth Centres in 2005 as part of the _____ Strategy to streamline the supply of _____ land to help contain Sydney's _____ footprint and to coordinate the delivery of infrastructure through the Department of Planning and _____.
The Growth Centres were established to sustainably prepare for and manage Sydney's growth over the next _____ years. With the Metropolitan Plan for Sydney 2036 identifying a need for 770,000 new homes in Sydney _____ and 2036 – and with up to 230,000 of these in new release areas – the government aims to supply land linked to key infrastructure, supported by essential services such as _____, medical centres , _____ and public transport. This aim is achieved through an approach called Precinct Planning which coordinates _____ and delivery of _____, wastewater, recycled water, _____, roads, transport and other services in time to service new communities.
Precinct Planning works alongside _____ and local infrastructure planning to increase the supply of land for housing and ensure jobs are closer to home. It works from a 'whole of government' perspective, ensuring _____ provision can be incorporated into wider state agency _____ and _____ so that elements like new roads, public transport, parks, water, sewer and community services are in place to meet the needs of new _____.

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

continued

The planning for the Growth Centres is subject to the following NSW laws:

Environmental Planning and Assessment Act 1979

http://www.austlii.edu.au/au/legis/nsw/consol_act/epaaa1979389

Why do you think these laws have to be followed? Their titles may provide a clue.

Go to the website **https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts** and select 'THE GROWTH CENTRES' tab on the left.
In the space below, highlight where the Growth Centres are in the Sydney Region.
Also highlight the other seven main Business Districts.

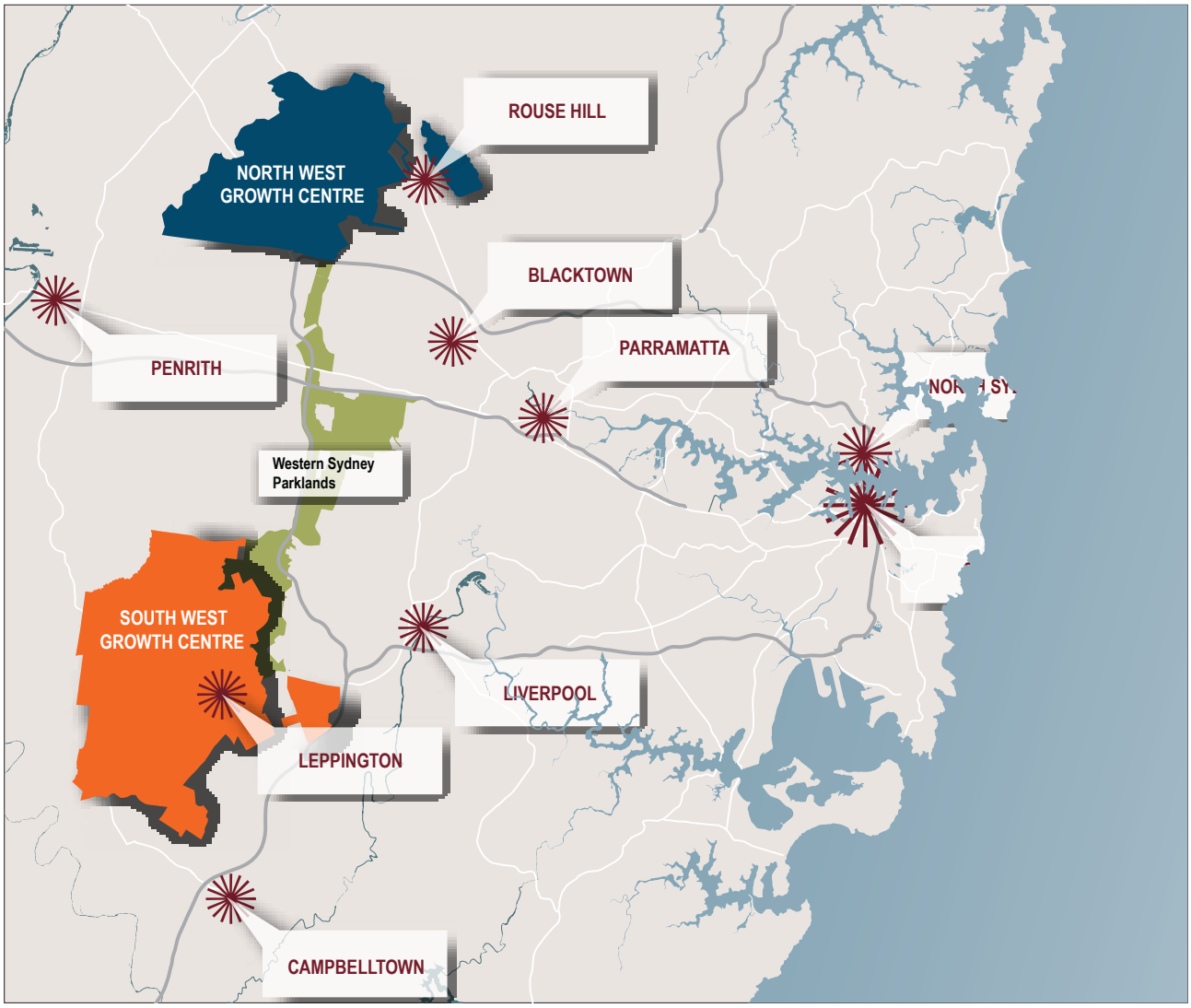

Figure 12: The North West region and South West region Growth Centres in the context of the Sydney region.
Source: NSW Department of Planning and Environment.

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

continued

Passage 3

The North West Growth Centre is approximately 10,200 _____ – the size of Wellington, New Zealand. Within the Local Government Areas boundaries of The Hills, Blacktown and _____, it will be supported by a Major Centre at _____ and will contain about 90,000 _____ dwellings over the next 30–40 years. It is made up of 16 'Precincts', which are areas that will be progressively released over the next 30 years.

The South West Growth Centre is within the LGA boundaries of _____, Camden and Campbelltown and will be around the same size as Canberra. Comprising 18 _____, it is approximately 17,000 hectares and will _____ on the _____ centre of Leppington, be serviced by the South West Rail Link and has capacity for around 110,000 new dwellings.

Now click on the 'scroll down to view priority growth areas and precincts' and go to the links below to find out more about the Precincts released for development so far:

North Kellyville
https://www.planning.nsw.gov.au/northkellyville

Alex Avenue
https://www.planning.nsw.gov.au/alexave

Riverstone
https://www.planning.nsw.gov.au/riverstone

Riverstone West
https://www.planning.nsw.gov.au/riverstonewest

Colebee
https://www.planning.nsw.gov.au/colebee

Marsden Park Industrial
https://www.planning.nsw.gov.au/marsdenparkindustrial

Box Hill
https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/North-West-Growth-Area/Box-Hill-and-Box-Hill-Industrial

Schofields
https://www.planning.nsw.gov.au/schofields

Marsden Park
https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/North-West-Growth-Area/Marsden-Park

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

continued

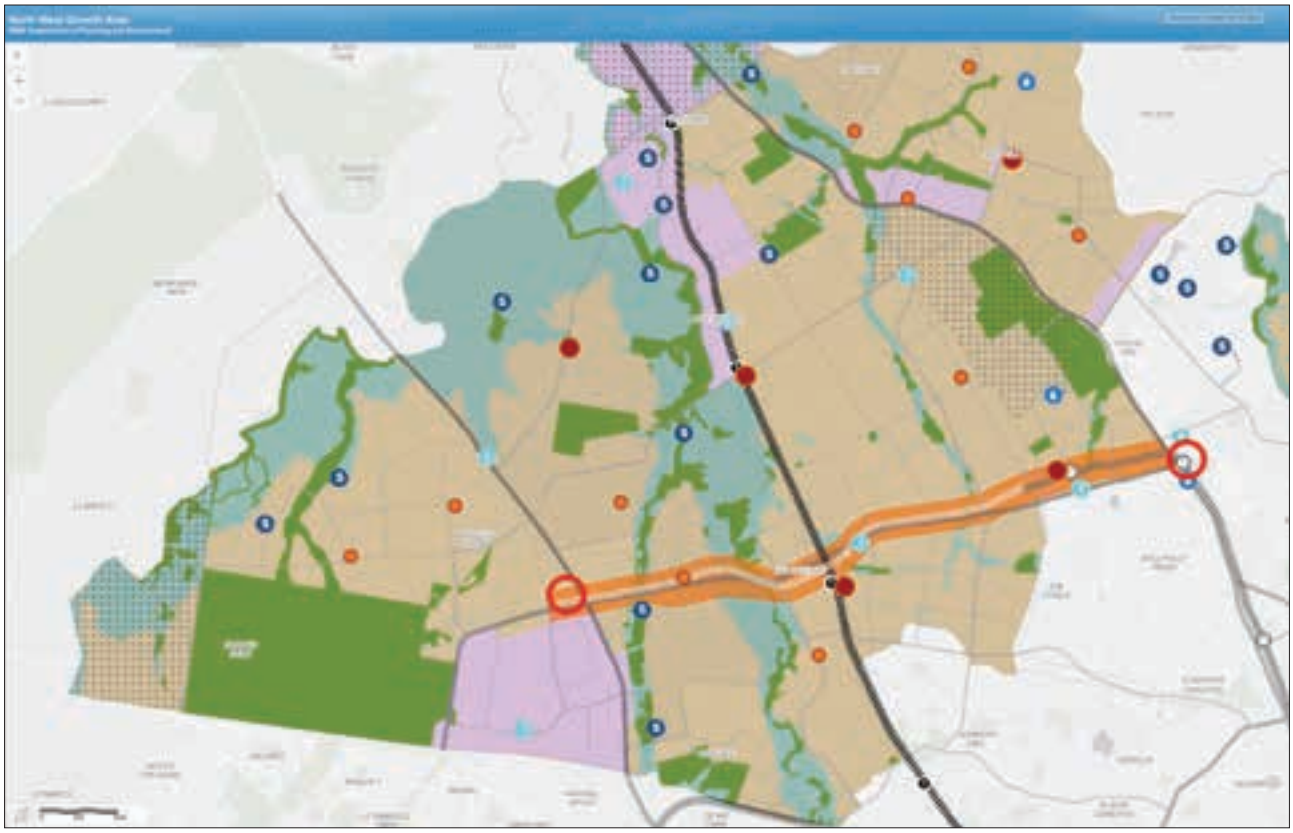

Figure 13: 3 August 2017: The North West Growth Area Land Use Plan has been updated to reflect a revised transport corridor alignment provided by Transport for New South Wales (TfNSW).The update confirms the alignment of the transit corridor north of Schofields Road in the West Schofields precinct.

Click on the North Kellyville Precinct

North Kellyville was rezoned in December _____. (This means previously it was zoned for large five acre properties, but now owners can divide their land into small blocks for large scale residential housing). It was one of the _____ release Precincts in the Growth Centres and the first in the North West Growth Centre to be placed on exhibition via the Precinct _____ process.

The North Kellyville Precinct is approximately 707 _____ and is bounded by Smalls Creek to the west, Cattai Creek along the east and north, and Samantha Riley Drive to the south. The Precinct will accommodate a _____ of 4500 dwellings. North Kellyville benefits from being _____ to existing residential areas and the new Rouse Hill Town Centre.

Click on the Riverstone Precinct

The Riverstone Precinct was rezoned for _____ in May 2010. The _____-hectare Precinct will deliver capacity for more than 9000 new dwellings to accommodate almost 27,000 residents.

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

continued

It will also feature:

- 58 hectares of open space
- 57 hectares of conservation reserves
- 14 hectares of _____ land
- Three new primary schools and a new K–12 school
- Rail duplication
- A new railway station at _____ with a commuter car park
- Neighbourhood centres at Vineyard and Schofields
- A new community services hub at Riverstone
- Upgrades to major roads
- Walking and cycle paths along major roads and open space corridors.

Click on the final Riverstone Indicative Layout Plan from the NSW Government Department of Planning and Infrastructure:

https://www.planning.nsw.gov.au/-/media/Files/DPE/Maps/map-riverstone-precinct-indicative-layout-plan.pdf

Answer the following questions

1. What colour are schools zones? _____

2. How many new primary schools and high schools will be built in this new urban development?_____. Do you think this will be enough? Why? [There will be 27,000 new residents and about 30 per cent will be school age children]

_____

_____

_____

_____

_____

3. What is the difference between medium and low density residential?

_____

4. Why is medium density located near the blue neighbourhood shopping centres?

_____

5. Why can't any homes be planned for the yellow zones? Explain.

_____

6. What is the road at the top of the map of?

_____

NSW GOVERNMENT | sydney METRO

Northwest

Activity sheet 1

continued

Go to **www.transportnsw.info**

Use the trip planner to determine the approximate times it currently takes to get from Cudgegong Rd and Schofields Rd, Rouse Hill to:

- Macquarie University _____minutes
- Chatswood _____ minutes
- Wynyard station _____minutes.

What types of transport would you currently use for these trips?

_____

_____

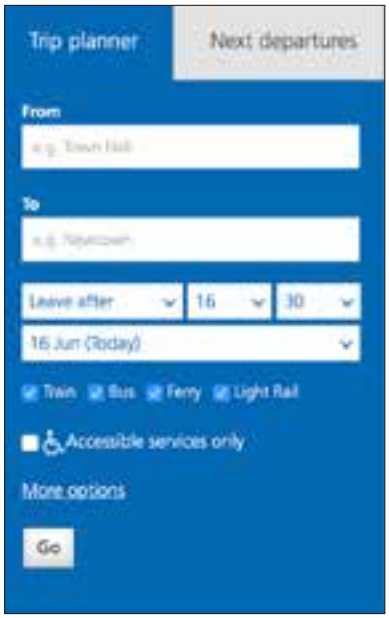

Figure 14: Plan your trip.
Source: transportnsw.info homepage.

The Riverstone and Schofields Precincts are located less than 1 kilometre from the new Tallawong Sydney Metro Northwest Station. This will give residents in this area a new travel option to the city, Chatswood and Macquarie University.

Using the Sydney Metro Northwest trip calculator located at **https://www.sydneymetro.info/** repeat the exercise above.

Travel from Rouse Hill to:

- Macquarie University _____ minutes
- Chatswood _____ minutes
- Wynyard station _____ minutes.

NSW GOVERNMENT | sydney METRO Northwest

Activity sheet 1

continued

Based on your findings, how will Sydney Metro Northwest change travel in the North West region of Sydney?

Explain how this might influence your decision to live in North West region in the future.

Go to Google Maps

https://maps.google.com/maps

Type in 'Riverstone NSW'. Zoom in and describe the satellite image of the Riverstone area now. Compare it to the future for Riverstone on the Riverstone Indicative Layout Plan.

https://www.planning.nsw.gov.au/-/media/Files/DPE/Maps/map-riverstone-precinct-indicative-layout-plan.pdf

What are the most important differences?

NSW GOVERNMENT | sydney METRO

Northwest

Answers to Activity sheet 1

Passage 1

The two new growth areas are located in Sydney's **North West region** and **South West region**. In the North West region this will provide **33,000** new homes to **250,000** people by **2026**. There will be **16** new precincts built.

Passage 2

The NSW Government established the North West region and South West Region Growth Centres in 2005 as part of the **Metropolitan** Strategy to streamline the supply of **greenfield** land to help contain Sydney's **urban** footprint and to coordinate the delivery of infrastructure through the Department of Planning and **Environment**. The Growth Centres were established to sustainably prepare for and manage Sydney's growth over the next **25–30** years. With the Metropolitan Plan for Sydney 2036 identifying a need for 770,000 new homes in Sydney **between 2006** and 2036 – and with up to 230,000 of these in new release areas – the government aims to supply land linked to key infrastructure, supported by essential services such as **shops**, medical centres , **schools** and public transport. This aim is achieved through an approach called Precinct Planning which coordinates **planning** and delivery of **water**, wastewater, recycled water, **power**, roads, transport and other services in time to service new communities. Precinct Planning works alongside **regional** and local infrastructure planning to increase the supply of land for housing and ensure jobs are closer to home. It works from a 'whole of government' perspective, ensuring **infrastructure** provision can be incorporated into wider state agency **planning** and **budgets** so that elements like new roads, public transport, parks, water, sewer and community services are in place to meet the needs of new **residents**.

Passage 3

The North West Growth Centre is approximately 10,200 **hectares** – the size of Wellington, New Zealand. Within the Local Government Areas boundaries of The Hills, Blacktown and **Hawkesbury**, it will be supported by a Major Centre at **Rouse Hill** and will contain about 90,000 **new** dwellings over the next 30–40 years. It is made up of 16 'Precincts', which are areas that will be progressively released over the next 30 years.

The South West Growth Centre is within the LGA boundaries of **Liverpool**, Camden and Campbelltown and will be around the same size as Canberra. Comprising 18 **precincts**, it is approximately 17,000 hectares and will **focus** on the **major** centre of Leppington, be serviced by the South West Rail Link and has capacity for around 110,000 new dwellings.

North Kellyville

North Kellyville was rezoned in December **2008**. (This means previously it was zoned for large five acre properties, but now owners can divide their land into small blocks for large scale residential housing) It was one of the **first** release Precincts in the Growth Centres and the first in the North West Growth Centre to be placed on exhibition via the Precinct **Planning** process.

The North Kellyville Precinct is approximately 707 **hectares** and is bounded by Smalls Creek to the west, Cattai Creek along the east and north, and Samantha Riley Drive to the south. The Precinct will accommodate a **minimum** of 4500 dwellings. North Kellyville benefits from being **close** to existing residential areas and the new Rouse Hill Town Centre.

NSW GOVERNMENT | sydney METRO

Northwest

Answers to Activity sheet 1

Riverstone

The Riverstone Precinct was rezoned for **urban development** in May 2010. The **975**-hectare Precinct will deliver capacity for more than 9000 new dwellings to accommodate almost 27,000 residents.

It will also feature:

- 58 hectares of open space
- 57 hectares of conservation reserves
- 14 hectares of **employment** land
- Three new primary schools and a new K–12 school
- Rail duplication
- A new railway station at **Vineyard** with a commuter car park
- Neighbourhood centres at Vineyard and Schofields
- A new community services hub at Riverstone
- Upgrades to major roads
- Walking and cycle paths along major roads and open space corridors.

The Riverstone Indicative Layout Plan

Answer the following questions

1. What colour are schools zones? **Purple**.
2. How many new primary schools and high schools will be built in this new urban development? Do you think this will be enough? Why? [There will be 27,000 new residents and about 30 per cent will be school age children].

   Example: "There are four new schools in the area. I think there are enough for the amount of people coming in. This is because each school could take a lot of people and they are spread out evenly across the development."
3. What is the difference between medium and low density residential?

   Example: "The amount of residential people living in the area. Low density would have not many and medium would have more people in the same space living there."
4. Why is medium density located near the blue Neighbourhood shopping centres?

   Example: "Because more people would like to live near the main shopping centre and it would be a more popular place to live as it is just a quick walk from the shops."
5. Why can't any homes be planned for the yellow zones? Explain.

   Example: "Because these areas are controlling the drainage for the new development so they can't have houses situated on them."
6. What is the road at the top of the map? **Windsor Road**

NSW GOVERNMENT | sydney METRO

Northwest

Answers to Activity sheet 1

Go to www.transportnsw.info

Use the trip planner to determine the approximate times it currently takes to get from Cudgegong Rd and Schofields Rd, Rouse Hill to:

- Macquarie University **99** minutes
- Chatswood **113** minutes
- Wynyard station **91** minutes.

What types of transport would you currently use for these trips?

A combination of bus and train

The Riverstone and Schofields Precincts are located less than 1 km from the new Cudgegong Road Sydney Metro Northwest station. This will give residents in this area a new travel option to the city, Chatswood and Macquarie University.

Using Sydney Metro Northwest trip calculator located at **https://www.sydneymetro.info/** repeat the exercise above.

Travel from Rouse Hill to:

- Macquarie University **24** minutes
- Chatswood **35** minutes
- Wynyard station **55** minutes.

Based on your findings, how will Sydney Metro Northwest change travel in the North West region of Sydney?

NSW GOVERNMENT | sydney METRO Northwest

Hills Showground canopy lift, September 2018.

Calculating the volume of the tunnels

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Mathematics	**Calculating the volume of the tunnels** How much rock material has to be excavated to build the rail tunnels?	**Stage 5** 1–2 lessons

Teacher briefing

In seeking answers to interesting calculations, students begin to understand how engineers apply mathematical knowledge to solving 'real-world' problems. When discussing the Sydney Metro Northwest tunnels, for example, many people might ask the following questions. How much rock material has to be excavated to make the rail tunnels? How heavy is all that rock? Students will enjoy finding answers to these questions and sharing them with peers.

Assessment

The teacher may assess both the correct working of the problems and students' appreciation of the application of Mathematics to finding 'real-world' solutions.

Key terms and vocabulary

Cylinder, volume, density, mass.

Syllabus links

Mathematics K–10

(MA5.2–2WM) interprets mathematical or real-life situations, systematically applying appropriate strategies to solve problems.

Background information

To minimise environmental change, allow for multiple land use and provide direct travel between points, trains travelling along the Sydney Metro Northwest alignment will pass through tunnels between Epping and Bella Vista. Each will be 15 kilometres long and have an internal diameter of 6 metres.

Construction of the tunnels is a major operation because it involves the drilling and removal of large quantities of rock. The question many people ask is: How much rock material has to be removed to make these rail tunnels?

The rock through which the tunnels will pass is mostly quartz-rich sandstone, which has a low porosity. This means that there are few spaces between particles that make up the rock. An estimate of the density of the sandstone rock is 2.35 tonne per cubic metre (Tm^{-3}). Some parts of the tunnel will be composed of rock that is slightly more or less dense, but this density value is a reasonable average.

Figure 15: Hills Showground tunnel and Castle Hill crossover tunnel, May 2016.

Learning experiences

Calculating the volume of rock that has to be removed

The tunnels between Epping and Bella Vista are simply long cylinders lying on their side. The length of each cylinder (h) is 15,000 metres. The diameter of each tunnel cylinder is 6 metres. Their radius (r) is therefore 3 metres.

The formula for the volume of a cylinder is the length multiplied by the cross sectional area of the tunnel. The volume (V) is calculated using the formula:

$$V = \pi r^2 h$$

Determine the volume of rock that has to be removed to make the tunnels. Remember there are two tunnels. Show your working.

Answer: 438,252.2 m^3

Calculating the mass of rock to be excavated from the tunnel

The density of a substance is the mass of the particles making up a certain volume of the substance. The density of water is one tonne per cubic metre. The density of rock depends on the composition of particles making up the rock and whether the rock has air spaces between the particles that compose it.

Density is determined using the formula D = M / V where D is the density expressed in tonne per m^3, M is the mass expressed in tonnes and V is the volume expressed in m^3. This algorithm can be rearranged to make M the subject of the formula. Attempt to do this, clearly stating what process you used to obtain your rearranged algorithm.

D = Density

M = Mass

V = Volume

D = M / V

M = D x V

V = M / D

Answer: M=DV

Using the rearranged algorithm, the mass of rock material that will have to be removed from the twin Sydney Metro Northwest tunnels can then be calculated.

Answer: 1,007,980 tonnes

Important note: The volumes and measurements outlined here are based on data from the Sydney Metro Northwest 's *Environmental Impact Statement 2* in 2012. More detailed engineering work has been undertaken since then following the awarding of the major tunnelling construction contract in June, 2013.

Teacher references and extension work

When designing tunnels such as those between Epping and Bella Vista, an engineer needs to carry out many calculations as shown on page 165.

Students may like to discuss some of the further complexities involved as shown in Figure 16 (below).

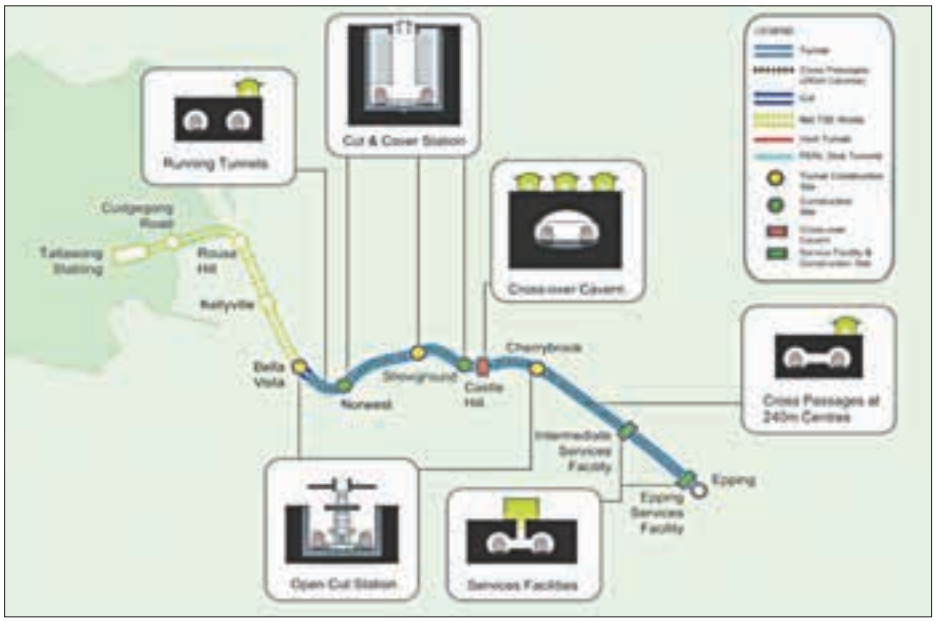

Figure 16: Diagram of the underground components of the Epping–Bella Vista Tunnel segment of Sydney Metro Northwest.

For example, while the twin tunnels are approximately 6 m in diameter, some other sections of tunnel may be larger – but the precise sizes and shapes of these are to be determined. The road header machines will excavate these other sections, which include caverns and TBM launch chambers as well as areas for mechanical and electrical services. The tunnels also have cross passages every 240 metres. In addition there are underground stations.

Students may discuss what additional percentage of volume they would add to accommodate some of these options.

Figure 17: A modern railway tunnel in construction. See more at: **https://www.sydneymetro.info/tunnelling**

Figure 18: Norwest underground station.

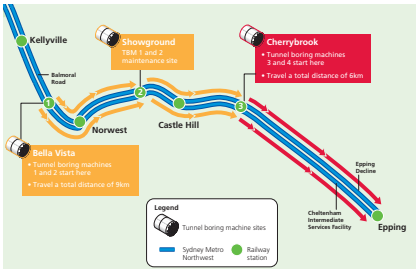

Figure 19: How the Sydney Metro Northwest tunnels were created.

Landscapes, rocks and tunnels: Practical considerations in transport geography

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
Geography	**Landscapes, rocks and tunnels: Practical considerations in transport geography** What landscapes and rock types does the railway cross, both underground and over ground?	**Stage 5** 1–3 lessons

Teacher briefing

Sydney Metro Northwest *Environmental Impact Statement 2,* provides easily accessed geological data on the construction of the Sydney Metro Northwest tunnels. This activity provides Stage 5 students with the opportunity to explore the basic ideas of geotechnics and some of the geological issues that need to be solved when building a tunnel.

Focus questions:

- Which part of Sydney Metro Northwest is underground?
- What rock types does it pass through?
- What technical problems might these rock types present to engineers and how will they solve these?
- Do the above ground sections of the rail line present the same or different challenges?

Requirements for these lessons

- Internet connected computers
- Google Earth or Google Maps
- Activity sheet 1 – Map of Epping-Rouse Hill
- Graph paper.

Key terms and vocabulary

Geotechnics, cross-section, geological long section.

Web links

Submissions Report Stage 1, **Chapter 2**

https://www.sydneymetro.info/documents

Sydney Metro Northwest *Environmental Impact Statement 2,* Appendix C – Geological long section

(This version only includes the cross-sections, with different page orientation)

https://www.sydneymetro.info/sites/default/files/29_Appendix_C_-_Geological_Long_Section.pdf%3Fext%3D.pdf

Sydney Metro Northwest *Environmental Impact Statement 1,* Appendix A – Geological long section

https://www.sydneymetro.info/sites/default/files/26_Appendix_A_-_DGRs__CoA___SoC.pdf%3Fext%3D.pdf

Sydney Metro Northwest *Environmental Impact Statement 2,* Project Description – Operations Part 1, Chapter 6

https://www.sydneymetro.info/sites/default/files/document-library/NWRL_EIS_2_Section_1overview.pdf

Sydney geological map

http://www.resources.nsw.gov.au/__data/assets/image/0005/287204/Sydney_500k.jpg

Any topographic map of the area, or SIX Viewer

https://six.nsw.gov.au/wps/portal

Background information

Students explore geological problems engineers have solved when planning Sydney Metro Northwest. The main rock type in this area is Hawkesbury sandstone that can be easily tunnelled, but may require support. Tunnels are unlike any other civil engineering structures. In buildings or bridges the construction materials have defined and testable properties, whereas this is not the case with tunnelling.

No matter how much of the ground is tested in preliminary site investigations, usually through borehole cores tested in the laboratory, only a small fraction of the tunnel construction area can be tested. Therefore, it is up to engineers to determine the relevant ground conditions and the effects of layering, fissures and discontinuities. Much of this assessment is based on geological and geographic judgment and experience.

A passage describing the planned tunnels from the Sydney Metro Northwest *Environmental Impact Statement 2* Overview

The tunnels would have a maximum vertical grade of 4.1 per cent and have been designed with an appropriate curvature to accommodate an operating speed of 100 kilometres per hour. The vertical gradient of the tunnels is influenced by the topography, geological constraints, presence of watercourses and the alignment has been designed to provide sufficient clearance to existing and proposed building basement levels (for example below Castle Hill town centre). The tunnel crown (top of the tunnel) would be located at its shallowest point approximately three metres below ground surface and at its deepest point approximately 58 metres below ground surface. On average the tunnels would be more typically in the 20–25 metre depth range and tunnel depth would tend to be at its shallowest at station locations and at the northern tunnel portal.

Syllabus links

Geography K–10

Geography Stage 5 – Changing places

– the management and planning of Australia's urban future.

Environmental change and management

– human-induced environmental changes across a range of scales

– the causes, extent and consequences of the environmental change

– management of the environmental change.

(GE5–2) explains the processes and influences that form and transform places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

(GE5–8) communicates geographical information to a range of audiences using a variety of strategies.

Learning experiences

Step 1 – Class discussion

Display Sydney Metro Northwest *Environmental Impact Statement 1*, Appendix C – Geological long section **https://www.sydneymetro.info/sites/default/files/29_Appendix_C_-_Geological_Long_Section.pdf%3Fext%3D.pdf** on the interactive whiteboard, or distribute the pdf for students to view on their own computers.

The teacher explains that most geographical studies create and analyse maps that 'look down' on the Earth. However, engineers working on Sydney Metro Northwest examine 'side-on' maps to see where the rail line will be elevated, where it will dip underground, and which rock types it will pass through.

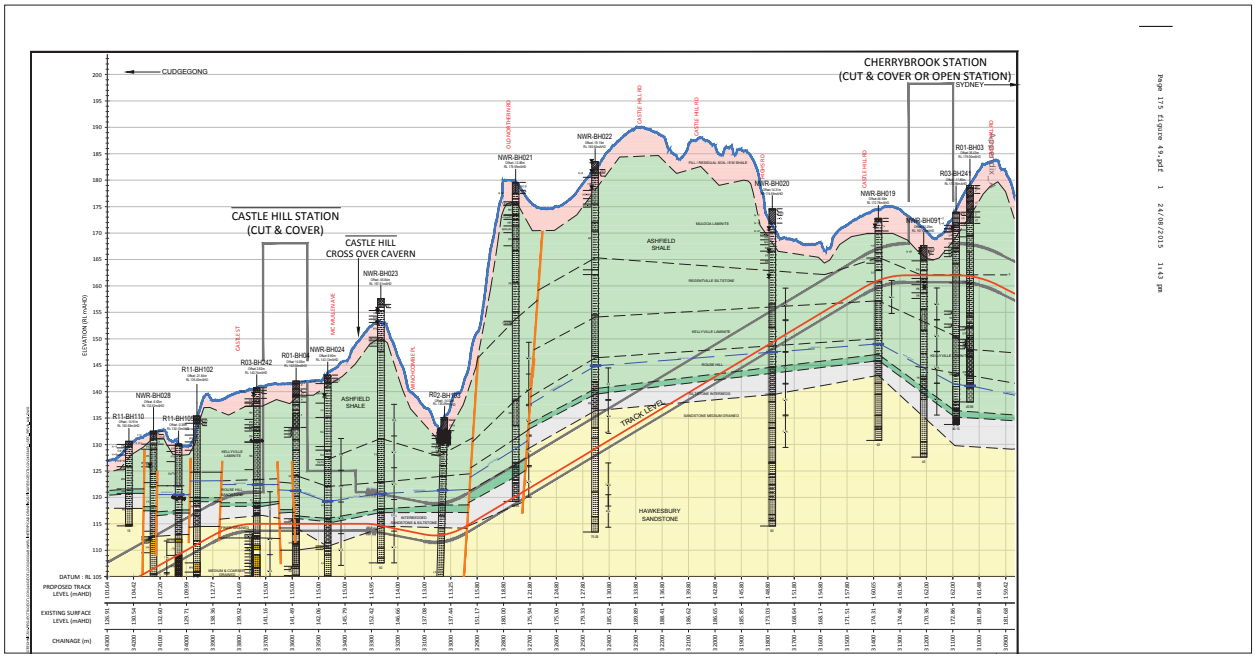

Figure 20: A page from Sydney Metro Northwest *Environmental Impact Statement 1,* Appendix A – Geological long section.
Source: https://www.sydneymetro.info/sites/default/files/Sydney_Metro_Northwest_Environmental_Impact_Statement_1-Appendix_A.pdf

Figure 21: An example of mapping the route as displayed in Sydney Metro Northwest *Environmental Impact Statement 1*, Appendix A – Geological long section.
Source: https://www.sydneymetro.info/sites/default/files/Sydney_Metro_Northwest_Environmental_Impact_Statement_1-Appendix_A.pdf

Step 2 – Listing the rock types

With reference to Figure 20 (page 201) (the geological long section detailing the rock and soil types for each section of the alignment), students list the rock types that will need to be excavated to construct these different sections of the line. They are instructed to mark these rock types on Activity sheet 1 (page 205).

Using the Castle Hill Station example shown in Figure 20, the teacher guides the students to identify the soil and rock types that must be excavated. In order of descending depth these are:

1. Fill residual soil/EW shale (shown in pink/salmon on the cross-section).
2. Kellyville laminate (a type of Ashfield shale, shown in green).
3. Rouse Hill sandstone (a type of Ashfield shale, shown in green).
4. Interbedded sandstone and siltstone (shown in grey).
5. Hawkesbury sandstone (shown in yellow).

Other examples such as Cudgegong Road Station are almost completely Hawkesbury sandstone (shown in yellow) and Bella Vista Station is almost entirely resting on Ashfield shale (shown in green).

Students should explore the Index and Geotechnical Legend (Figure 22) lists all of the rock and soil types on the internet.

Soil and rocks

Topsoil	Gravelly clay	Silty sandstone	Interlaminated siltstone and sandstone
Fill	Gravelly sandy clay	Conglomerate	Interbedded siltstone and sandstone
Asphalt	Sandy clayey silt	Shale	Interbedded shale and sandstone
Silty gravel	Sandy silt	Mudstone	Interbedded shale and siltstone
Clay	Sandy silty clay	Sandstone	
Silty clay	Silt	Siltstone	
Clayey sand	Clayey gravel	Sandstone	
Cobbles	Gravelly sandy silt	Claystone	
Clayey silt	Gravelly sand		
Sand	Silty clayey gravel		
Silty sand			

Geological material

Fill	Bringelly shale
Fill/residual soil/EW shale	Siltstone or siltstone and sandstone interbedded unit
Alluvium	Minchinbury sandstone
Ashfield shale	Volcanic ash correlation layer
Mittagong formation	Possible fault displacement
Hawkesbury sandstone	

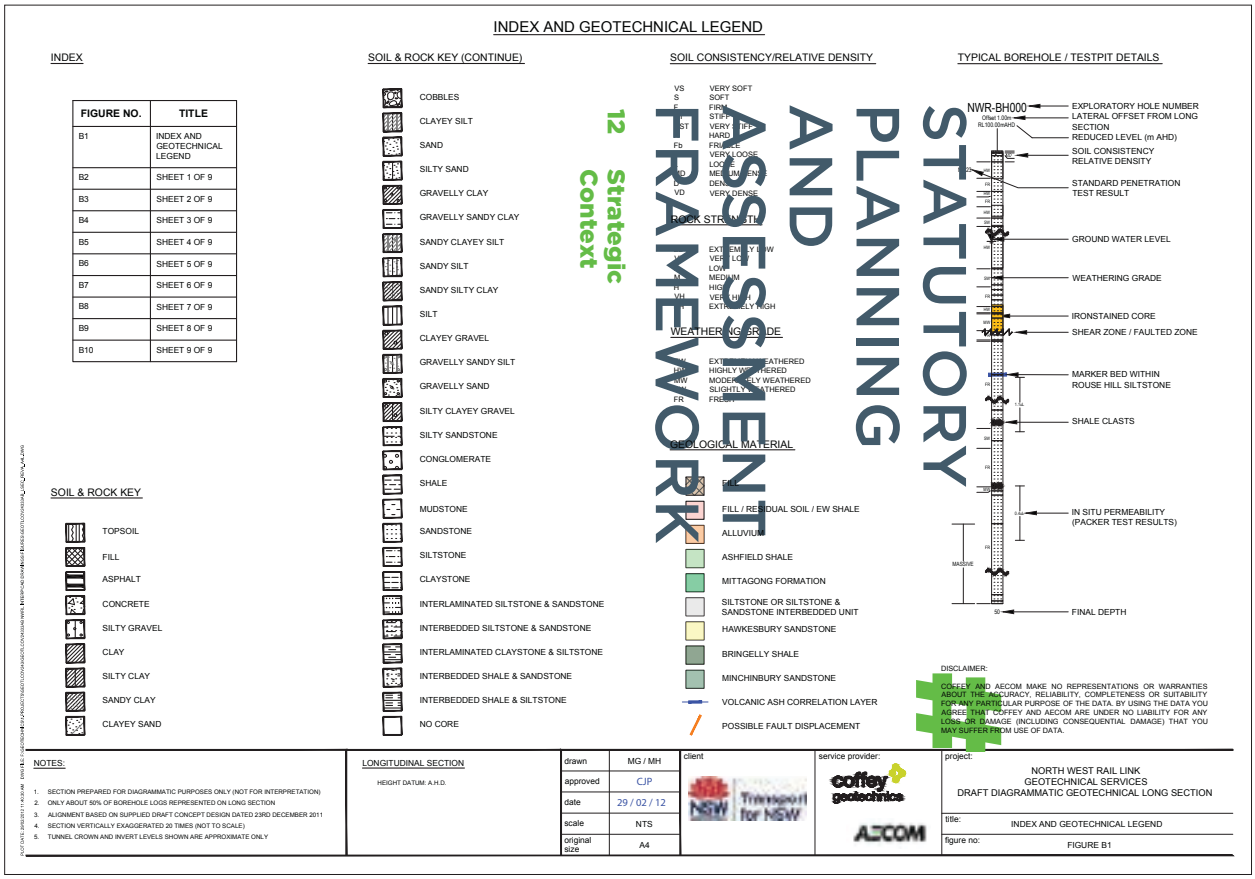

Figure 22: The Index and Geotechnical Legend lists of all the soil and rock types across which the railway travels.

Step 3 – Making a map

- Using the maps and diagrams in Sydney Metro Northwest *Environmental Impact Statement 1*, (Appendix A, page 201 – Geological long section) as a guide, students draw the route of Sydney Metro Northwest on their map (Activity sheet 1, page 205), marking those sections that run above ground and underground
- Using the Geological long section diagrams, students note down the heights above sea level of each main part of the track. The scale used on the Geological long sections is marked in mAHD, the abbreviation for elevation in metres with respect to the Australian Height Datum, that sets mean sea level as zero elevation
- Close reading of the geological long section diagrams can also provide an opportunity for the teacher to discuss surveying and the measurement called 'chainage' along the foot of each diagram
- It is also important to note while examining these geological diagrams, that the cross-sections are vertically exaggerated 20 times and not to scale
- Students should summarise their geological findings and describe the geology of the area in general terms.

Teacher references and extension work

Some students will become very interested in the geology and engineering of tunnels.

- Explore Sydney rock types in greater detail. Showing students rock microstructure (the ways the minerals or particles are joined in rocks) can introduce them to this field. Using photomicrographs of rocks, for example, it is possible to examine the composition and resultant strength of the rock
- Explore tunnelling methodologies. They may look either at earlier tunnelling systems and compare them or explore contemporary tunnelling technology on the web.

Figure 23: Tunnelling boring machine breaks through at Cherrybrook Station, January 2016.

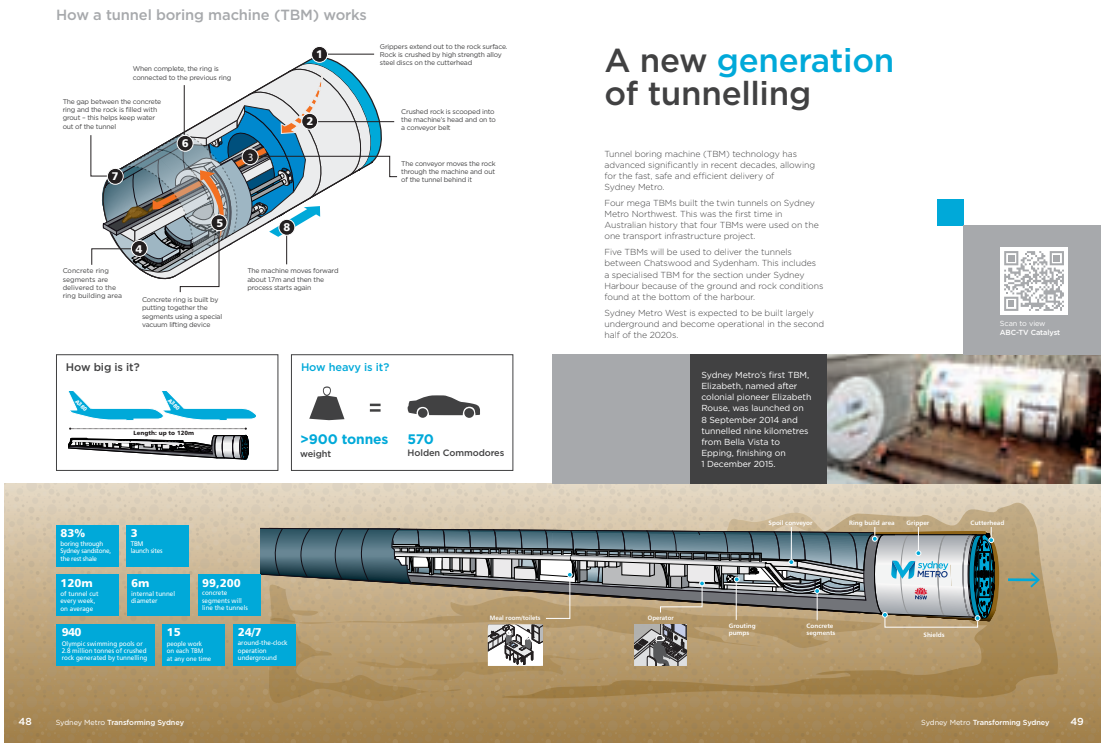

Figure 24: Tunnel boring machine information sheet.

Activity sheet 1

An example base map, showing Epping to Rouse Hill.

This can be created easily by typing 'Castle Hill, NSW' into Google Maps, and capturing the screen, and printing it.

http://maps.google.com.au/maps?q=Castle+Hill,+NSW&z=13

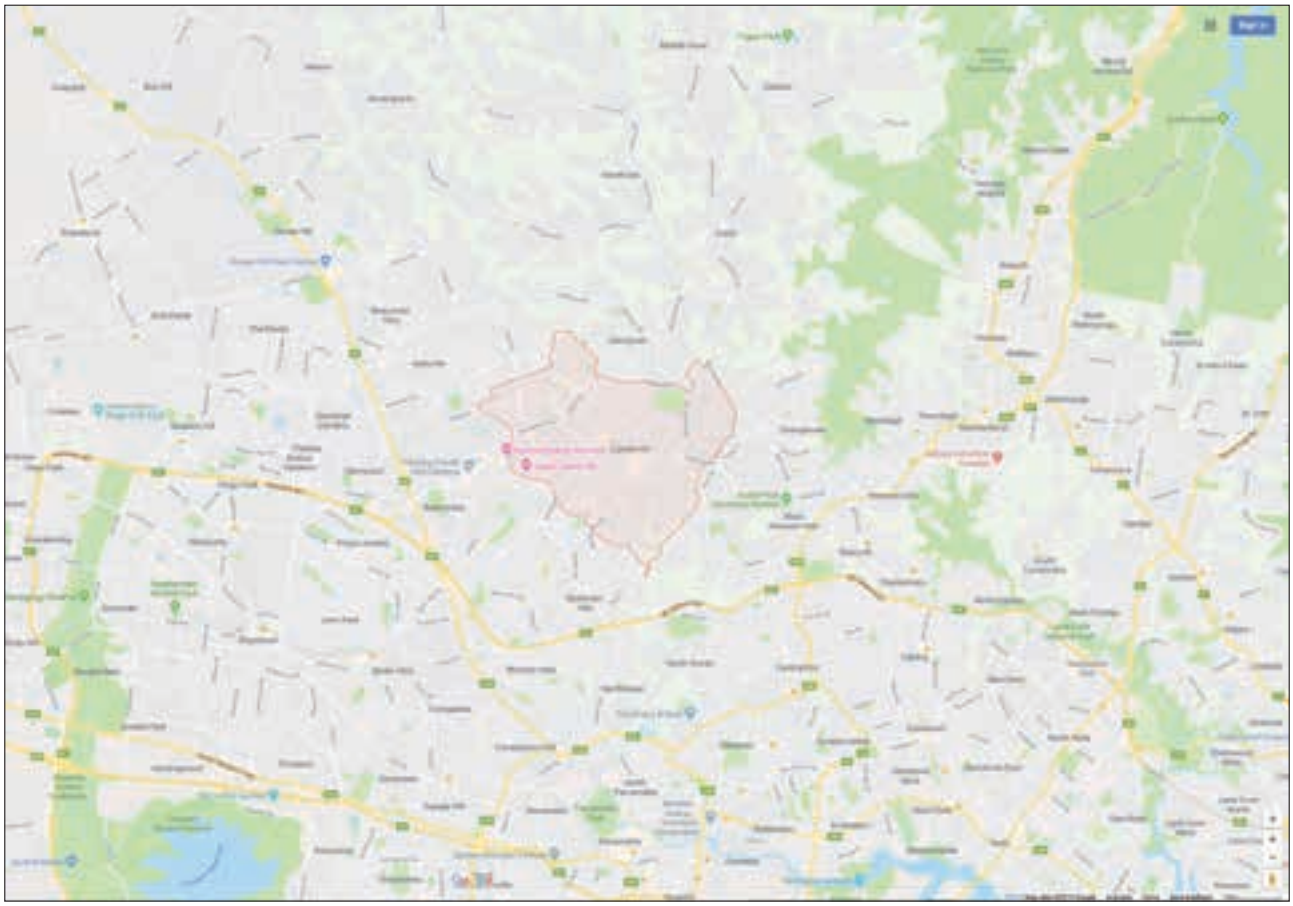

Figure 25: An example base map, showing Epping to Rouse Hill. Copyright, Google Maps 2013.

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Northwest

Production and development

Lyndon Sharp – Development coordinator and reviewer

(Sydney Metro Northwest Education Program Resource Development)

As Information Services Manager at the Board of Studies Teaching and Educational Standards NSW, Lyndon led the design, development and maintenance of more than 20 educational websites, including New South Wales Schools Online, New South Wales Students Online and the online HSC examination results delivery system. He also managed the publication of the Board's education materials sent to all New South Wales schools. Prior to that, he taught History and English in secondary schools for many years, and was an Executive Member of the New South Wales History Teachers Association.

Lyndon developed one of the first Australian CD-ROM multimedia teaching resources, 'Flashback Australian History' and led the development of Australian History websites for the Australian Government Department of Veterans' Affairs on the Kokoda Track, Australian Involvement in the Korean War and Hellfire Pass on the Thai-Burma Railway. Past sites, such as those on Gallipoli and Multicultural History won National or State awards for design excellence, as have several educational resource printed publications.

Carmel Young – Development coordinator and reviewer

(Sydney Metro Northwest Education Program Resource Development)

Carmel coordinated and lectured in the History Education and Combined Degrees Programs, Faculty of Education and Social Work, University of Sydney. Prior to this she taught History and English in various secondary schools. She has chaired syllabus committees (Years 7–12 History) for the Board of Studies Teaching and Educational Standards NSW, been President of State and National professional History teacher associations, and authored a number of award winning school textbooks. Carmel was joint recipient, New South Wales Premier's History Prize (Children's History Writing) for *Unlocking the past: Preliminary studies in the ancient world*, (Nelson). A number of her other texts have been shortlisted for the Australian Awards for Excellence in Educational Publishing.

Education Reference Group

An Education Reference Group monitored the development of this resource to ensure that it aligned with current curriculum requirements, would meet teachers' needs and students' interests, and model sound pedagogical practice. Membership comprised:

- Sydney Metro Northwest personnel and consultants involved in managing the Program
- Teacher representatives drawn from independent, Catholic and Department of Education and Communities schools situated along the North West region alignment.

The Sydney Metro Northwest Education Reference Group members:

Gaye Braiding – Epping North Public School and Field of Mars Environmental Education Centre

Terry Gainey – Castle Hill High School

Jon Hinde – Crestwood High School

Nathan Jones – William Clarke College, Kellyville

Leanne Nettleton – St. Bernadette's Primary School, Castle Hill

Margaret O'Neill – Sydney Metro Northwest Education Program Resource Development

Lyndon Sharp – Sydney Metro Northwest Education Program Resource Development

Carmel Young – Sydney Metro Northwest Education Program Resource Development

Oliver Young – Sydney Metro Northwest Education Program Resource Development

Writers

Individuals who participated in the development of the unit plans, lessons and teaching-learning activities contained in this publication are experienced practitioners, some extensively published and involved in teacher education and professional learning. Listed in alphabetical order:

Paul Ganderton

Paul has over 30 years' experience in Geography teaching. The Royal Geographical Society recently awarded him the qualification of Chartered Geographer in recognition of his contribution to Geography education. He has taught in various school contexts in Australia and internationally. In addition, Paul has extensive knowledge of school examination systems operating in Africa, Asia, Europe and Australia developed as a result of his work with the Board of Studies New South Wales, University of London Examinations Board and Oxford and Cambridge Local Examinations Syndicate. He has been a consultant to the World Bank.

Paul's most recent publications include the tertiary texts *Environmental biogeography* (Pearson) and *Mastering geography* (Palgrave).

Antoinette (Toni) Hurley

Toni has taught History, English and Modern Languages in state, independent and Catholic systemic schools for many years. In addition, she has taught in teacher education programs at Macquarie University, the University of Sydney, Australian Catholic University and the University of Technology Sydney. She has been a member of the Board of Studies Teaching and Educational Standards NSW review team for the Senior Ancient History syllabus. For a number of years she has been Vice President of the New South Wales History Teachers' Association and an editor of its journal *Teaching History*. At the same time, she is a committee member of the Macquarie Ancient History Association, and Editor of its Newsletter.

Toni has co-authored senior Ancient History texts, *Antiquity 1, 2 and 3* (Oxford University Press), now in their third editions. Her publications include the History lessons on the Board of Studies Teaching and Educational Standards NSW website 'The Sydney Harbour Bridge'.

Nathan Jones

Nathan has taught Geography, Economics, Business Studies and Commerce in state, independent and Catholic systemic schools for five years. He was a Social Science teacher at William Clarke College.

Nathan previously had a career in accounting/finance.

This is the first publication that he has been a part of.

Richard Morante

Richard is a science communicator and program developer. He has contributed to the 'Inspiring Australia' Expert Working Group on Science Education and currently teaches at a Sydney secondary school. He has held various positions throughout his career. These include Senior Curriculum Support Officer Science K–12 and Senior Curriculum Adviser Science 7–12, New South Wales Department of Education and Communities, Chief Learning Design Officer, Centre for Learning Innovation, Department of Education, lecturer in postgraduate certificate in Physics at the Australian Catholic University and lecturer in Diploma of Fire Technology, Petersham TAFE.

Richard has published extensively. His publications include co-authoring the *Physics* textbook series for Jacaranda Press, which won the 2002 Excellence in Educational Publishing Award.

Christine Murray

Christine Murray has over 35 years' teaching experience in the state system where she has specialised in English, Ancient History, Modern History and History Extension. Christine is co-author of the *Antiquity 1, 2 and 3* series of Ancient History textbooks (Oxford University Press). She has extensive experience lecturing at HSC Study Days, seminars and teachers' conferences. More recently she has been an Education Officer at the Macquarie University Museum of Ancient Cultures and a casual tutor in the University Technology Sydney, Bachelor of Teaching degree.

Kate Cameron

Kate Cameron has had extensive experience as a history teacher and teacher educator. Her interest in history teaching is reflected in the professional development programs she provides for primary and secondary teachers of history and the resources she produces. Kate's publications include textbooks on Australian history and ancient history, *Discovering History*, a resource for primary teachers, and chapters and journal articles on history teaching in a range of publications and websites.

Kate's contribution to history teaching has been recognised in a range of awards, among them the Australian College of Educators Award in 2002 for her 'outstanding contribution to higher education in the area of secondary education', the Premier's Westfield Scholarship for History in 2004, the Annual Citation by the NSW History Council of NSW in 2010, the Professional Teachers' Council of NSW Outstanding Professional Service Award, also in 2010, and the Renee Erdos Award from the History Teachers Association of NSW in 2015. Although now retired from full time teaching, Kate continues to provide resources and professional development to support teachers of history.

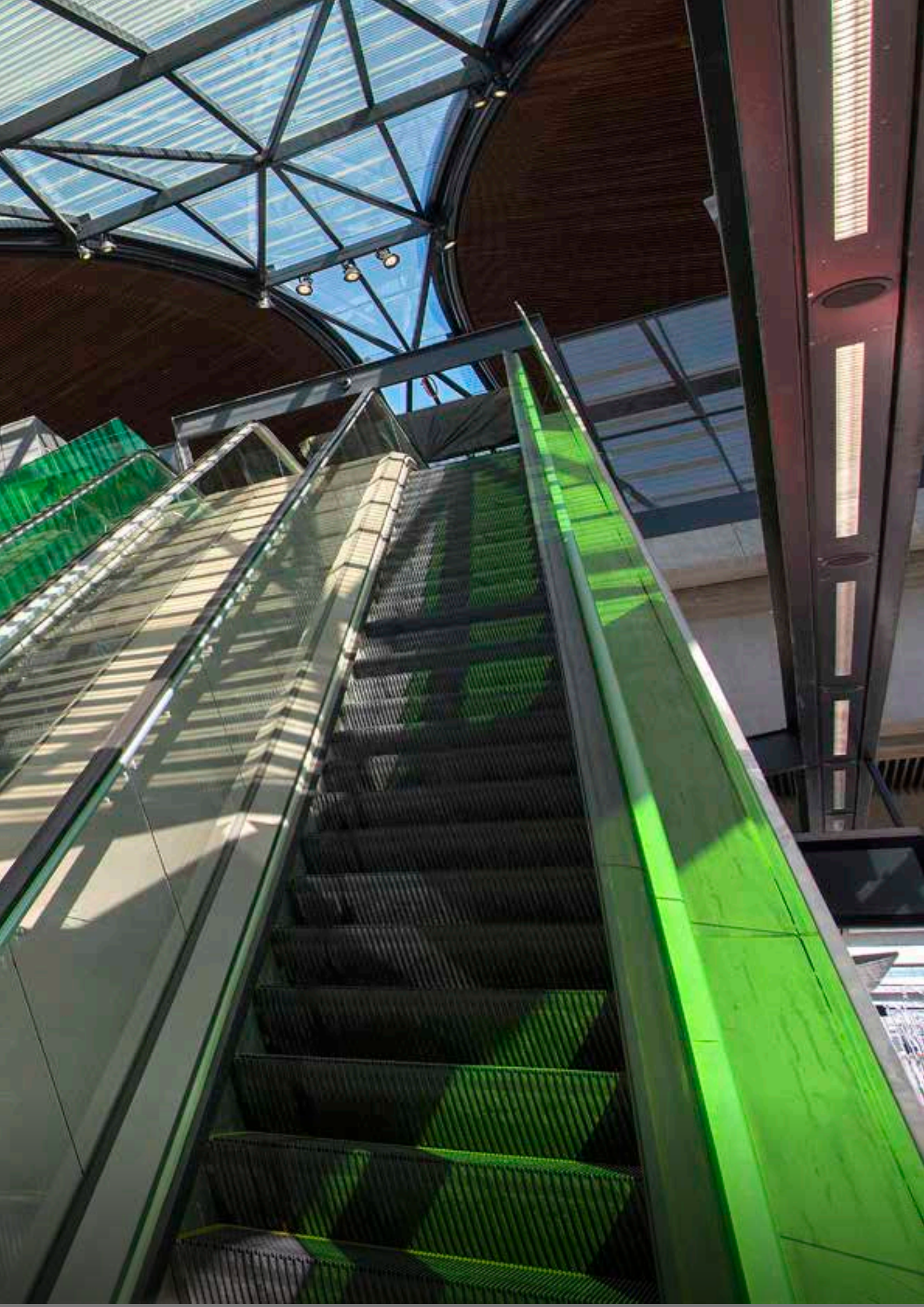
Disclaimer: this section is correct at time of print in third edition – November 2016.

Kellyville Station glass installation, November 2018.

Glossary

This glossary is provided to clarify specialised terminology used in this book and other Sydney Metro Northwest publications.

Down	Railway description of direction for a train travelling away from Central Station. For example, a train travels from Epping in the down direction to Rouse Hill. (See 'Up').
Dwell time	The amount of time a train stands at a station while passengers get on or off.
ECRL	Epping to Chatswood Rail Link.
EIS	Environmental Impact Statement.
ESD	Ecologically Sustainable Development. Using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Global Economic Corridor	Macquarie Park – Chatswood – North Sydney – Central Business District – Airport.
Heavy rail	Typical modern rail system for freight or large passenger trains. This includes both the existing Sydney Trains system as well as the metro transit system, of which Sydney Metro Northwest will be the first stage.
Hills M2	The Hills Motorway Limited, the company responsible for the operation and maintenance of the M2 Motorway. Hills M2 is a wholly owned subsidiary of Transurban Limited.
Kiss and ride	A spot where cars can pull up and drop off passengers near a public transport stop.
Laydown area	An area designated for the temporary storage of equipment and supplies.
M2 Motorway	M2 Motorway, which extends from the M7 Motorway/Abbott Road to the Lane Cove Tunnel including carriageways, ramps and associated structures and infrastructure.
North West Rail Link	The North West Rail Link became known as Sydney Metro Northwest in June 2015. Sydney Metro Northwest is stage 1 of Sydney Metro, Sydney's new stand alone rail network.
Commuter Car Park	A car park near a public transport stop for use by commuters.
PAD	Potential Archaeological Deposit.
PA	Public Address System.
Precinct	Stations and land in vicinity of the stations, including station design and amenity, integrated transport facilities, pedestrian links and access facilities, traffic and parking, public domain amenities and improvements, retail and commercial development associated with rail, other development, and other matters ancillary to the operation of rail/associated transport.
Rail customers along the alignment	A Transport for New South Wales term for potential users of trains.
Running tunnels	The portion of tunnel that would house the railway tracks – that is where the trains run. Other tunnel types include tunnels for crossovers and turnbacks, cross passages and connections to maintenance facilities.
Substation	A facility that controls the flow of electricity by switching, changing, or regulating electric voltage.
Stabling facility	A facility for the stabling of trains.
Stub tunnels	A short section of tunnel which links to a main tunnel. The new Sydney Metro Northwest tunnels will commence from the existing stub tunnels at Epping.
TBM	Tunnel Boring Machine.
TfNSW	Transport for New South Wales.
T-way	A bus Transitway.
Up	Railway description of direction for a train travelling toward Central Station. For example, a train travels from Rouse Hill in the up direction to Epping. (See 'Down').
VMS	Variable Message Sign.



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