



Windsor Bridge replacement project

Environmental impact statement
Volume 1 - main report

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Roads and Maritime Services

Windsor Bridge replacement project

Environmental impact statement

November 2012



Prepared by Sinclair Knight Merz
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Volume 2

Working paper 1 - Historic Heritage Assessment and Statement of Heritage Impact

Working paper 2 - Maritime Archaeological Statement of Heritage Impact

Working paper 3 - Aboriginal Cultural Heritage Assessment Report

Volume 3

Working paper 5 - Urban Design and Landscape Concept Report including Landscape Character and Visual Impact Assessment

Volume 4

Working paper 4 - Traffic and transport

Working paper 6 - Noise and vibration

Working paper 7 - Soil, sediments, water and waste

Working paper 8 - Hydrology

Working paper 9 - Land use, property and socio-economic

Working paper 10 - Flora and fauna

Working paper 11 - Air quality

Certification

Submission of environmental impact statement prepared under Part 5.1 of the *Environmental Planning and Assessment Act 1979*.

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Address of the land on which the infrastructure to which the statement relates:

Parts of Old Bridge Street, Bridge Street, George Street Wilberforce Road, Freemans Reach Road, The Terrace, Thompson Square, Hawkesbury River and other adjacent areas in Windsor. Hawkesbury LGA.

Description of the infrastructure to which the statement relates:

Windsor bridge replacement:

- Construction and operation of a replacement bridge, approach roads, intersections and associated infrastructure for a new river crossing at Windsor.
- Demolition of the existing Windsor bridge and approach roads.
- Rehabilitation and landscaping of Thompson Square and other areas.

Environmental impact statement:

An environmental impact statement is attached addressing all matters in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979*.

Declaration:

I certify that I have prepared the contents of this environmental impact statement in response to the Director-General's environmental assessment requirements dated 24 November 2011 and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. To the best of my knowledge the information contained in the environmental impact statement is not false or misleading.

Signature:

A handwritten signature in black ink, appearing to read 'Jonas Ball', written in a cursive style.

Name: Jonas Ball

Date: 1.11.2012

Glossary of terms and abbreviations

Term	Meaning
Abutment	The end support of a bridge or similar structure
Access	The driveway by which vehicles and/or pedestrians enter and/or leave property adjacent to a road.
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical).
AM peak period	6 – 10 am weekdays
Annual average daily traffic (AADT)	The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year (365 or 366 days).
Annual average weekday traffic (AAWT)	The average 24 hour traffic volume on weekdays (Monday to Thursday or Friday) throughout a 12 month period, at a specific observation point.
Arterial	The main or trunk roads of the State road network.
Acid Sulfate Soils (ASS)	Naturally acidic clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen and may produce acidic leachate run-off that can pollute waters and liberate toxins.
Backed artefacts	An Aboriginal artefact generally produced before 1500BC that is characterised by a flat back.
Backfill	Fill replaced in an excavation
Base case / 'do nothing case'	Used in evaluating projects to compare the cost and benefit of the existing road (the base case) with another or a number of other projects or options.
Beams seating area	The area on headstocks on which the bridge beams sit upon
Benefit cost ratio (BCR)	The ratio of the monetary benefits to the costs of a project as a measure of worth to the community. The higher the number the greater the benefits compared to the costs.
Bored piling	A method of piling using drilling or boring.
Bridge approach road	A relatively short length of carriageway leading up to a bridge, including embankment, pavement and safety barriers.
Bridge deck	The surface of the bridge, including road and pedestrian/cyclist pathway.
Carbonation of concrete	Carbon dioxide in the air diffuses into concrete and reacts with alkalis within the concrete. This leads to corrosion of embedded reinforcing steel in the concrete which expand, causing the concrete to bulge and crack.
Carriageway	The portion of roadway used by vehicles including shoulders and ancillary lanes.
Casting bed	A temporary work area where concrete is placed to construct the bridge prior to launching the bridge into its final position.
Collector road	A local road that moves traffic to arterial roads.
Concrete	A mixture of fine and coarse aggregate, water, cement and admixtures.
Crossfall	The slope, measured at right angles to the alignment, of the surface of any part of a carriageway.

Term	Meaning
Cross-section	A vertical section, generally at right angles to the centreline showing the ground. On drawings it commonly shows the road to be constructed, or as constructed.
Cut	The depth from the natural surface of the ground to the subgrade level.
Cutting	Formation resulting from the construction of the road below existing ground level – the material is cut out or excavated.
dB(A)	Decibels using the A-weighted scale measured according to the frequency to the human ear.
Design speed	A speed fixed for the design and correlation of those geometric features of a carriageway that influence vehicle operation. Design speed should not be less than the intended 85th percentile speed
Design standard	Identified particular standards used in the design eg standard lane width.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
EIS	Environmental impact statement.
Embankment	An earthen structure where the road subgrade level is above the natural surface.
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i> .
Fill	The material placed in an embankment
Foreshore	The area of land adjacent to the bank of a river.
Foundation	The soil or rock upon which a structure rests.
Girders	A type of support beam.
Graphitisation	Leaching of cast iron in slightly acidic water which leads to corrosion and weakening.
Grade	A length of carriageway sloping longitudinally.
Greenhouse gases (GHG)	Include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluocarbons and perfluorocarbons.
Gutter	A drain which is lined or paved (along the side of a road).
Headstocks	A structure that sits on top of bridge piers that supports the superstructure and deck of a bridge.
Incrementally launched	A type of bridge that is constructed by setting up a casting bed on one side of the river, casting segments of the bridge and then launching each new segment across the alignment on to the piers.
In situ	An operation carried out on a material in its final position.
Kerb	An edge stone or concrete shape used for bordering a road and defining the footway.
LA _{eq}	The equivalent continuous sound level. This is the energy average of the varying noise over the sample period and is equivalent to the level of constant noise which contains the same energy as the varying noise environment. This measure is a common measure of environmental noise and road traffic noise.

Term	Meaning
LA ₉₀	The noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below LA ₉₀ level for 10% of the time. This measure is commonly referred to as background noise level.
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
Launching yard	A temporary work area (adjacent to the casting bed) where completed sections of the bridge are pushed (launched) into their final position.
LEP	Local Environmental Plan.
Level of service (LoS)	A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
LGA	Local government area.
Matters of national environmental significance	Matters listed under the <i>Environment Protection and Biodiveristy Conservation Act 1999</i> .
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction.
Milling	Removing the surface of a pavement (typically 25 to 75 mm in depth) with a machine equipped with a transverse rotating cutter drum.
PAMP	Pedestrian Access Management Plan
Pavement	The portion of carriageway placed above the subgrade for the support of, and to form a running surface for vehicular traffic.
Pier	An intermediate support in a bridge having more than one span. Part of the substructure supporting the superstructure and transferring the loads to the foundations.
Pier caps / pile caps	A structural member designed to connect and distribute loads from the above structure to a group of piers or piles.
Pile	A slender member driven, screwed or formed in the ground to resist loads or thrust.
PM ₁₀	Particulate matter less than 10 microns in diameter.
PM peak period	3-7pm weekdays.
Post tensioning	A method of prestressing in which tendons are tensioned after the concrete has hardened.
Project footprint	The extent of impact that the project makes on the land.
Office of the Hawkesbury Nepean	A NSW Government initiative to improve the health of the Hawkesbury-Nepean river system (now closed).
Open space	Space available to recreational uses.
Overshadowing	The shadow cast by a structure.
Rat run	Avoiding traffic on main roads by using secondary and local roads.
Reinforced concrete	Concrete strengthened within its mass by steel bars, mesh or steel fibres.

Term	Meaning
Reinforcement	Bars, or mesh, usually steel, embedded in concrete, masonry or brickwork for the purpose of resisting particular stresses eg tensile, temperature related etc.
Receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receiver is a home, work place, school or other place where people spend some time.
Retaining wall	A wall constructed to resist lateral pressure from the adjoining ground or to maintain in position a mass of earth.
Riparian	Relating to the banks of a natural waterway.
RMS	Roads and Maritime Services NSW (formerly Roads and Traffic Authority).
Roadworks	A general term for any work on a road for construction, repair or maintenance.
Rock rip rap protection	Medium to large size rock protection, against scour, applied (usually by dumping) to the face of an embankment.
Roundabout	An intersection where all traffic travels in one direction around a central island.
RTA	(former) Roads and Traffic Authority (now RMS).
Safety barrier	A physical barrier separating roadside hazards or opposing traffic and the travelled way, designed to resist penetration by an out-of-control vehicle and as far as practicable, to stop or redirect colliding vehicles.
Scour	The erosion of material by the action of flowing water.
Section 170 register	A register established in accordance with section 170 of the <i>Heritage Act 1977</i> to record all heritage items in the ownership or under control of RMS (or other state government agencies).
Shared path	A pathway used for both cyclists and pedestrians, usually located on the side of the road.
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement.
Sight distance	The distance measured along the carriageway over which objects of defined height are visible to a driver whose eyes are at a specified height above the pavement surface level.
Site compound	Area enclosing construction machinery, stockpiles, site offices and other ancillary facilities.
Soffit	The underside of a building or bridge.
Spalling	Natural deterioration of concrete due to carbonation.
Span	The distance between centres of adjacent supports of a bridge.
Spoil	Surplus excavated material
Stockpile	Temporarily stored materials such as soil, sand, gravel and spoil/waste.
Sub-arterial	A road that supports and links state roads.
Subgrade	The trimmed or prepared portion of the formation on which the pavement is constructed.
Substructure	In a bridge, the piers and abutments (including wing walls) which support the superstructure.

Term	Meaning
Superstructure	That part of a bridge structure which is supported by the piers and abutments.
Thompson Square	The area defined by George Street, the building lines on the east and west of Thompson Square parkland and The Terrace.
Thompson Square Conservation Area	Also known as the Thompson Square Precinct, this is the area of Thompson Square listed on the State Heritage Register of NSW. One of the oldest public squares in Australia, constructed in 1811. Surrounding buildings were constructed between 1815 and 1880 in the colonial Georgian style. The Square consists of George Street, Bridge Street, Thompson Square and The Terrace.
Thompson Square open space area	Including all public lands (roads, footpaths, car parks, parkland areas, verges and medians) within Thompson Square.
Thompson Square lower parkland	Includes the parkland area below / north of Bridge Street bounded by Bridge Street, Old Bridge Street and The Terrace.
Thompson Square parkland	The parkland area bounded by George Street, Old Bridge Street, The Terrace and Thompson Square road. It includes both the Thompson Square upper and lower parkland areas.
Thompson Square road	The road on the western side of Thompson Square parkland.
Thompson Square upper parkland	Includes the parkland area above / south of Bridge Street bounded by Bridge Street, George Street and Thompson Square road.
Underpass	A tunnel constructed for the use of pedestrians and cyclists under a carriageway.
Urban design	The process and product of designing human settlements and their supporting infrastructure, in urban and rural environments.
Vertical alignment	The longitudinal profile along the design line of a road.
Vertical curve	A curve (generally parabolic) in the longitudinal profile of a carriageway to provide for a change of grade at a specified vertical acceleration.
View point	A point in the landscape chosen to measure impacts to visual amenity.
Water quality basin	An area where stormwater is ponded to be treated before entering a waterway.

Executive Summary

What is proposed?

Roads and Maritime Services NSW (RMS) is proposing to replace the existing bridge over the Hawkesbury River at Windsor. The proposal for bridge replacement includes the following key features:

- Construction of a new bridge over the Hawkesbury River at Windsor, around 35 metres downstream of the existing Windsor bridge.
- Construction of new approach roads and intersections to connect the new bridge to existing road network.
- Modifications to local roads and access arrangements, including changes to the Macquarie Park access and connection of The Terrace.
- Construction of pedestrian and cycling facilities, including a shared pedestrian/cycle pathway for access to and across the new bridge.
- Removal and backfilling of the existing bridge approach roads.
- Demolition and removal of the existing road bridge, known as Windsor bridge.
- Urban design and landscaping works, including within the parkland area of Thompson Square and adjacent to the northern intersection of Wilberforce Road, Freemans Reach Road and the Macquarie Park access road.
- Ancillary works such as public utility adjustments, water management measures and scour protection works, as required.

What are the project objectives?

The primary aim of the project is to provide a safe and reliable crossing of the Hawkesbury River at Windsor. Specific objectives for the project are:

- To improve safety for motorists, pedestrians and cyclists.
- To improve traffic and transport efficiency.
- To improve the level of flood immunity.
- To meet long term community needs.
- To minimise the impact on heritage and the character of the local area.
- To be a cost effective and an affordable outcome.

Why is it needed?

Windsor bridge provides an important link for communities on each side of the Hawkesbury River in the Windsor locality, as well as an important regional link between western Sydney, the Blue Mountains and the Hunter region. Around 19,000 vehicles use the bridge each day, with around seven per cent of these being heavy vehicles. The nearest alternative bridge crossing of the Hawkesbury is located around 10 kilometres away at Richmond, requiring a road detour of around 20 kilometres to drive between the southern and northern sides of the river at Windsor.

There are a number of reasons why the project is needed. Critically, the structural piers and other parts of the existing Windsor bridge are over 130 years old and are substantially deteriorated due to age and heavy use. The bridge requires extensive rehabilitation work if it is to be used and maintained into the future.

Speed restrictions are currently imposed due to the structural weakness of the bridge and it is inspected regularly to ensure public safety. A load limit may also need to be applied in the short term and ultimately closure of the bridge is expected in the longer term when ongoing maintenance can no longer provide a structurally adequate bridge.

The remaining safe life of the bridge cannot be accurately predicted due to deterioration, heavy use and risk of flooding, however RMS could need to close it anytime without notice to protect public safety if regular inspections identify considerable further structural weakness.

In addition to deteriorating with age, the existing bridge does not meet current engineering and road safety standards. The approach roads and intersections also have a number of safety issues, such as lack of safe crossing locations for pedestrians and poor vehicle sight distances.

A further limitation of the existing bridge is that it is below the 1-in-2 year flood event level while the surrounding approach roads have a higher level of flood immunity. Finally, the existing bridge and intersections cause traffic delays and congestion especially in the peak period. The predicted growth in traffic numbers using this river crossing would result in even greater delays and congestion at the existing bridge and intersections in the future. RMS has identified that the most effective solution to these deficiencies is to replace the existing bridge.

How would the project satisfy this need?

The project would provide a new bridge, approach roads and intersections to current road design standards. The project design would improve the level of flood immunity to that of the surrounding approach roads, and provide safer crossings for pedestrians. The existing bridge would be removed thereby removing the risk of deterioration and failure.

The improved intersections and higher capacity bridge would provide acceptable traffic performance immediately and into the future when the bridge would be reconfigured to provide three lanes (two lanes southbound and one lane northbound).

What alternatives were considered?

The project development process involved an integrated design approach with engineers, urban designers and architects working collaboratively with environmental and heritage specialists. This approach complemented the process of participation and input from community and stakeholders.

A range of options were considered during the options selection process, including a number of options identified by the community. The options assessment process took into account transport needs, heritage impacts, environmental impacts and engineering and cost constraints.

Early phases of the options assessment process identified opportunities to retain the existing bridge, bypass Windsor or replace the existing bridge at Windsor. The ten options considered would have provided river crossings at a variety of different locations. Three of these options were short-listed and further assessment identified a preferred option for the location of a replacement bridge at Windsor.

Various bridge types and bridge and road alignments were then considered for this preferred option. The different bridges and alignments presented different impacts and opportunities.

An outcome of the integrated design approach was adjusting project design speed, allowing the southern approach road to the new bridge through Thompson Square to be lowered. This lower alignment option reduced potential visual and heritage impacts. Different intersection types and configurations were considered on the northern and southern sides of the bridge, as were locations for the pedestrian and cyclist shared path. A number of options were considered for the design of Thompson Square.

How did the community participate in selecting the preferred project?

RMS used a range of consultation tools and activities to ensure the community was actively involved in the project development and options selection process. Consultation for the project began in July 2009 with input sought on the ten options to rehabilitate or replace the existing bridge. Consultation continued on the preferred option to allow community issues to be considered in the design of the bridge, Thompson Square and surrounding project elements.

Consultation tools and activities used to facilitate community participation throughout the options assessment process included community information sessions, public displays, on-line discussion forums, a series of community focus group meetings and a deliberative forum. A range of more traditional activities were also adopted, including door knocking, newsletters, advertisements and community updates seeking feedback and input on the project. Local council, government agencies the Heritage Council of NSW and Aboriginal stakeholders were also consulted during project development.

RMS will continue to provide opportunities for the community to participate in the detailed design of Thompson Square and in further minimising project impacts.

What are the main beneficial outcomes expected?

The main beneficial outcome of the project would be maintaining an essential local and regional road link across the Hawkesbury River at Windsor for commercial, residential and tourist traffic. The project would also improve safety and flood immunity for this river crossing.

The removal of the approach road to the existing bridge which currently diagonally bisects Thompson Square and the consolidation of the two parkland areas would increase the usable open space area within Thompson Square. It would also improve access to the waterfront from the Windsor commercial area. Transport through and from Windsor, and access to the waterfront, are important historical aspects of this area dating back to its establishment.

The project would also improve pedestrian and cyclist access, safety and connectivity through the provision of shared use pathways and a signalised intersection at Bridge and George streets to enable safe crossing of this busy intersection for pedestrians.

What are the main adverse outcomes expected?

The project would result in a number of adverse impacts particularly on heritage and visual impacts. The main adverse outcomes identified include:

- Impacts to the heritage values of Thompson Square, as well as potential impacts to archaeology within Thompson Square and foreshore areas.
- Impacts to Aboriginal archaeology.
- Visual impacts and impacts to the landscape character of the area.
- Additional traffic noise and changes to access arrangements for some residents.
- Construction related impacts such as noise, vibration, traffic and air and water quality issues.

How will the likely impacts be managed?

RMS has identified a number of mitigation and management measures to avoid, manage, mitigate, offset and/or monitor impacts during pre-construction, construction and operation of the project.

If the project is approved, the design, construction and operation of the project would be undertaken in accordance with these measures, as well as any additional measures identified in conditions of approval for the project.

How can I comment on the proposal and/or the environmental impact statement?

The NSW Department of Planning and Infrastructure will make the environmental impact statement publicly available for a minimum period of 30 days. During this period, it will be available for inspection at the Department of Planning and Infrastructure website: <http://majorprojects.planning.nsw.gov.au/>, on the RMS project website www.rms.nsw.gov.au, at selected RMS offices, and at various displays in the region. Display locations include:

- Hawkesbury Council Chambers.
- RMS Motor Registry, Richmond.
- Deerubbin Centre (Windsor Central Library).
- Windsor Post Office.
- RMS Office, Blacktown.
- RMS Head Office, North Sydney.
- NSW Department of Planning and Infrastructure, Bridge Street, Sydney.
- Nature Conservation Council of NSW, Newtown.

RMS will also be conducting community information sessions. A project information line will be available throughout the exhibition period – 1800 822 486 (toll free).

A person may make written submissions to the Director-General of the Department of Planning and Infrastructure during the exhibition period. All submissions received will be placed on the Department of Planning and Infrastructure website.

Submissions can be made using the online form at the Department's website at <http://majorprojects.planning.nsw.gov.au>

People unable to lodge submissions online can send it via email to **plan_comments@planning.nsw.gov.au** or via mail to:

Director Infrastructure Projects
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

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