



Transport for NSW

# Beaches Link and Gore Hill Freeway Connection

Submissions report

November 2021



## Acknowledgment of Country

Transport for NSW acknowledges and pays respect to the Gammeraygal, Birrabirrigal and Garigal peoples of the Eora Nation, the traditional custodians of the land on which the project is proposed. We recognise their continuing connection to the land, waters and culture of this Country and pay our respects to their Elders past and present.







Transport for NSW





# Beaches Link and Gore Hill Freeway Connection

Table of contents and glossary

November 2021





-  [nswroads.work/whtbl](https://nswroads.work/whtbl)
-  [whtbl@transport.nsw.gov.au](mailto:whtbl@transport.nsw.gov.au)
-  1800 931 189
-  Customer feedback  
Transport for NSW, Locked Bag 928  
North Sydney NSW 2059



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## Contents

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Glossary and abbreviations .....	iv
----------------------------------	----

Executive summary .....	E-i
-------------------------	-----

### **Part A Introduction, overview of engagement and submissions received, refinements and clarifications**

Contents .....	A-i
A1 Introduction and background .....	A1-1
A2 Community and stakeholder engagement .....	A2-1
A3 Submissions received .....	A3-1
A4 Project refinements .....	A4-1
A5 Clarifications .....	A5-1

### **Part B Response to key stakeholder submissions**

Contents .....	B-i
B1 NSW Environment Protection Authority .....	B1-i
B2 NSW Health (Northern Sydney Public Health Unit) .....	B2-i
B3 Office of the Chief Scientist and Engineer (Advisory Committee on Tunnel Air Quality) .....	B3-i
B4 Department of Planning, Industry and Environment (Environment, Energy and Science Group) .....	B4-i
B5 Department of Primary Industries (Fisheries) .....	B5-i
B6 Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator .....	B6-i
B7 Department of Planning, Industry and Environment (Crown Land) .....	B7-i
B8 Fire and Rescue NSW .....	B8-i
B9 Heritage NSW .....	B9-i
B10 Heritage Council of NSW .....	B10-i
B11 Northern Beaches Council .....	B11-i
B12 Willoughby City Council .....	B12-i
B13 Mosman Council .....	B13-i
B14 North Sydney Council .....	B14-i

### **Part C Response to community submissions**

Contents .....	C-i
C1 Assessment process .....	C1-i
C2 Strategic context and project need .....	C2-i
C3 Project development and alternatives .....	C3-i
C4 Project description .....	C4-i
C5 Construction work .....	C5-i
C6 Stakeholder and community engagement .....	C6-i
C7 Construction traffic and transport .....	C7-i

## Contents

C8	Operational traffic and transport.....	C8-i
C9	Construction noise and vibration.....	C9-i
C10	Operational noise and vibration .....	C10-i
C11	Air quality .....	C11-i
C12	Human health.....	C12-i
C13	Non-Aboriginal heritage .....	C13-i
C14	Aboriginal cultural heritage .....	C14-i
C15	Geology, soils and groundwater .....	C15-i
C16	Hydrodynamics and water quality .....	C16-i
C17	Flooding .....	C17-i
C18	Biodiversity.....	C18-i
C19	Land use and property .....	C19-i
C20	Socio-economics.....	C20-i
C21	Urban design and visual amenity.....	C21-i
C22	Hazards and risks .....	C22-i
C23	Resource use and waste management .....	C23-i
C24	Sustainability .....	C24-i
C25	Climate change and greenhouse gas .....	C25-i
C26	Cumulative impacts.....	C26-i
C27	Support.....	C27-i
C28	Out of scope .....	C28-i
C29	Related projects .....	C29-i

## **Part D Revised environmental management measures, conclusion and references**

Contents .....	D-i	
D1	Construction environmental management framework .....	D1-1
D2	Revised environmental management measures .....	D2-1
D3	Conclusion and next steps.....	D3-1
D4	References.....	D4-1

## **Appendices**

Appendix A	Updated mapping and assessment of Aboriginal cultural heritage sites
	<ul style="list-style-type: none"><li>Annexure A – AHIMS search results from 19 February 2021</li></ul>
Appendix B	Parking impact assessment
Appendix C	Sediment and marine water quality memorandums
	<ul style="list-style-type: none"><li>Appendix C1 – Responses to submissions on marine construction activities, sediment and water quality</li><li>Appendix C2 – Review of recreational exposures during dredging activities</li></ul>
Appendix D	Expanded groundwater modelling uncertainty analysis
Appendix E	Further information on predicted groundwater drawdown, baseflow reductions and related environmental assessment



## Contents

- Annexure A – Assessment of baseflow change in freshwater creeks
- Annexure B – Groundwater dependent ecosystem assessment

### Appendix F Further information on biodiversity matters

- Appendix F1 – Updated Duffys Forest threatened ecological community mapping and assessment
- Appendix F2 – Updated biodiversity credit reports
  - Annexure A – Updated biodiversity credit reports
- Appendix F3 – Supplementary koala survey and assessment
  - Annexure A – Fauna species list
  - Annexure B – Camera trap results
- Appendix F4 – Biodiversity development assessment report roadmap
- Appendix F5 – Updated biodiversity assessment

### Appendix G Updated flood mapping

### Appendix H Supplementary non-Aboriginal heritage assessment

### Appendix I Noise insulation program

### Appendix J Construction noise strategy

## Glossary and abbreviations

Abbreviation	Definition
AADT	Annual average daily traffic
AAQ NEPM	Ambient Air Quality National Environment Protection Measure
ABLV	Australian bat lyssavirus
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACTAQ	Advisory Committee on Tunnel Air Quality
AEP	Annual exceedance probability
AFG	Aboriginal focus group
AFL	Australian Football League
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
Alluvium	Unconsolidated deposit of gravel, sand or mud formed by water flowing in identifiable channels. Commonly well sorted and stratified
AM peak	Time period between 8am and 9am
ANZAC	Australian and New Zealand Army Corps
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
AQIA	Air Quality Impact Assessment
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARR	Australian rainfall and runoff
AS	Australian Standard
ASRIS	Australian Soil Resource Information System
ASS	Acid sulfate soils
ASSMAC	Acid Sulfate Soils Management Advisory Committee
AUSRIVAS	Australian River Assessment System
Average recurrence interval (ARI)	The long-term average number of years between the occurrence of a flood larger than the selected event
BC Act	<i>Biodiversity Conservation Act 2016</i>



Abbreviation	Definition
BDAR	Biodiversity Development Assessment Report
Beaches Link	The Beaches Link and Gore Hill Freeway Connection project which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway and Reserve Road at Artarmon
Biodiversity Assessment Method (BAM)	Established under section 6.7 of the BC Act to assess impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act
BL	Beaches Link
B-Line	Northern Beaches Bus Rapid Transit
The Blue Book	Managing Urban Stormwater, Soils and Construction guidelines, Volumes 1 (Landcom, 2004) and 2 (2008)
BOM	Bureau of Meteorology
BS	British Standard
BTEX	Benzene, toluene, ethylbenzene and xylene
Burra Charter	<i>Australia International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance</i>
CALD	Culturally and Linguistically Diverse
CASA	Civil Aviation Safety Authority
CBD	Central business district
CCT	Cross City Tunnel
CCTV	Closed circuit television
CEMP	Construction environmental management plan
CEO	Chief Executive Officer
Chart datum	The level of water from which charted depths displayed on a nautical chart are measured
CH <sub>4</sub>	Methane
CLM Act	<i>Contaminated Land Management Act 1997</i>
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
Cofferdam	A temporary enclosure within a body of water that is constructed to allow dewatering of an enclosed area
Complaint fatigue	An impact that may occur where community perceptions of project complaint management systems result in failure to report concerns about construction impacts. This impact may

Abbreviation	Definition
	be compounded where multiple agencies are responsible for issues in the same area where construction of multiple projects occurs
Construction fatigue	An impact that may be experienced by receivers that are in the vicinity of concurrent or consecutive project construction activities where the activities overlap or have little or no break between the activities of one project, or multiple adjacent projects
Construction footprint	The total area required to facilitate the construction of the project
Construction support sites	Parcels of land on which temporary construction-related activities would be carried out
COVID-19	Coronavirus disease
CPTED	Crime prevention through environmental design
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cumulative impact	An impact that may occur when impacts from one project interact or overlap with impacts from other projects and potentially result in a larger overall effect on the environment, businesses or local communities. Cumulative impacts may also occur when projects are constructed consecutively with construction activities occurring over extended periods of time with little to no break in between
Cut and cover tunnel	Tunnels that are typically constructed at locations where the tunnel alignment does not have enough rock cover to support the construction of traditional driven tunnels
DAWE	Department of Agriculture, Water and Environment
dB	Decibel
dB(A)	A-weighted decibels
DEC	Department of Environment and Conservation (former)
DECC	Department of Environment and Climate Change (former)
DECCW	Department of Environment, Climate Change and Water (former)
DEWHA	Department of the Environment, Water, Heritage and the Arts (former)
Dioxins	Polychlorinated dibenzo-para-dioxins
DIPNR	Department of Infrastructure, Planning and Natural Resources (former)
DLWC	Department of Lands and Water Conservation (former)
DPE	Department of Planning and Environment (now known as Department of Planning, Industry and Environment)
DPI	Department of Primary Industries

Abbreviation	Definition
DPIE	Department of Planning, Industry and Environment
Drained structures	Underground structures designed to allow the inflow of groundwater, which is then captured, treated and discharged
Drawdown	The localised lowering of groundwater levels as a result of water extraction
Dredging	Excavation carried out underwater or partially underwater
Driven tunnel	Tunnels excavated using roadheaders
DUAP	Department of Urban Affairs and Planning (former)
EEC	Endangered ecological community
EES	Environment, Energy and Science Group within the Department of Planning, Industry and Environment
EIA	Environmental impact assessment
EIS	Environmental Impact statement
EMM	Environmental management measure
EMS	Environmental management system
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPL	Environment protection licence
ESD	Ecologically sustainable development
ESP	Electrostatic precipitator
FDM	Floodplain Development Manual
Floodway	Floodplains that transmit large quantities of water
Flood fringe	Floodplains that do not play a significant role in either storing or conveying water
Flood storage	Floodplains that store a significant volume of water
FM Act	<i>Fisheries Management Act 1994</i>
GDE	Groundwater dependent ecosystem
GHF	Gore Hill Freeway
GIS	Geographic Information System
Gore Hill Freeway Connection	Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon
GPS	Global positioning system

Abbreviation	Definition
GRAL	Graz Lagrangian model
GRAMM	Graz Mesoscale model
Groundwater	All waters occurring below the land surface. The upper surface of the soils saturated by groundwater in any particular area is called the water table
GSC	Greater Sydney Commission
GSP	Gross state product
gy	Gynea landscape group
ha	Hawkesbury landscape group
HEPA	Heads of EPAs Australia and New Zealand
HGV	Heavy goods vehicle
IAQM	UK Institute of Air Quality Management
IBC	Intermediate bulk containers
IBRA	Interim Biogeographically Regionalisation of Australia
ICNG	Interim Construction Noise Guideline
ICOMOS	International Council on Monuments and Sites
Immersed tube tunnel	A series of steel tunnel segments placed on top, or within the top layers, of harbour rock and sediment
IMT	Immersed tube tunnel
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
INP	Industrial Noise Policy
IPCC	International Panel on Climate Change
ISC	Infrastructure Sustainability Council
ISO	International Organisation for Standardisation
ISQG	High and Low Interim Sediment Quality Guidelines
kg	Kilogram
km	Kilometre
km/h	Kilometres per hour
kN	Kilonewtons
ktCO <sub>2</sub> -e	Kilotonnes of carbon dioxide equivalent
kV	Kilovolt
la	Lambert landscape group



Abbreviation	Definition
LA90	Noise level exceeded for 90 per cent of the measurement period
LAeq	Sound level in decibels equivalent to the total A-weighted sound energy measured over a stated period of time
L <sub>Amax</sub>	Maximum A – weighted sound pressure level
LALC	Local Aboriginal Land Council
LCT	Lane Cove Tunnel
LCZ	Landscape character zone
LED	Light-emitting diode
LEP	Local environmental plan
LGA	Local government area
LoS	Level of service
L/s/km	Litres per second per kilometre
LSPS	Local Strategic Planning Statement
m	Metre
m/s	Metres per second
mm	Millimetres
mm/s	Millimetres per second
m <sup>2</sup>	Square metres
m <sup>3</sup>	Cubic metres
m <sup>3</sup> /s	Cubic metres per second
Mainline tunnel	<p>Commencing at the Warringah Freeway at Cammeray, the mainline tunnels would pass under Naremburn and Northbridge, then cross Middle Harbour between Northbridge and Seaforth. The mainline tunnels would then split under Seaforth into two ramp tunnels and continue north to the Wakehurst Parkway at Killarney Heights and north-east to Balgowlah.</p> <p>The mainline tunnels would also have on and off ramps from under Northbridge connecting to the Gore Hill Freeway and Reserve Road east of the existing Lane Cove Tunnel.</p>
Mature amenity trees	Trees that are over three metres in height that do not classify for offset under the NSW Biodiversity Offsets Scheme, established under Part 6 of the Biodiversity Conservation Act 2016.
MSDS	Material Safety Data Sheet
mf	Manmade fill

Abbreviation	Definition
mg	Milligrams
mg/L	Milligrams per litre
mg/m <sup>3</sup>	Milligrams per cubic metre
ML/year	Megalitres per year
Midblock	A general location on a road between two intersections
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
MTB	Manly Warringah Mountain Bike
MVA	Megavolt ampere
NAGD	National Assessment Guidelines for Dredging
NBN	National Broadband Network
NBSC	Northern Beaches Secondary College
NCA	Noise catchment area
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Ambient Air) Measures
NHMRC	National Health and Medical Research Council
NML	Noise management level
NO	Nitrogen oxides
NO <sub>2</sub>	Nitrous dioxide
NO <sub>x</sub>	Nitrogen oxides
North Sydney Program	North Sydney Integrated Transport Program
NPW	National Parks and Wildlife
NSITP	North Sydney Integrated Transport Program
NSROC	Northern Sydney Regional Organisation of Councils
NSW	New South Wales
NSW Approved Methods	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW
NTU	Nephelometric turbidity unit
NZS	New Zealand Standard
OCP	Organochlorine pesticides
OCSE	Office of the Chief Scientist and Engineer

Abbreviation	Definition
OEH	Office of Environment and Heritage (now known as the Department of Premier and Cabinet (Heritage) or Heritage NSW)
OLS	Obstacle limitation surface
OOHW	Out of hours work
OPP	Organophosphorus pesticides
OU	Odour unit
PACHCI	Procedure for Aboriginal cultural heritage consultation and investigation
PAD	Potential archaeological deposit
PAH	Polycyclic aromatic hydrocarbons
Palaeochannels	Old river or stream channels which have been filled or buried by younger sediment
PANS-OPS	Procedures for air navigation services - aircraft operations
PASS	Potential acid sulfate soil
PCB	Polychlorinated biphenyls
PCT	Plant community type
PCU	Passenger car unit
PFAS	Poly-fluoroalkyl substances
PFHxS	Perfluorohexane sulfonic acid
PFOS	Perfluorooctane sulfonic acid
pH	A measure of the degree of acidity or alkalinity expressed on a logarithmic scale of 1-14, on which 1 is most acid, 7 is neutral and 14 is most basic (alkaline)
PIARC	Permanent International Association of Road Congress
Pile	Heavy stake or post installed to support the foundations of a structure
PIR	Preferred infrastructure report
PM peak	Time period between 5pm and 6pm
PM <sub>2.5</sub>	Particulate matter less than or equal to 2.5 micrometre diameter
PM <sub>10</sub>	Particulate matter less than or equal to 10 micrometre diameter
PMF	Probable maximum flood
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)

Abbreviation	Definition
Point to point transport	Includes taxis, hire cars, tourist services, rideshare services and other vehicles with 12 seats or less (including the driver) that provide passenger transport services for a fare
ppm	Parts per million
Probable maximum flood event	The largest flood that could conceivably occur (a worst-case flood event)
Project area	In relation to operational noise, the project area is the same as the project assessment area as defined in Section 3.5.2 of Appendix G (Technical working paper: Noise and vibration)
PVC	Polyvinyl chloride
RAP	Remediation Action Plan
RBL	Rating background level
REF	Review of environmental factors
Residual lands	Lots that would be wholly or partially occupied during construction of the project, but would not be required for permanent operational infrastructure or other operational activities (also referred to as surplus lands)
RFS	Rural Fire Service
Rh	Hawkesbury sandstone
RMS	NSW Roads and Maritime Services (now part of Transport for NSW)
Roadheader	An excavation machine that has a rotating, rock-cutting head on the front, mounted to a boom
Roads and Maritime	NSW Roads and Maritime Services (now part of Transport for NSW)
RSL	Returned & Services League of Australia
RTA	Roads and Traffic Authority of NSW (former)
Rwa	Ashfield shale
SEARs	Secretary's environmental assessment requirements
SEED	NSW Government's central resource for Sharing and Enabling Environmental Data
SDS	Site Safety Data Sheet
SEPP	State environmental planning policy
SHT	Sydney Harbour Tunnel
SIDRA	A software package used for intersection and network capacity, level of service and performance analysis, and signalised intersection and network timing calculations
SIMS	Sydney Institute of Marine Science



Abbreviation	Definition
SIX	Spatial Information eXchange
SMCMA	Sydney Metropolitan Catchment Management Authority
SMPM	Sydney Motorway Planning Model
Social infrastructure	Facilities, spaces, services and networks that support the quality of life and wellbeing of communities
SO <sub>2</sub>	Sulphur dioxide
Spadable	A consistency which allows the material to be spaded or shovelled
SRA	State Rail Authority
SREP	Sydney regional environmental plan
SSI	State Significant Infrastructure
Stage 1 contamination investigation	A preliminary investigation to identify the potential for site contamination, consistent with Section 1.1 of <i>Consultants reporting on Contaminated Land – Contaminated Land Guidelines</i> (NSW Environment Protection Authority (EPA), 2020). For the project this investigation was based on a desktop review of background and historical information, site inspections and limited sampling. Areas identified with the potential for site contamination were labelled potential areas of environmental interest
Stage 2 contamination investigation	A detailed site investigation consistent with Section 1.3 of <i>Consultants reporting on Contaminated Land – Contaminated Land Guidelines</i> (NSW EPA, 2020) that provides information on the extent and degree of contamination present based on sampling eg boreholes, test pits, groundwater wells, gas testing. For the project, Stage 2 detailed site investigations will be completed at potential terrestrial areas of environmental interest in accordance with revised environmental management measure SG8
Standard construction hours	7am to 6pm Monday to Friday, 8am to 1pm Saturday and no construction works on Sundays or public holidays
State and Regional Development SEPP	State Environmental Planning Policy (State and Regional Development) 2011
STM	Strategic Travel Model
Substratum acquisition	The acquisition of land below the surface of the ground
TAFE	Technical and further education
TAGG	Transport Authorities Greenhouse Group
TBM	Tunnel boring machine
TBT	Tributyltin
TCDD	Tetrachlorodibenzo para dioxin
TCLP	Toxicity Characteristic Leaching Procedure

Abbreviation	Definition
TEC	Threatened ecological community
TEQ	Toxic equivalence quotient
TfNSW	Transport for NSW
THC	Total hydrocarbon
The project	The Beaches Link and Gore Hill Freeway Connection project
TMAP	Transport Management and Accessibility Plan
Transport for NSW	Transport for New South Wales
TRH	Total recoverable hydrocarbons
Trough structure	Similar to cut and cover structure, except a cover is not required
TSP	Total suspended particles
TSS	Total suspended solids
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNSW	University of New South Wales
USEPA	United States Environmental Protection Agency
µg/m <sup>3</sup>	Microgram per cubic metre
V/C	Volume to capacity ratio
VENM	Virgin excavated natural material
VIS	Vegetation Information System
VISSIM	Traffic simulation software that simulates all modes of traffic and analyses their interactions
VKT	Vehicle kilometres travelled
VOCs	Volatile organic compounds
Warringah Freeway Upgrade	Upgrade and integration works along the existing Warringah Freeway, including infrastructure required for connections to the Beaches Link and Gore Hill Freeway Connection project
WBCSD	World Business Council for Sustainable Business Development
Western Harbour Tunnel	A new crossing of Sydney Harbour involving twin motorway tunnels connecting the M4-M5 Link at Rozelle and the existing Warringah Freeway at North Sydney
WFU	Warringah Freeway Upgrade
WHO	World Health Organisation

Abbreviation	Definition
WHT	Western Harbour Tunnel
WHTBL	Western Harbour Tunnel and Beaches Link
WPS	Water Pumping Station
WQO	NSW water quality objectives
WRI	World Resources Institute