

Table of Contents

ES.	Executive Summary	ES-1
ES-1	Description of the Proposal	ES-1
ES-2	Project Justification	ES-1
ES-3	Consultation and Approval Process	ES-1
ES-4	Environmental Impacts of the Proposed Transmission Line	ES-2
ES-4.1	Flora and Fauna	ES-2
ES-4.2	Cultural Heritage	ES-3
ES-4.3	Soils	ES-3
ES-4.4	Hydrology and Water Quality	ES-4
ES-4.5	Air Quality	ES-4
ES-4.6	Noise	ES-4
ES-4.7	Land Use	ES-4
ES-4.8	Visual Amenity	ES-5
ES-4.9	Electric and Magnetic Fields	ES-5
ES-4.10	Environmental Management	ES-5
ES-5	Conclusion	ES-6
ES-6	How to Make a Response to the EIS	ES-6
ES-7	Legislative Changes	ES-7

1.	Introduction	1-1
1.1	Project Overview	1-1
1.2	The Proponent (TransGrid)	1-3
1.3	Key Stakeholders	1-3
1.3.1	TransGrid	1-3
1.3.2	Government	1-3
1.3.3	Community	1-4
1.4	Consultation	1-4
1.4.1	Community and Stakeholder Consultation During Corridor Selection Process	1-5
1.4.2	Community and Stakeholder Consultation During EIS Preparation	1-6
1.4.3	Government Authorities	1-7
1.5	EIS Structure	1-15
1.6	Project Team	1-17

2.	Legislation and Planning	2-1
2.1	Statutory Requirements	2-1
2.1.1	Environmental Planning and Assessment Act, 1979	2-1
2.1.2	Part 3A of the EP&A Act	2-1
2.2	Environment Protection and Biodiversity Conservation Act	2-2
2.3	Forestry Act	2-3
2.4	Native Vegetation Conservation Act, 1997 and Native Vegetation Act, 2003	2-3

2.5	National Parks and Wildlife Act	2-3
2.5.1	Permissible Activities	2-4
2.5.2	Protection of Native Flora and Fauna	2-4
2.5.3	Protection of Heritage	2-5
2.6	Heritage Act 1977	2-5
2.7	Noxious Weeds Act 1993	2-5
2.8	NSW Land Acquisition (Just Terms Compensation) Act 1991	2-6
2.9	Water Management Act 2000 / Rivers and Foreshores Improvement Act 1948	2-6
2.10	Local and Regional Planning Instruments	2-6
2.10.1	Hunter Regional Environmental Plan 1989	2-7
2.10.2	Mudgee LEP 1998	2-7
2.10.3	Merriwa LEP 1992	2-9
2.10.4	Wellington LEP 1995	2-10
2.10.5	Mudgee Shire Sustainable Development Strategy 2003	2-11
2.10.6	Central West Catchment Blueprint	2-11
2.11	State Environmental Planning Instruments and Policies	2-12
2.11.1	SEPP No. 44 – Koala Habitat Protection	2-12
2.11.2	SEPP No. 55 – Remediation of Land	2-12
2.11.3	SEPP (State Significant Development) 2005	2-12
2.11.4	NSW Rivers and Estuaries Policy	2-13
2.11.5	Soil and Landscape Issues in Environmental Impact Assessment	2-13
2.12	Environmental Assessment Process	2-13

3.	Project Justification and Alternatives	3-1
3.1	Electricity Supply Planning	3-1
3.1.1	Supply Adequacy and the Planning Criterion	3-1
3.1.2	The Planning Process	3-2
3.1.3	Transmission Network Limitations – General Considerations	3-3
3.1.4	Transmission Network Limitations – Western Area	3-4
3.1.5	Maintenance Considerations	3-5
3.2	Project Justification	3-5
3.2.1	Limitations in the Existing Transmission Network	3-6
3.2.2	Existing Electrical Loads and Their Economic Importance	3-7
3.2.3	Growth in Demand for Electricity	3-7
3.2.4	Demand Management	3-9
3.2.5	Project Justification - Summary	3-10
3.3	Project Alternatives – Other Energy Sources	3-10
3.3.1	Solar Energy	3-10
3.3.2	Hydro-electric Power	3-11
3.3.3	Wind Energy	3-11
3.3.4	Combustion Turbines	3-11
3.3.5	Biomass	3-12
3.3.6	Geothermal Energy	3-12
3.3.7	Fuel Cells	3-12
3.3.8	Nuclear Power	3-12

3.3.9	Conclusion	3-12
3.4	Project Alternatives - Network Options	3-12
3.4.1	Option 1 (Wollar-Wellington)	3-13
3.4.2	Option 2 (Yetholme – Kerr’s Creek)	3-13
3.4.3	Option 3 (Yetholme – Wellington)	3-14
3.4.4	Advantages, Disadvantages and Risks of Network Options	3-15
3.4.5	Economic Considerations	3-17
3.5	Preferred Transmission Line Development	3-18
3.6	Project Justification Issues and Mr Robert Needham	3-18
3.7	Route Development Process	3-19
3.8	Alternative Route Options	3-20
3.8.1	Northern Corridor	3-20
3.8.2	Central Corridor	3-20
3.8.3	Southern Corridor	3-20
3.9	Assessment of Viable Corridors	3-20
3.9.1	Number of Houses	3-21
3.9.2	Distance of Transmission Line to Existing Houses	3-21
3.9.3	Use of Existing Infrastructure Easements	3-21
3.9.4	Property Size	3-22
3.9.5	Tourism Impacts	3-22
3.9.6	Visual Impacts	3-22
3.9.7	Land Capability	3-22
3.9.8	EMF	3-22
3.9.9	Threatened Species	3-22
3.9.10	Vegetation	3-23
3.9.11	National Parks and Nature Reserves	3-23
3.9.12	Historical Heritage	3-23
3.9.13	Aboriginal Heritage	3-23
3.9.14	Engineering Aspects and Costs	3-23
3.10	Preferred Corridor Selection	3-24
3.11	Ecologically Sustainable Development	3-24
3.11.1	Precautionary Principle	3-25
3.11.2	Intergenerational Equity	3-26
3.11.3	Conservation and Biological Diversity and Ecological Integrity	3-26
3.11.4	Improved Valuation and Pricing of Environmental Resources	3-27
4.	Description of Proposed Development	4-1
4.1	Preferred Alignment Overview	4-1
4.2	Project Overview	4-1
4.3	Project Schedule	4-2
4.4	Detailed Description of the Route	4-3
4.4.1	Wollar Substation Site – Wollar Road	4-3
4.4.2	Wollar Road – Sandy Hollow-Maryvale Railway	4-3
4.4.3	Sandy Hollow-Maryvale Railway – Ulan Colliery (around Goulburn River National Park)	4-4
4.4.4	Ulan Colliery – Cope State Forest	4-5

4.4.5	Cope State Forest – Gwabegar–Wallerawang Railway Line	4-6
4.4.6	Gwabegar–Wallerawang Railway Line – Castlereagh Highway	4-7
4.4.7	Castlereagh Highway – Goolma Road	4-7
4.4.8	Goolma Road – Spicer Creek Road	4-8
4.4.9	Spicer Creek Road – Wellington Substation	4-8
4.4.10	Determination of Tower Sites Access Track Locations	4-9
4.5	Physical Components of the Transmission Line	4-32
4.5.1	Supporting Structures	4-32
4.5.2	Conductors	4-33
4.5.3	Insulators	4-33
4.5.4	Earthwires	4-33
4.6	Ground Clearance	4-34
4.7	Associated Infrastructure	4-34
4.7.1	New Switching Station in Wollar	4-34
4.7.2	Augmentation of Wellington 330 kV Substation	4-35
4.7.3	Connections to Wollar Substation	4-35
4.8	Easement Requirements	4-35
4.9	Construction Procedures	4-36
4.9.1	Centreline and Easement Surveys	4-36
4.9.2	Access Track Construction	4-37
4.9.3	Vegetation Clearing	4-37
4.9.4	Tower Foundations	4-39
4.9.5	Tower Erection	4-39
4.9.6	Conductor and Earthwire Erection	4-40
4.10	Erosion and Sediment Control	4-41
4.10.1	Access Tracks	4-41
4.10.2	Stream and Drainage Line Crossings	4-43
4.10.3	Works within 40 m of Prescribed Streams	4-43
4.11	Cost of Construction	4-43
4.12	Rehabilitation Program	4-43
4.13	Operation and Maintenance of the Line	4-44
4.13.1	Structure and Conductor Maintenance	4-44
4.13.2	Easement and Access Track Maintenance	4-44
4.14	Construction Schedule and Hours of Operation	4-45
4.14.1	Construction Schedule	4-45
4.14.2	Workforce	4-45
4.14.3	Construction Hours	4-45
4.15	Fuels and Lubricants	4-46
4.16	Fire Protection	4-46
4.17	Energy Statement	4-47
4.18	Waste Management	4-48

5.	Land Systems and Environmental Effects	5-1
5.1	Topography, Geology and Soils	5-1
5.1.1	Topography	5-1
5.1.2	Regional Geology	5-1

5.1.3	Soils	5-2
5.1.4	Potential Impacts on Soils	5-7
5.1.5	Mitigation Measures	5-8
5.2	Geotechnical Issues and Assessment	5-8
5.2.1	Laboratory Testing	5-8
5.2.2	Subsurface Conditions	5-10
5.2.3	Tower Footings	5-10
5.2.4	Assessment of Geotechnical Issues	5-10
5.3	Hydrology and Water Quality	5-13
5.3.1	Existing Hydrological Regime	5-13
5.3.2	Hydrology and Water Quality Safeguards	5-14
5.4	Flora and Fauna	5-15
5.4.1	Survey Methodology	5-17
5.4.1.1	<i>Flora Investigation</i>	5-17
5.4.1.2	<i>Fauna Investigation</i>	5-19
5.4.2	Vegetation Communities	5-21
5.4.2.1	<i>Black Cypress Pine – Broad-leaved Ironbark Open Forest</i>	5-23
5.4.2.2	<i>Black Cypress Pine</i>	5-24
5.4.2.3	<i>Black Cypress Pine – White Box Woodland</i>	5-25
5.4.2.4	<i>Black Cypress Pine – Red Box Woodland</i>	5-26
5.4.2.5	<i>Black Cypress Pine – Tumble-down Red Gum Woodland</i>	5-27
5.4.2.6	<i>Yellow Box – Blakely’s Red Gum Woodland</i>	5-28
5.4.2.7	<i>Yellow Box – White Box Woodland</i>	5-30
5.4.2.8	<i>White Box – Inland Grey Box Woodland</i>	5-31
5.4.2.9	<i>White Box Woodland</i>	5-32
5.4.2.10	<i>White Box – Red Stringybark Woodland</i>	5-34
5.4.2.11	<i>Blakely’s Red Gum Woodland</i>	5-35
5.4.2.12	<i>River Red Gum Riparian Woodland</i>	5-35
5.4.2.13	<i>Fuzzy Box Woodland</i>	5-36
5.4.2.14	<i>Cleared/Partially Cleared</i>	5-36
5.4.2.15	<i>Improved Pasture and Cropland</i>	5-37
5.4.3	Fauna and Fauna Habitats	5-38
5.4.3.1	<i>Fauna Habitats</i>	5-38
5.4.3.2	<i>Corridors and Habitat Links</i>	5-39
5.4.3.3	<i>Fauna Species</i>	5-40
5.4.4	Significant Flora and Fauna	5-43
5.4.5	Impact Assessment and Mitigation Strategies	5-44
5.4.5.1	<i>Fauna Rescue and Pre-clearance Surveys</i>	5-45
5.4.5.2	<i>Nest Box Erection</i>	5-45
5.4.5.3	<i>Site-specific Conservation Measures</i>	5-46
5.4.6	Offset Strategies and Sustainability	5-47
5.5	Aboriginal Archaeology and European Heritage	5-48
5.5.1	Aboriginal Heritage	5-49
5.5.1.1	<i>Archaeological Significance</i>	5-56
5.5.1.2	<i>Impact Assessment</i>	5-58
5.5.1.3	<i>Management</i>	5-60
5.5.2	European Heritage	5-64

5.5.2.1	<i>Survey Results - European Heritage</i>	5-64
5.5.2.2	<i>Significance</i>	5-67
5.5.2.3	<i>Mitigation and Management Measures for Non-Indigenous Heritage</i>	5-69
6.	Emissions and Environmental Effects	6-1
6.1	Electric and Magnetic Fields	6-1
6.1.1	Existing Environment	6-1
6.1.2	Predicted Fields Associated with the Project	6-3
6.1.3	Environmental Effects and Impact Assessment	6-7
6.2	Noise	6-19
6.2.1	Existing Conditions	6-19
6.2.2	Noise Assessment Criteria	6-19
6.2.2.1	<i>Construction Noise</i>	6-19
6.2.2.2	<i>Ground Vibration</i>	6-20
6.2.2.3	<i>Blast Assessment Goals</i>	6-22
6.2.3	Noise Emissions and Impacts	6-23
6.2.3.1	<i>Construction Equipment Noise Emission Levels</i>	6-23
6.2.3.2	<i>Construction Equipment Vibration Emission Levels</i>	6-24
6.2.3.3	<i>Construction Noise Impact Assessment</i>	6-24
6.2.3.4	<i>Construction Vibration Impact Assessment</i>	6-25
6.2.3.5	<i>Blast Impact Assessment</i>	6-25
6.2.4	Noise Controls and Safeguards	6-26
6.3	Air Quality	6-27
6.3.1	Emissions and Impacts	6-27
6.3.2	Air Quality Safeguards	6-27
6.4	Greenhouse Gases	6-28
6.5	Transportation Impacts	6-28
6.5.1	Existing Traffic Network and Flows	6-28
6.5.2	Expected Traffic Generation	6-29
6.5.3	Transportation Impacts	6-29
6.5.4	Transport Controls and Safeguards	6-31
6.6	Fire Risk	6-31
7.	Social and Economic Considerations	7-1
7.1	Land Ownership	7-1
7.2	Surrounding Land Uses and Impacts	7-1
7.2.1	Mining and Resources Recovery	7-2
7.2.2	Agricultural Suitability	7-2
7.2.3	Weed Controls	7-4
7.2.4	Urban Development and Industry	7-7
7.2.5	Agriculture and Horticulture	7-7
7.2.6	Forestry	7-8
7.2.7	Recreation and Tourism	7-8
7.3	Visual Amenity	7-10
7.3.1	Existing Landscape Elements	7-10

7.3.2	Assessment Criteria	7-13
7.3.3	Visual Impacts	7-16
7.3.4	Mitigation Measures	7-17
7.4	Social Impacts	7-18
7.5	Employment Generation	7-21
7.6	Accommodation	7-21
7.7	Social Amenity Issues	7-21
7.8	Access Issues	7-22
7.9	Property	7-22
7.9.1	Land Use Effects	7-22
7.9.2	Compensation Issues	7-22
7.10	Transmission Line Easements	7-23
7.11	Television and Radio Interference	7-25
7.12	Electrical Safety	7-25
8.	Environmental Management and Conclusions	8-1
8.1	Potential Environmental Impacts	8-1
8.1.1	Project Specific Impacts	8-1
8.1.2	Cumulative Impacts	8-1
8.2	Compilation of Mitigation Measures	8-2
8.3	Environmental Management System	8-4
8.4	Environmental Management Plan	8-4
8.5	Conclusion	8-6
Project Environmental Management Plan		
Tables		
Table 1.1	Government Authority Development Requirements	Page 1-8
Table 3.1	Best Estimate Summer and Winter Maximum Demand Forecast	Page 3-8
Table 3.2	Comparison of Transmission Options Advantages, Disadvantages and Risks	Page 3-16
Table 3.3	Capital Costs of Transmission Options (in \$ millions)	Page 3-17
Table 4.1	Distance of the Proposed Transmission Line to Residences	Page 4-9
Table 4.2	Environmental Summary of Supporting Structures	Page 4-10
Table 4.3	Typical Structure Characteristics	Page 4-31
Table 4.4	Cross Bank Spacing (m)	Page 4-42
Table 5.1	Geological Units Along the Proposed Transmission Line	Page 5-2
Table 5.2	Soil Characteristics along the Proposed Transmission Line	Page 5-8
Table 5.3	Laboratory Test Results – Soil Classification	Page 5-9
Table 5.4	Laboratory Test Results – soil Chemical Analysis	Page 5-9

Table 5.5	Unconfined Compressive Strengths	Page 5-9
Table 5.6	Summary of Geological Environment	Page 5-10
Table 5.7	Summary of Subsurface Conditions	Page 5-11
Table 5.8	Intensive Vegetation Survey	Page 5-18
Table 5.9	Fauna Survey Effort	Page 5-21
Table 5.10	Fauna Species Recorded in Study Area	Page 5-40
Table 5.11	Major Threatened Species and Communities Found within the Study Area	Page 5-43
Table 5.12	Descriptions of Indigenous sites recorded during the current survey	Page 5-51
Table 5.13	All tower sites and creek crossings within the study area that have Indigenous Heritage recommendations attached to them	Page 5-54
Table 5.14	Scientific assessment of sites recorded during this survey	Page 5-56
Table 5.15	Summary of Likely Impacts to Recorded Indigenous Sites	Page 5-58
Table 5.16	Impacts and mitigation measures for recorded archaeological sites within the study area	Page 5-61
Table 5.17	Summary of Likely Impacts to Recorded Non-Indigenous Sites	Page 5-69
Table 6.1	Typical magnetic field at normal user distances from Australian appliances	Page 6-3
Table 6.2	Key Measures of Electric Fields	Page 6-6
Table 6.3	Tabulated Prediction of Magnetic Fields	Page 6-7
Table 6.4	NHMRC Limits of Exposure	Page 6-14
Table 6.5	Construction Noise Goals (Day) dB(A) ref: 20×10^{-6} Pa	Page 6-20
Table 6.6	Vibration Limits (Human Annoyance) Velocity (vertical axis 1 Hz – 80 Hz)	Page 6-21
Table 6.7	Human Perception of Vibration Ref: German Standard DIN 4150 (1986)	Page 6-21
Table 6.8	Structural Damage Goals Ref: British Standard BS7385 (1993)	Page 6-21
Table 6.9	Assessment Goals for Blasting	Page 6-23
Table 6.10	Typical Plant and Equipment dB(A) re: 20×10^{-6} Pa	Page 6-23
Table 6.11	Typical Plant Vibration Levels mm/s	Page 6-24
Table 6.12	Predicted Noise Levels from Construction Activities L_{A10} dB(A) re: 20×10^{-6} Pa	Page 6-25
Table 6.13	Predicted Air-blast Overpressure MIC's	Page 6-26
Table 6.14	Predicted Ground Vibration (Average Rock Conditions) MIC's 6.3.2(a) Assessment	Page 6-26
Table 6.15	Traffic Volumes in the Region	Page 6-29
Table 6.16	Austroad Traffic Service Assessment Criteria for Rural Roads	Page 6-30
Table 7.1	Visual Impacts - New Corridor Created	Page 7-17
Table 7.2	Population Summary of Affected Local Government Areas (Based on Australian Bureau of Statistics Census Data)	Page 7-19
Table 8.1	Compilation of Proposed Mitigation Measures	Page 8-2

Volume 2 - Appendices

- Appendix A** - Species Impact Statement
 - Appendix B** - Archaeological and Heritage Report
 - Appendix C** - Noise Impact Assessment
 - Appendix D** - Requirements of the Director General
 - Appendix E** - Relevant Correspondence
-

Volume 3 - Figures and Plans

- Figure 1** – Route Alignment
- Figure 2** – Route Alignment East
- Figure 3** – Route Alignment West
- Figure 4** – Regional Topography
- Figure 5** – Soil Landscapes
- Figures 6a to 6o** – Existing Environment
- Figures 7a to 7o** – Visual Catchment

Visual Montages 1 to 10

Project Route Plans 1 to 42
