Table of Contents

Sec	tion		Page
LIS.	T OF T	ABLES	VI
		GURES	
		_ATES	
		PPENDICES	
		MENTAL ASSESSMENT CERTIFICATION	
		TIONS	
		EXPLANATION OF MAP GRIDS	
		Υ	
FXF	CUTIV	E SUMMARY	ES-1
	ES1	Introduction	
	ES2	Project Objectives and Alternatives Considered	
	ES3	Project Description	
	ES4	Planning Context, Approvals and Consultation	
	ES5	Existing Environment	
	ES6	Visual Issues	
	ES7	Flora and Fauna Issues	
	ES8	Heritage Issues	ES-7
	ES9	Traffic and Transport Issues	ES-8
	ES10	Noise Issues	ES-8
	ES11	Telecommunications Interference	ES-9
	ES12	Safety Issues	ES-9
	ES13	Greenhouse Issues	ES-10
	ES14	Cumulative Impact	ES-10
	ES15	Statement of Commitments	ES-10
	ES16	Project Justification	ES-10
1.	INTRO	DDUCTION	1-1
	1.1	Background	1-1
	1.2	Overview of Proposed Development	1-1
	1.3	Project Location	1-2
	1.4	Properties involved in the Development	1-2
	1.5	Local Government Areas	1-4
	1.6	Project Participants	1-5
	1.7	Greenhouse Gas Emissions	1-6

	1.8	National Electricity Market	1-6
	1.9	Outline of Planning Requirements and Purpose of this Document	1-6
	1.10	Stages of the Development Process	
	1.11	Contributors to the Environmental Assessment Process	
	1.12	Structure and Content of this Environmental Assessment	1-9
	1.13	Contact Details for Further Information	1-10
2.	PRO	JECT CONTEXT AND ALTERNATIVES CONSIDERED	2-1
	2.1	Context for Wind Energy Developments	2-1
	2.2	Renewable Power Ventures consideration of feasible alternatives	2-5
3.	PRO	JECT DESCRIPTION	3-1
	3.1	Wind Farm Layout	3-1
	3.2	Wind Turbines	3-2
	3.3	Electrical Works	3-4
	3.4	Site Access Works	3-6
	3.5	Utility Services	3-9
	3.6	Ongoing Wind Monitoring	3-9
	3.7	Overview of Connection to the Electricity Grid	3-10
	3.8	Wind Farm Development Phases	3-11
	3.9	Construction Impacts	3-13
	3.10	Environmental Management of Construction Impacts	3-18
4.	PLAN	INING CONTEXT, APPROVALS AND CONSULTATION	4-1
	4.1	Key Planning Considerations	4-1
	4.2	NSW Development Control	4-1
	4.3	State Environmental Planning Policies (SEPPs)	4-11
	4.4	Relevant Planning and EIA Guidelines	4-12
	4.5	Relevant New South Wales Environmental Acts	4-13
	4.6	Federal Statutory Controls	4-15
	4.7	Approvals for the Capital Wind Farm Project	4-16
	4.8	Consultation	4-17
5.	EXIS	TING ENVIRONMENT	5-1
	5.1	Regional Setting and Topography	5-1
	5.2	Climate	5-4
	5.3	Air Quality Aspects	
Ren	ewable	Power Ventures	Connell Wagner PPI

Connell Wagner PPI

	5.4	Geology	5-7
	5.5	Soils Assessment	5-10
	5.6	Site Drainage, Water Resources & Water Quality	5-14
	5.7	Land Use	5-18
	5.8	Social Aspects	5-22
	5.9	Economic Aspects	5-24
6.	VISU	AL ISSUES	6-1
	6.1	Introduction	6-1
	6.2	Landscape Analysis	6-2
	6.3	Visual Catchment of the Wind Farm	6-2
	6.4	Visual Impact Assessment Sites	6-4
	6.5	Production of Photomontages for selected Viewpoints	6-4
	6.6	Visibility Assessment	6-5
	6.7	Visual Issues associated with Ancillary Works	6-6
	6.8	Shadow Flicker	6-7
	6.9	Blade Glint	6-8
	6.10	Mitigation of Visual Impact	6-8
	6.11	Overview of Visual Issues	6-9
7.	FLOF	RA AND FAUNA	7-1
	7.1	Introduction	7-1
	7.2	Flora	7-2
	7.3	Fauna	7-5
	7.4	Assessment of Conservation Values	7-10
	7.5	Impact of the Proposal on Flora and Fauna	7-16
	7.6	Mitigation Measures	7-22
8.	HERI	TAGE ISSUES	8-1
	8.1	Overview of Aboriginal Heritage Assessment	8-1
	8.2	Summary of Findings and Recommendations of the Archaeological Assessment	8-1
	8.3	Background Details	8-2
	8.4	Survey Details	8-4
	8.5	Aboriginal and Archaeological Significance	8-7
	8.6	Conclusions	8-8
	8.7	Mitigation Measures relating to Aboriginal Heritage Issues	8-9
	8.8	Non Aboriginal Heritage Issues	8-10

Renewable Power Ventures

Connell Wagner PPI

9.	TRAF	FIC AND TRANSPORT ISSUES	9-1
	9.1	Overview of Traffic and Transport Issues	9-1
	9.2	Deliveries to the Wind Farm Site	9-1
	9.3	Nature of Traffic on Local Roads during the Construction Stage	9-3
	9.4	On-Site Access Management	9-5
	9.5	Mitigation Measures	9-5
	9.6	Conclusions	9-6
10.	NOISI	E ISSUES	10-1
	10.1	Introduction	10-1
	10.2	Overview of Noise Impacts and their Assessment	10-1
	10.3	Project Components relative to noise impacts	10-2
	10.4	Residential Receivers	10-2
	10.5	Background Sound Levels and Objectives	10-3
	10.6	Source Sound Characteristics	10-4
	10.7	Sound Level Prediction Modelling for Wind Turbines	10-5
	10.8	Substation Noise	10-9
	10.9	Construction Noise	10-9
	10.10	Mitigation Matters	10-10
	10.11	Conclusions	10-10
11.	TELECOMMUNICATIONS INTERFERENCE11-		
	11.1	Introduction	11-1
	11.2	Radar	11-1
	11.3	Radio reception	11-2
	11.4	Mobile Phone and Microwave Communications	11-2
	11.5	Television Reception	11-3
	11.6	Mitigation Measures	
12.	SAFE	TY ASPECTS	12-1
	12.1	Introduction	
	12.2	Air Safety	12-1
	12.3	Physical Safety	
	12.4	Electrical Safety	
	12.5	Bushfire Risk	
	12.6	Road Safety	
	12.7	Use of Plant and Equipment on Steep Slopes	

Renewable Power Ventures

	12.8	Shadow Flicker	12-7
	12.9	Noise	
13.	GREI	ENHOUSE ISSUES	13-1
	13.1	Reasons for Reducing Greenhouse Gas Emissions	13-1
	13.2	Australian Greenhouse Gas Emissions and the Government's Response	13-1
	13.3	Wind Technology and Life Cycle Analysis of Emissions	13-3
	13.4	Estimation of Greenhouse Gas Emissions of the Capital Wind Farm	13-4
	13.5	Summary on Greenhouse	13-5
14.	CUM	ULATIVE IMPACTS	14-1
	14.1	Introduction	
	14.2	Wind Farm Developments in the Southern Tablelands	
	14.3	Wind Farm Developments within Palerang and Goulburn Mulwaree LGAs	
	14.4	Cumulative Effects of Existing and Planned Wind Farms in the Region	
	14.5	Other Industry in the Area with Similar Impacts	
	14.6	Advantages/Disadvantages of Future Wind Farms in the Region	
	14.7	Long Term Cumulative Impacts	14-3
	14.8	Short Term Cumulative Impacts	14-4
	14.9	Transmission Line Infrastructure	14-4
15.	STAT	EMENT OF COMMITMENTS	15-1
16.	PRO	JECT JUSTIFICATION	16-1
	16.1	Overview	16-1
	16.2	Additional Generation Capacity	
	16.3	Acceptability of Environmetnal Impacts	16-2
	16.4	Ecologically Sustainable Developments	16-3
	16.5	Project Benefits	
	16.6	Project Justification/Conclusion	16-5
17.	REFE	RENCES	17-1

List of Tables

Table	Description
1.1	Turbine Groups
1.2	Property Details for Land on which the Wind Farm is Located
1.3	Trig Stations relevant to the Wind Farm Project
1.4	The Environmental Assessment Preparation
3.1	Wind Farm Groups
3.2	Extent of the Development
3.3	Indicative Wind Speeds for Turbine Operational Mode
3.4	Summary of Access to Wind Farm Site
3.5	Details of Wind Monitoring at the Site
3.6	Locations of Proposed Permanent Wind Monitoring Towers
3.6	Wind Farm Development Phases – Planning Approval to Operation
3.7	Details of Suzlon 2.1 MW Wind Turbine Components
4.1	Summary of LEPs relevant to the Capital Wind Farm
4.2	Relevance of development to Mulwaree Zone 1(a) objectives
4.3	Relevance of development to Yarrowlumla Zone 1(a) objectives
4.4	LEP Clauses involving Special Provisions and Controls
4.5	List of Approvals for the Capital Wind Farm Project
4.6	Stakeholders consulted as part of the planning process
4.7	Capital Wind Farm: Key Stages of Consultation
4.8	Issues arising from Consultation undertaken to date
5.1	Key to Location of Sections Describing the Existing Environment
5.2	Locations of Climate Data Stations
5.3	Rainfall Statistics for Canberra Airport
5.4	Rainfall Statistics for Goulburn
5.5	Summary of Soil Landscape Characteristics at the Wind Farm Locality
5.6	Lake George Sub-catchments Draining Wind Farm Site
5.7	Proximity of Neighbouring Residences to the Wind Farm
5.8	Trigonometrical Stations in the Project Area
5.9	Population for Main Population Centres closest to Capital Wind Farm
5.10	Mulwaree (2001) Employment in Top 10 Industries
6.1	Visibility Assessment Results – Representative Viewpoints
7.1	Vegetation Communities of the Project Area
7.2	Summary of Bird Surveys for the Locality
7.3	Sightings of Birds of Prey
7.4	List of Bat Species Potentially Present and Recorded in the Study Area

Table	Description
7.5	Results of Reptile Surveys
7.6	List of Threatened Plant Species for the Project Area
7.7	List of Threatened Fauna Species for the Project Area or Nearby
7.8	Summary of Impact on Fauna Habitat
7.9	Relevant Key Threatening Processes
8.1	Summary of Aboriginal Sites Database in the Vicinity of the Study Area
8.2	Summary of Previous Studies
8.3	Description of Likely Archaeological Site Types
8.4	Summary of Ground Surface Visibility and Archaeological Potential
8.5	Listing of Identified Aboriginal Heritage Sensitive Areas
9.1	Predicted Traffic Movements on Public Roads for Transport of Equipment and Materials to the Site
10.1	Derived L _{Aeq} Sound Level Objectives at Selected Receiver Locations
10.2	Predicted and Objective Sound Levels at Relevant Receiver Locations
10.3	Summary of Predicted Exceedances of Criteria at Relevant Receivers
10.4	Predicted Noise Levels at Non Relevant Receivers
11.1	Details of Canberra Television Channels
11.2	Details of Illawarra Television Channels
13.3	Greenhouse Gas Emissions for Project Stages of a United States Wind Farm
15.1	Statement of Commitments

List of Figures

(Figures are located at back of chapter, except as shown below)

Figure No.	Description
ES-1	Project Layout
ES-2	Aerial Photo with Wind Farm Layout
1.1	Regional Location Plan
1.2	Locality Map
1.3	Wind Turbine Generator Schematic Diagram
1.4	Project Layout
1.5	Property Plan
1.6	Aerial Photo with Wind Farm Layout
1.7	Boundaries of Local Government Areas
1.8	Planning Assessment and Approvals Process
2.1	Annual Global Growth in Wind Power Generation (in text)
3.1	Schematic Arrangement – Electrical Cables and Overhead Lines
3.2	Conceptual Substation Layout
3.3	Construction Site Office General Layout
3.4	Turbine Construction
5.1	General Topographic Variation
5.2	Wind Monitoring
5.3	Wind Energy
5.4	Regional Geology
5.5	Soil Landscapes
5.6	Slope Map
5.7	Site Drainage Map, Creeks and Catchments
6.1	Visual Catchment and Viewpoints
7.1	Location of Endangered Communities
8.1	Location of Aboriginal Heritage Survey Units
8.2	Location of Aboriginal Heritage Sites and PAD
9.1	Traffic Access
10.1	Location of Residences and Background Noise Monitoring Sites
10.2	Predicted Noise Level Contours
11.1	Main Fixed Radio Links and Canberra Television Transmission Directions
11.2	Schematic Diagram of Television Signal Interference Zones around a Wind Turbine (in text)
11.3	Canberra Television Transmission Paths and Zones where Interference May Occur
13.1	Net CO ₂ -equivalent emissions by sector, 1990 – 2002 (in text)
13.2	Proportion of Australia's Greenhouse Gas Emissions caused by Electricity Generation (in text)
13.3	Greenhouse gas emissions for different generation types (g/kWh CO ₂ eq) (in text)
Renewable Po	wer Ventures Connell Wagner PPI

List of Plates

Plate No.	Description
3.1	Substation Site and Existing 330,000 kV Transmission Line West of Dry Creek
3.2	Typical Site Office and Storage Area
3.3	Typical Portable Concrete Batch Plant
5.1	View of Ridge within Groses Hill Group showing Cleared Nature of the Site
5.2	Distant View of the Ellenden Group from the Groses Hill Group
5.3	View to the South along Hammonds Hill Ridgeline towards Big Hill
5.4	View to the South toward Hammonds Hill from Northern End of Hammonds Hill Group
5.5	Adamellite Boulders – Hammonds Hill
5.6	Excavated Granitic Material from Monitoring Tower Footing
5.7	Steeply Dipping Strata in Creek near Substation
5.8	Footing for Hammonds Hill Monitoring Tower
5.9	Centre Footing, Hammonds Hill Monitoring Tower
5.10	Erosion on Slope to the West of Big Hill
5.11	Groses Hill Trig Station
5.12	Osborne Trig Station
5.13	Red Hill Trig Station
5.14	Butler Trig Station
6.1	Landscape Element – Groses Hill
6.2	Landscape Element – Taylors Creek Catchment
6.3	Landscape Element – Red Hill
6.4	Landscape Element – Governors Hill
6.5	Landscape Element – Hammonds Hill Grassland
6.6	Landscape Element – Hammonds Hill Woodland
6.7	Landscape Element – Bungendore Plain
6.8	Landscape Element – Lake George Landscape
6.9	Viewpoint 4 – Photomontage – Hammonds Hill Group from Taylors Creek Road
6.10	Viewpoint 5 – Photomontage – Groses Hill Group from Taylors Creek Road
8.1	Currandooley Homestead
8.2	Currandooley Homestead
8.3	Osborne Hill Trig Station
8.4	Red Hill Trig Station

List of Appendices (in Volume 2)

Appendix No.	Document Description
Α	NSW Dept. of Planning Correspondence re Director-General's Requirements for the EA
В	Correspondence from other Agencies and Stakeholders
С	Visual Impact Assessment
D	Shadow Flicker Analysis
Е	Aboriginal Heritage Assessments and Section 87 Permit Application Documents
F	Flora and Fauna Assessment
G	Bat Fauna Assessments
Н	Noise Impact Assessment
1	Traffic and Transport Issues Assessment
J	Investigation of Possible Impacts on Broadcasting and Radiocommunication Services
K	Contractor's Environmental Management Program