Flyers Creek Wind Farm Pty Ltd

Flyers Creek WIND FARM

Environmental Assessment

VOLUME 1
May 2011

Certification of Project Details and Environmental Assessment

This Environmental Assessment (EA) supports an updated project application submitted by Flyers Creek Wind Farm Pty Ltd under the Environmental Planning and Assessment Act, 1979 (EP&A Act) in respect of:

Construction and Operation of the Flyers Creek Wind Farm within the Blayney Shire, Central Western, NSW.

The project involves the construction and operation of up to 44 wind turbines and associated works which include a 33 kV/132 kV substation, access works, temporary and permanent wind monitoring masts, 33 kV underground cables and one or more internal 33 kV overhead lines and 15 kilometre section of 132 kV transmission line for grid connection electricity grid.

The details of the properties to which the project application refers are described in Chapter 4 of this document and as shown with the updated Project Application submitted to the Department of Planning

Project Proponent Document prepared for proponent based on proponent's project description, record of consultation and proposed measures to mitigate its impacts.	Mr Jonathan Upson, Flyers Creek Farm Wind Pty Ltd Level 22, 56 Pitt Street SYDNEY NSW 2000
Certification of • Project Details, • Consultation • Mitigation Measures presented in the EA document.	I Jonathan Upson, _____ Date: 8 June 2011 *Signature* certify that this document provides: • a true representation of the proposed project • accurately represents the consultation undertaken • does not seek to materially mislead, and that • Flyers Creek Wind Farm Pty Ltd is committed to implementing the project environmental management measures set out in this document.
EA prepared by Aurecon Organisation: Business Address:	Graham Mackay, Senior Environmental Consultant *(Bachelor of Natural Resources, University of New England, Diploma of Environmental Studies, Macquarie University, Certified Environmental Practitioner CEnvP No. 400)* Aurecon Australia 116 Military Road Neutral Bay NSW 2089
Certification	I Graham Mackay, _____ Date 8 June 2011 *Signature* certify that this EA document: • addresses the Director General's assessment requirements for the EA • provides a thorough assessment of the potential impacts of the proposed Flyers Creek Wind Farm Project • the information contained in the EA does not seek to materially mislead

Document prepared by:

Aurecon Australia Pty Ltd
ABN 54 005 139 873
116 Military Road
Neutral Bay
New South Wales 2089 Australia

T: +61 2 9465 5599
F: +61 2 9465 5598
E: sydney@ap.aurecongroup.com
W: aurecongroup.com

Document control

aurecon

Document ID: Certification

Rev No	Date	Revision details	Typist	Author	Verifier	Approver
1	8 June 2011	Final	Various	Various	GM	LK

A person using Aurecon documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Contents

B1 – Department of Water and Energy
B2 – Department of Environment and Conservation
B3 – Department of the Environment, Water, Heritage and the Arts
B4 – Forests NSW – Macquarie Region
B5 – Aerial Agricultural Association of Australia Ltd
B6 – Department of Sustainability, Environment, Water, Population and Communities
B7 – Roads and Traffic Authority
B8 – Department of Defence
B9 – TransGrid
B10 – Land and Property Management Authority
B11 – Airservices Australia
B12 – NSW Department of Primary Industries
B13 – NSW Rural Fire Service
B14 – APA Group

Appendix C

C1 – Visual Assessment (Aurecon, 2010)
C2 – Shadow Flicker (PB, 2010)

Appendix D

Flora and Fauna (KMA, 2011)

Appendix E

Avifauna Bats (GRA, 2011)

Appendix F

Heritage (Austral, 2011)

Appendix G

G1 – Background Noise Assessment (Vipac, 2010)
G2 – Noise Assessment (Vipac, 2010)

Appendix H

Telecommunications (LDA, 2010)

List of Tables

List of Figures

List of Plates

Glossary and Acronyms

Term / Acronym	Description
Abatement (mitigation)	Decrease or reduction. In the context of greenhouse gas emissions, a wind farm is said to 'abate' the greenhouse pollution which would otherwise have been emitted by conventional fossil fuelled power generation.
Aboriginal archaeological site (Aboriginal site)	A place where physical remains or modification of the natural environment indicate past and 'traditional' activities by Aboriginal people. Site types include artefact scatters, isolated artefacts, burials, shell middens, scarred trees, quarries and contact sites.
ACMA	Australian Communications & Media Authority
AEMO	Australian Energy Market Operator
ARA	Appropriate Regulatory Authorities
Band 111	VHF TV Channels 5A - 12
Base load generation	Power plants optimised economically and in an engineering sense to a relatively constant, steady and reliable stream of energy
Biodiversity	First coined in 1988 as a contraction of "biological diversity", diversity traditionally referring to species richness and species abundance. Biodiversity has been defined subsequently as encompassing biological variety at genetic, species and ecosystem scales (DASETT 1992). The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority, and is protected by the International Convention on Biological Diversity 1992.
Biota	All the animal and plant life in a given area.
Blade-strike	The phenomenon of avifauna colliding with wind turbine blades resulting in casualty.
Bund	A barrier or wall to contain and control spillage. Normally associated with tank farms, fuel and chemical storage facilities.
Burial Site	Usually a sub-surface pit containing human remains and sometimes associated artefacts.
CB Radio	Citizens Band Radio
CDMA	Code Division Multiple Access Cellular Mobile System
Commissioning	The final aspect of the construction phase. Manufacturers' and contractors' representatives undertake a series of tests and fine tuning relating to wind farm performance. Environmental impacts such as noise monitoring may be part of the commissioning tests.
Conservation	The management of natural resources in a way that will benefit both present and future generations.
Construction Environmental Management Plan (CEMP)	An element of an EMP that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Consumer Price Index (CPI)	A fixed weighted price index that relates to household expenditure on retail goods and services and other items such as housing, government charges and consumer credit charges.
Control Cables	Cables used to send signals to central turbine operation and to monitor turbine and generator performance.
Crown Land	Land that is owned and managed by State Government. Crown land accounts for over half of all land in NSW and includes: Crown lands held under lease, licence or permit; community managed reserves; lands retained in public ownership for environmental purposes; lands within the Crown public roads network; and other unallocated lands.
Cumulative Effect	Refers to the accumulation of effects over time.
DEC	Department of Climate Change (Federal Government)
DECCW	Department of Environment, Climate Change and Water (NSW)

Term / Acronym	Description
Decommissioning	The dismantling of a wind farm at the conclusion of its working life. The whole structure of the turbines and all related above ground infrastructure is removed, and the site landscaped to its original appearance.
Development Consent	Consent under Part 4 of the NSW EP&A Act to carry out development and includes, unless expressly excluded, a complying development certificate.
DEWHA	Department of Environment, Heritage, Water and the Arts
Ecologically Sustainable Development (ESD)	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased.
Ecosystem	An interdependent system of interacting plants, animals and other organisms together with the non-living (physical and chemical) components of their surroundings.
Emergency Response	The reaction by personnel and emergency services such as Fire, Police, Ambulance, Industrial Fire Brigades, etc to an emergency.
EMI	Electromagnetic Interference
Endangered Species	Those plants and animal species likely to become extinct unless action is taken to remove or control the factors that threaten their survival.
Environmental Impact Assessment (EIA)	The orderly and systematic evaluation of a proposal, including alternatives and objectives, and its effects on the environment, including the mitigation and management of these effects.
Environmental Management (EM)	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy. (Refer to the related term- Environmental Management System).
Environmental Management Plan (EMP)	The control, training and monitoring measures to be implemented during the design, construction and operation phases of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental (being socio-economic, cultural, physical, biological) assessments.
Environmental Management System (EMS)	The concept and major components of an EMS are set out in the Australian / New Zealand Standard (AS / NZS) ISO 14001. An EMS has several key components as set out below: Organisational commitment, corporate environmental policy, environmental aspects register, objectives and performance indicators, environmental management program documentation (often called an EMP), operational and emergency procedures, responsibility and reporting structure, training and awareness program, environmental impact, regulatory and legal compliance, and environmental performance review audits performance monitoring and measurement.
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection License
Fauna	Animals
First Fresnel Clearance	Clearance to obstructions from the ray line on a radio Path which does not produce any additional loss above free space loss
Flora	Plants
Floristic Composition	The plant species present in a particular community, sub-community or site.
FM	Frequency Modulation
Frequency Control Ancillary Services (FCAS)	Unforeseen variations in generation and demand, and variations that occur within the 5-minute dispatch interval are managed by frequency control ancillary services. As the amount of intermittent generation in the NEM increases, there is likely to be an increase in the uncontrolled variation of generation levels and, therefore, an increase in the usage of these services.

Term / Acronym	Description
Fresnel Zone	In optics and radio communications, the Fresnel zone is an elliptical region surrounding the line of sight path between transmitting and receiver antennas. Must be obstruction free for a microwave radio link to work properly.
Geotechnical	Relating to the form, arrangement and structure of the geology.
Greenhouse Effect	Predicted global climatic change (eg global warming) associated with build up of certain gases such as water vapour and CO_2 within the atmospheric environment of the earth.
Greenhouse Gas	A gas which has an effect on the radioactive adsorptivity of the earth's atmosphere and the atmosphere's temperature.
Grid	The electricity transmission and distribution network.
Groundwater	Subsurface water contained within saturated zone.
GSM	European Digital Cellular Mobile System
Heritage (Cultural Heritage)	A term which encompasses Aboriginal and post-contract archaeological sites and material remains (cultural resources).
Hub	Attaches the rotor blades to the driveshaft that drives the gearbox and generator.
Hub Height	The height of the centre of rotor blades above ground level.
INP	NSW Industrial Noise Policy
Installed Capacity	The capacity of the generating plant installed that is the maximum that can be used at any point in time.
Integrated Development	Development that requires development consent and one or more of the approvals listed within section 91 of the EP&A Act 1979 (as amended).
Inter-Generational Equity	Principle whereby the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
ITU	International Telecommunications Union
LEP	Local Environmental Plans
LF	Low Frequency (not used for sound broadcasting in Australia)
LGA	Local Government Area
Lithologies	Rock types.
Load Flow Analysis	An analysis of the potential dynamic effect on the power transmission capacity of a section of the electrical grid.
LPMA	Land and Property Management Authority
Mandatory Renewable Energy Target (MRET)	A target prescribed by Federal Government legislation of 9,500 GWh per year of new renewable energy generation to be implemented by 2010.
Mean	The average of a set of numbers obtained by dividing the total sum of all their values by the number of individual values.
Mean Annual Wind Speed	The average wind speed experienced at a specific location, at a given height, based on regular measurements throughout the year.
Median	The middle value of a set of values. If there are two middle values, then the median is the average of those two values.
MF	Medium Frequency
Mitigate (abate)	To lessen in intensity or level.
Monitoring	The checking of impacts of a proposal or an existing activity in order to improve or evaluate environmental management practices. To check the efficiency and effectiveness of the environmental impact assessment process. To determine if the requirements of environmental legislation and associated regulations are being met.
Nacelle	The structure on top of the tower that houses the gearbox and the generator.

Term / Acronym	Description
Native Vegetation	A broad term for vegetation comprised of plant species which occur naturally in Australia (but which are not necessarily indigenous).
NEM	National Electricity Market
NES	National Environmental Significance
NETS	National Emissions Trading Scheme
NGACs	NSW Greenhouse Abatement Certificates
NGER	National Greenhouse and Energy Reporting Act
Operational Environmental Management Plan (OEMP)	An element of an EMP that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Phyllite	A green, grey, or red metamorphic rock, similar to slate but often having a wavy surface and a distinctive micaceous luster.
POEO Act	Protection of the Environment Operations Act 1997
Precautionary Principle	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
Ramsar	Listed wetlands of International significance.
Renewable Energy Certificate (REC)	The mechanism for accounting for the environmental attributes of electricity generated from renewable sources. One REC represents 1 MWh of renewable energy eligible under the Renewable Energy (Electricity) Act 2001 (Commonwealth).
REP	Regional Environmental Plans
Riparian	Of, on, or relating to the banks of a natural course of water.
rpm	revolutions per minute
Scarred Tree	Scars are caused on trees by the removal of bark by Aboriginals for the manufacture of utensils, canoes or for shelter. A toehole tree or possum tree also falls under this category as it is a tree which has had small patches of bark chopped out to provide hand and foot holds for climbers after possums or vantage.
Sediment / Detention Pond	Artificial earthen depression to retain water runoff for a period of time so as to control high intensity runoff and allow settling of sediment prior to discharge.
SEPP	State Environmental Planning Policy
Shadow Flicker Analysis	An analysis on the potential lighting fluctuations which a proposed wind turbine may cause at a specific location.
SML	Special Mining Lease
Substation	Any premises or place (including a switchyard) in which high-voltage supply is converted, controlled or transformed.
Sustainable Use	Use of organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
Terrestrial	Of, or pertaining to the land as distinct from the water.
Transformer	A device which converts one voltage / current of electricity to a different voltage / current. A transformer at each wind turbine steps up the voltage from 690 V to a level of 33 kV for supply to the wind farm's substation where a larger transformer increases the voltage to 330 kV for distribution by the grid.
Transmission Losses	Electricity losses that occur in the transmission and distribution network, often as heat.
Turbine generator	A mechanical electrical generator.
UHF	Ultra High frequency
UHF Channels	TV Channels 28 - 46 (526 - 820 Mhz)
VHF	Very High Frequency

Term / Acronym	Description
VHF Channels	TV Channels 0 to 12 (45 - 230 Mhz)
Visibility	The extent to which particular components of a development may be visible from surrounding areas.
Visual Catchment or Viewfield	In the case of a wind farm this includes the areas from which the wind farm will be visible. For this assessment the area has been computed within 10 km of the nearest turbine and due to lack of detail on vegetation it is indicative only. It is likely that the viewfields shown in this assessment will be conservative.
Weed	Naturalised, non-indigenous plant species which may be noxious weeds (or agriculture), environmental weeds or any other generally undesirable introduced species.
Wind Energy Modelling	Manipulating raw wind data using software tools to develop an accurate understanding of wind energy resources in a particular location.
Wind Turbine Generator	In the context of this project: a large, three bladed wind driven turbine connected via a gearbox to an electric generator

Units

Term / Acronym	Description
cm	centimetres
CO_2	Carbon dioxide
$CO_{2\text{-eq}}$	Carbon dioxide equivalent
dB(A)	Abbreviation for A-weighted decibel. The most common measurement of sound pressure levels that approximates the response of the human ear.
g/kWh	Grams per kilowatt hour
GW	gigawatts – 1 billion watts
GWh	gigawatt hours – one billion watt-hours (or 1,000 MWh). The amount of energy produced or consumed over one hour in a system operating at a capacity level of one gigawatt.
Hz	Hertz
kg	Kilograms
km	Kilometre
km^2	Square kilometres
km/h	Kilometres per hour
kV	kilovolt – one thousand volts
$kgCO_{2\text{-eq}}/MWh$	Kilogram of CO_2 equivalent per unit electricity generated (MWh)
kWh	Kilowatt hours
L_{A90}	The noise level exceeded for 90% of the 15 minute interval. This is commonly referred to as the average background noise level.
L_{Aeq}	The equivalent continuous sound level in dB(A); that is, the constant sound level which has the same acoustic energy as the original fluctuating noise for the same period of time.
m	Metre
m/s	metres per second
m^2	Square metres
m^3	cubic metre
mg/m^3	milligrams per cubic metre
MHz	Megahertz
ML	Megalitres
mm	Millimetre
MW	megawatt – one million watts (or 1,000 kW)

Term / Acronym	Description
MWh	megawatt hours – one million watt-hours
MVA	Megavolt-ampere
RML	Richter Magnitude Level
rpm	revolutions per minute
t	tonne
TWh	terawatt hours – 1,000 GWh (or one million MWh)
VOC	Volatile organic compounds

Map grids and coordinate systems

1. The Flyers Creek Wind Farm project uses Map Grid of Australia (MGA) Zone 55 as the principal map reference for reporting coordinate locations of project components and for the grids shown on figures presented in the Environmental Assessment. Map Grid of Australia (MGA) Zone 55 uses Universal Transverse Mercator UTM projection control based on Geodetic survey of NSW and Geocentric Datum of Australia 1994 (GDA94)

2. The available 1:25,000 scale Carcoar and Millthorpe mapping sheets reference the Australian Map Grid (AMG) based on Australian Geodetic Datum 1966 (AGD66) and this can been seen on the mapping used as the base for some figures (eg. Figure 1.4) of the Environmental Assessment together with the MGA Grid that is used for the Flyers Creek Wind Farm Project.

3. The following conversion from AGD66 to GDA 94 is approximately as follows:

    - Increase Northing by 190 metres
    - Increase Easting by 105 metres

4. For all practical purposes, no conversion is necessary from GDA94 coordinates to GPS satellite datum World Geodetic System 1984 (WGS84). It should be noted that coordinates derived via satellites using GPS instruments are on WGS 84 and can be approximate