Delta electricity

Marulan Gas Turbine Facility

Environmental Assessment

PROJECT APPLICATION

VOLUME 1	MAIN REPORT	August 2008

URS

Cover illustration: Note this is a graphical representation of a gas turbine facility it may not represent the actual plant.

Photograph: C. Bergesen.

Statement of Validity

Submission of Environmental Assessment

Prepared under Part 3A of the *Environmental Planning and Assessment Act* 1979

Environmental Assessment prepared by

Name	Nicole Brewer	Ian McCardle
Qualifications	B Eng (Civ & Env), Dip Eng Prac Associate Environmental Engineer	M Sc, B Sci (Hons) Principal Environmental Scientist
Address	URS Australia Pty Ltd Level 3 116 Miller Street NORTH SYDNEY NSW 2060	

In respect of

Applicant & Land Details

Applicant	*Delta Electricity* Darling Park, 201 Sussex Street Sydney NSW 2000
Application No.	MP07_0176
Subject Site	**Marulan, NSW**
Land to be developed	**Lot & DP**
Development Site	Lot 2 DP1120270
Project Summary	Construction and operation of a gas -fired power station and associated infrastructure.

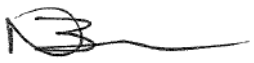
Environmental Assessment

An Environmental Assessment is attached.

Declaration

I certify that I have prepared the contents of the Environmental Assessment in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 and Regulation and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Signature



Name	**Nicole Brewer**	**Ian McCardle**
Date	**29 August 2008**	**29 August 2008**

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Notes on Text

As a determination of the project will only be made after the Environmental Assessment has been on public display and submissions considered, the future conditional tense is used throughout this Environmental Assessment when describing the project, alternatives and assessing impacts. “Would” is, therefore, used throughout the text in preference to “will”.

If all approvals are given for the project to proceed, all “would” references should be interpreted as “will”, subject to final conditions of consent.

Notes on Text

Abbreviations

ABBREVIATIONS

AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
AHC	Australian Heritage Commission
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANEPM	National Environment Protection Measure for Ambient Air Quality
ANZECC	Australia and New Zealand Environment and Conservation Council
ARI	Annual Recurrence Interval
AWS	Automatic Weather Station
BCA	Building Code of Australia
BoM	Bureau of Meterology
Calmet	A 3-D meteorological model designed to provide data for use in Calpuff
Calpuff	An airquality dispersion model
CASA	Civil Aviation and Safety Authority
CCGT	Combined Cycle Gas Turbine
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CFC	Chloro-Fluorocarbons
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
DA	Development Application
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DEHA	Department of Environment, Heritage and the Arts
DOP	Department of Planning
EA	Environmental Assessment
ECRTN	Environmental Criteria for Road Traffic Noise
EMF	Electric and Magnetic Field
EMP	Environmental Management Plan
EMS	Environmental Management Systems
ENCM	Environmental Noise Control Manual
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EP&A Reg	NSW Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
GPS	Global Positioning System
GT	Gas Turbine
HAZID	Hazard Identification
HIPAP	Department of Planning's Hazardous Industry Planning Advisory Paper
HHV	Higher Heating Value
HRSG	Heat Recovery Steam Generator
INP	Industrial Noise Policy (EPA, 2000)
IPCC	International Panel on Climate Change
IPRA	International Power (Australia) Pty Ltd)
ISO	International Standards Organisation
JSA	Job Safety Analysis
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area

Abbreviations

LHV	Lower Heating Value
LoS	Level of Service
MGA	Map Grid of Australia
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MLEP	Mulwaree Local Environment Plan 1995
NA	Not Applicable
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NGRS	National Greenhouse Response Strategy
NHMRC	National Health and Medical Research Council
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NP&W Act	NSW *National Parks and Wildlife Act* 1974
NPWS	National Parks and Wildlife Service
NSW	New South Wales
O_3	Ozone
OCGT	Open Cycle Gas Turbine
OEMP	Operation Environmental Management Plan
PAD	potential archaeological deposit
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulphate Soils
PB	Parsons Brickerhoff
PFM	Planning Focus Meeting
PHA	Preliminary Hazard Analysis
PHLALC	Peak Hill Local Aboriginal Land Council
PM_{10}	Particles effectively less than 10µm diameter
$PM_{2.5}$	Particles effectively less than 2.5µm diameter
POEO Act	NSW *Protection of the Environment Operations Act* 1997
REP	Regional Environmental Plan
RFI Act	NSW *Rivers and Foreshores Improvements Act* 1948
RNE	Register of the National Estate
ROTAP	Rare or Threatened Australian Plants
RPM	Revolutions per Minute
RTA	NSW Roads and Traffic Authority
SCR	Selective Catalytic Reduction
SEDA	Sustainable Energy Development Authority
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SO_2	Sulphur dioxide
SO_x	Sulphur Oxides
SOO	Statement of Opportunities
TAPM	The Air Pollution Model
TCP	Tree Clearance Protocol
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSC Act	NSW *Threatened Species Conservation Act* 1995
TSP	Total suspended particulate
TSP Act	NSW Threatened Species Act 1995
TSS	total suspended sediment
VOC	Volatile Organic Compound
WM Act	Water Management Act 2000

Abbreviations

UNITS

µm	Microns
cm	centimetres
g	Grams
GL	Gigalitre (10^9 L or 10^6 m^3)
GWh	Gigawatt Hour
Ha	hectare
hr	Hour
Hz	Hertz
kg	Kilograms
kJ	Kilojoules
kL	Kilolitre (10^3 L or 1 m^3)
km	Kilometre
km/hr	Kilometres per hour
kPa	Kilopascals
kV	Kilovolts
kW	Kilowatts
m	Metres
mg	Milligrams
m^2	square metres
m^3	cubic metres
MHz	Megahertz
ML	Megalitre (10^6 L or 10^3 m^3)
MW	Megawatts
pa	per annum
ppm	Parts per million
pmpy	per million per year
s	second
SG	Density
t	Tonne
Yr	Year

Abbreviations

Glossary

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.
acid sulphate soils (ASS)	Soils containing pyrite which produces sulphuric acid when exposed to oxygen.
ambient	Surrounding environment.
aquifer	Rock formation containing water in recoverable quantities.
background scatter	Aboriginal artefacts that cannot be usefully related to a place or focus of past activity.
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.
bunds	An earthwork or wall to contain and control spillages, normally associated with tank farms, fuelling and chemical storage facilities.
CO_2-e	The carbon dioxide equivalent relates to the greenhouse warming potential (GWP) of a certain gas compared to that of carbon dioxide where carbon dioxide has a GWP of 1. For example, methane (CH_4) has a GWP of 21, meaning that a release of 100 tonnes of CH_4 would be the equivalent to releasing 2100 tonnes of CO_2 in terms of global warming.
Construction Environmental Management Plan	An element of an Environmental Management Plan 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.
conservation	The management of natural resources in a way that will benefit both present and future generations.
cumulative effect	Refers to the accumulation of effects over time.
dB(A)	The A-weighting has a frequency response corresponding approximately to that of human hearing. People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the "loudness" of that sound. Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).

Glossary

dB(C)	The C-Weighting has a relatively flat response. C- weighting is used in evaluating annoying community noises such as low frequency sound.
Ecologically Sustainable Development	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.
effluent	The outflow of liquid e.g. from sewage or an industrial process.
emergency response	The reaction by emergency services such as Fire, Police, Ambulance, Industrial Fire Brigades, etc., to an emergency.
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.
environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
Environmental Assessment	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	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 related term Environmental Management System).
Environmental Management Plan	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	The concept and major components of an Environmental Management System (EMS) are set out in the Australian/New Zealand Standard (AS/NZS) ISO 1400l. 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 Environmental Management Plan or 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.
fauna	Animals.

Glossary

fire fence	A gap in vegetation or fuels which prevents or hinders the spread of fire.
flora	Plants.
floristic composition	The plant species present in a particular community, sub-community or site.
free ammonia	The toxic fraction of ammonia (NH_3) that is undissociated and therefore available for uptake by organisms. The usual source of ammonia to waterways is domestic sewage and industrial effluents.
GGAS	The Greenhouse Gas Reduction Scheme (GGAS) commenced on 1 January 2003. It is one of the first mandatory GHG emissions trading schemes in the world and is specifically associated with the electricity generation sector. GGAS aims to reduce GHG emissions in NSW by 5% per capita below 1989/90 levels by 2007, by encouraging project based activities to offset the production of GHG emissions.
geotechnical	Relating to the form, arrangement and structure of the geology.
Greenhouse Challenge Plus	The programme integrates the Generator Efficiency Standards and the Greenhouse Friendly TM initiative into a single industry programme, focused on reducing greenhouse gas, promoting energy efficiency, integrating greenhouse issues into decision making and allowing for a consistent manner for reporting greenhouse gas emissions.
Greenhouse Gas	A gas which has an effect on the radioactive absorptivity of the earth's atmosphere and the atmosphere's temperature.
Greenhouse Effect	Predicted global climatic change (e.g. global warming) associated with build up of certain gases (such as water vapour, carbon dioxide, methane, chloroflurocarbons, ozone, nitrous oxide, etc.) within the atmospheric environment of the earth. These are known as Greenhouse Gases.
Greenhouse gas intensity	the amount of greenhouse gases per unit of energy produced from a power station (eg in units of kg CO_2-e/MWh).
Greenhouse Gas Protocol	A globally accepted procedure for companies to quantify, report and reduce their greenhouse gas emissions.
groundwater	Subsurface water contained within the saturated zone.
heritage (cultural heritage)	A term which encompasses Aboriginal and post-contact archaeological sites and material remains (cultural resources).
higher heating value	The heat content of fuel, measured in a bomb calorimeter when the products of combustion are cooled to the initial temperature and all of the water vapour formed during combustion is condensed to liquid. This gives the gross, or higher heat content of the fuel, which includes in the reported value the heat of vaporisation of the water produced from combustion of hydrogen atoms in the fuel. The lower heating value excludes the heat of vaporisation of the water produced from combustion of hydrogen atoms in the fuel.

Glossary

Hydrocarbons	A class or compounds containing only carbon and hydrogen in various structures. Both naturally occurring and from anthropogenic sources.
Hydrology	Surface water and groundwater and their interaction with earth materials.
Hydrogeology	The study of subsurface water in its geological context.
INTANAL	Specialist traffic model for intersection analysis.
Invertebrate	An animal without a backbone.
Isolated find	Single stone artefact, not located within a rock shelter which occurs without any associated evidence of Aboriginal occupation within a radius of 60 m.
L_{A1}	The noise level exceeded for 1% of the 15 minute interval.
L_{A10}	The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
L_{A90}	The LA90 level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the LA90 level for 10% of the time. This measure is commonly referred to as the background noise level.
L_{Aeq}	The equivalent continuous sound level (LAeq) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
$L_{Aeq\ (1hr)}$	The LAeq noise level for a one hour period.
$L_{Aeq\ (15\ hr)}$	The LAeq noise level for the period 7am to 10pm.
$L_{Aeq\ (9\ hr)}$	The LAeq noise level for the period 10pm to 7am.
L_{eq}	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.
Level of Service	A description of the operating performance of a road or intersection as defined in Austroads 'Guide to Traffic Engineering Practice, Pt 2 – Road Capacity.'
Lithologies	Rock types.
Lower Heating Value (LHV)	The heat content of fuel, measured in a bomb calorimeter when the products of combustion are cooled to the initial temperature and all of the water vapour formed during combustion is condensed to liquid. The lower heating value excludes the heat of vaporisation of the water produced from combustion of hydrogen atoms in the fuel.
mean	The sum of n values divided by n.
median	The middle value of a set of values.
middens	Evidence of Aboriginal occupation of an area.

Glossary

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.
native vegetation	A broad term for vegetation comprised of plant species which occur naturally in Australia (but which are not necessarily indigenous).
natural gas	Combustible gas formed naturally in the earth.
Organochlorines	A group or organic chemicals used in pesticides. Most organochlorine pesticides have low water-solubility, but high chemical and biological stability. They are fat soluble and tend to accumulate in the fat tissue of organisms.
Operation Environmental Management Plan	An element of an Environmental Management Plan 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.
Ozone	A form of oxygen having three atoms to the molecule. Ozone is a powerful oxidising agent.
Particulate	Small particles, usually in suspension.
Petroleum hydrocarbons [total petroleum hydrocarbons (TPH)]	A class of organic compounds arising from unburnt fuel sources.
Piles	Type of foundation using columns of concrete, steel or timber.
Plume	Area of impact extending from a source.
Polycyclic aromatic hydrocarbons (PAH)	A class of organic chemicals, PAHs are formed by incomplete combustion or organic material, diagenesis (during or throughout generation) and biosynthesis. PAHs are naturally occurring, however, a significant proportion are the result of anthropogenic combustion.
potable water	Water suitable for drinking.
potential acid sulphate soil (PASS)	Soil material which is waterlogged and contains oxidisable sulphur compounds, usually iron sulphide (pyrite) that has a field pH of 4 or more (1:5 soil:water).
Register of the National Estate	A list of the National Estate developed under the provisions of the Commonwealth's Australian Heritage Commission Act 1975.
risk	Likelihood of a specific undesirable event occurring within a specified period or in specified circumstances. Listed as a frequency or probability.

Glossary

risk assessment	A process used to determine whether people and the environment are at risk (e.g. health and safety) from exposure to hazardous substances used or produced (mainly in an industrial or work place) so that appropriate control measures or management practices can be introduced to prevent or minimise the risk.
security fence	A fence designed to prevent unlawful intrusion to a prohibited area.
sediment/detention pond	Artificial earthen depression to retain water runoff for a period of time so as to control high intensity runoff.
sustainable use	Use of organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
TAPM	The Air Pollution Model is an air quality dispersion model developed by the Commonwealth Scientific Investigation & Research Organisation.
terrestrial	Of or pertaining to the land as distinct from the water.
thermal efficiency	The proportion of energy converted from the fuel to electricity in the generation process is an indication of CO_2 emissions.
total aromatic hydrocarbons	A class of organic chemicals which contain an aromatic ring (e.g. benzene, anthracene, naphthalene and their derivatives). Used in chemical and pharmaceutical industries.
total organic carbon (TOC)	The amount of carbon in the organic form contained in a sample, measured as a percentage.
total suspended solids (TSS)	Total load of particulates in water, measured in mg/L.
turbidity	Liquid's ability to intercept light. Measured in nephelometric turbidity units (NTU). Cannot be consistently correlated with the concentration of suspended matter.
visibility	Measure of extent to which particular components of a development may be visible from surrounding areas.
visual absorption capacity	An estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality.
volatiles	Any chemical compound which will evaporate quickly due to its low boiling point.
vulnerable species	Those that may soon become endangered unless action is taken.
waders	Synonymous with shorebirds.
weed	Naturalised, non-indigenous plant species which may be noxious weeds (or agriculture), environmental weeds or any other generally undesirable introduced species.
wetlands	Areas largely inundated with water, yet offering elevated land as a habitat for wildlife, notably waterfowl. Can be landlocked.

Glossary

wind climate	A description of the meteorological conditions created by the wind involving measurements of wind speed, direction and frequency of gusts for average, seasonal and annual conditions.
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conservation	The management of natural resources in a way that will benefit both present and future generations.
cumulative effect	Refers to the accumulation of effects over time.
dB(A)	The most common measurement of environmental noise – measured using a simple sound level meter having an A-weighting filter to simulate the subjective response of the human ear.

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Glossary

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Hydrogeology	The study of subsurface water in its geological context.
INTANAL	Specialist traffic model for intersection analysis.
Invertebrate	An animal without a backbone.
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L_{Aeq}	The energy averaged noise level over the 15 minute interval.
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median	The middle value of a set of values.
middens	Evidence of Aboriginal occupation of an area.
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.
native vegetation	A broad term for vegetation comprised of plant species which occur naturally in Australia (but which are not necessarily indigenous).
natural gas	Combustible gas formed naturally in the earth.

Glossary

Organochlorines	A group or organic chemicals used in pesticides. Most organochlorine pesticides have low water-solubility, but high chemical and biological stability. They are fat soluble and tend to accumulate in the fat tissue of organisms.
Operation Environmental Management Plan	An element of an Environmental Management Plan 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.
Ozone	A form of oxygen having three atoms to the molecule. Ozone is a powerful oxidising agent.
Particulate	Small particles, usually in suspension.
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Piles	Type of foundation using columns of concrete, steel or timber.
Plume	Area of impact extending from a source.
Polycyclic aromatic hydrocarbons (PAH)	A class of organic chemicals, PAHs are formed by incomplete combustion or organic material, diagenesis (during or throughout generation) and biosynthesis. PAHs are naturally occurring, however, a significant proportion are the result of anthropogenic combustion.
potable water	Water suitable for drinking.
potential acid sulphate soil (PASS)	Soil material which is waterlogged and contains oxidisable sulphur compounds, usually iron sulphide (pyrite) that has a field pH of 4 or more (1:5 soil:water).
Register of the National Estate	A list of the National Estate developed under the provisions of the Commonwealth's Australian Heritage Commission Act 1975.
risk	Likelihood of a specific undesirable event occurring within a specified period or in specified circumstances. Listed as a frequency or probability.
risk assessment	A process used to determine whether people and the environment are at risk (e.g. health and safety) from exposure to hazardous substances used or produced (mainly in an industrial or work place) so that appropriate control measures or management practices can be introduced to prevent or minimise the risk.
security fence	A fence designed to prevent unlawful intrusion to a prohibited area.
sediment/detention pond	Artificial earthen depression to retain water runoff for a period of time so as to control high intensity runoff.
sustainable use	Use of organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
TAPM	The Air Pollution Model is an air quality dispersion model developed by the Commonwealth Scientific Investigation & Research Organisation.

Glossary

terrestrial	Of or pertaining to the land as distinct from the water.
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total aromatic hydrocarbons	A class of organic chemicals which contain an aromatic ring (e.g. benzene, anthracene, naphthalene and their derivatives). Used in chemical and pharmaceutical industries.
total organic carbon (TOC)	The amount of carbon in the organic form contained in a sample, measured as a percentage.
total suspended solids (TSS)	Total load of particulates in water, measured in mg/L.
turbidity	Liquid's ability to intercept light. Measured in nephelometric turbidity units (NTU). Cannot be consistently correlated with the concentration of suspended matter.
visibility	Measure of extent to which particular components of a development may be visible from surrounding areas.
visual absorption capacity	An estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality.
volatiles	Any chemical compound which will evaporate quickly due to its low boiling point.
vulnerable species	Those that may soon become endangered unless action is taken.
waders	Synonymous with shorebirds.
weed	Naturalised, non-indigenous plant species which may be noxious weeds (or agriculture), environmental weeds or any other generally undesirable introduced species.
wetlands	Areas largely inundated with water, yet offering elevated land as a habitat for wildlife, notably waterfowl. Can be landlocked.
wind climate	A description of the meteorological conditions created by the wind involving measurements of wind speed, direction and frequency of gusts for average, seasonal and annual conditions.