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1 Introduction

This document provides a technical overview of the *DIRECTWIND* 900kW Wind Turbine designed for the IEC class II/III application. It is to be read in conjunction with document S-1000921 "*DIRECTWIND* 900 Electrical Summary". Chapter 2 includes a technical description of the *DIRECTWIND* 900 wind turbine. Chapter 3 includes technical data. Appendix 1 includes a 3-D assembly of main turbine components.

2 Technical Description

The *DIRECTWIND* 900 is a direct-drive, variable speed, pitch regulated, horizontal axis, three-bladed upwind rotor wind turbine.

The gearless direct-driven synchronous generator operates at variable speed. This is made possible by an actively controlled AC-DC-AC IGBT power converter connected to the grid. Benefits of this design are low maintenance, constant power output at wind speed above rated, and relatively low structural loads compared to constant-speed stall-controlled or constant-speed pitch-controlled wind turbines.

The generator is fully integrated into the structural design of the turbine, which allows for a very compact nacelle design. The drive-train makes use of only one main bearing, whereas classic designs have separately supported main shaft, gearbox and generator. All dynamically loaded interfaces from the blades to the foundation are sturdy flange connections with machined surfaces, and high tensile steel pre-stressed bolt connections are used.

2.1.1 Operation and safety system

The turbine operates automatically under all wind conditions and is controlled by an industrial PLC (Programmable Logic Controller). The cut-in wind speed is approximately 3m/s. When the rotational speed reaches the cut-in power threshold, the turbine is connected to the grid by the power converter.

The power converter controls the generator power output and is programmed with a power set-point versus rotor speed curve. Below rated wind speed the power output is controlled to optimise rotor speed versus aerodynamic performance (optimum λ -control). Above rated wind speed the power output is kept constant at rated value by PD-controlled active blade pitching.

The dynamic responses of the drive train and power controller are optimised for high yield and negligible electrical power fluctuations. The variable speed rotor acts as a flywheel, absorbing fluctuating aerodynamic power input. The turbine controllers are located in the rotor hub and the tower base (with remote IO in the nacelle) and carry out all control functions and safety condition monitoring. In the case of a fault, or extreme weather conditions, the turbine is stopped by feathering of the blades to vane position (blades swivelled to 90° with respect to rotor's rotational plane).

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In the case of less serious faults which have been resolved, or when extreme weather conditions have passed, the turbine restarts automatically to minimise downtime.

2.1.2 Generator

The multiple-pole, direct-drive generator is directly mounted to the hub. The stator is located in the non-moving outer ring and the wound pole, separately excited rotor rotates on the inner ring.

The generator is designed such that all aerodynamic forces are directly transferred to the nacelle construction without interfering with the generator-induced loads.

2.1.3 Power Converter

The power converter is an AC-DC-AC IGBT active switching converter. It controls the generator to operate in its optimum range, and maintains power quality to the grid. Power factor is controllable within limits. The inverter produces unity power factor ($\cos\Phi=1$) to the grid under all load conditions, as standard, with adjustable power factor. Harmonic distortion conforms to IEEE 519.

2.1.4 Rotor

The rotor is a three bladed construction, mounted up-wind of the tower. Rotational speed is regulated by active blade adjustment towards vane position. Blade pitch is adjusted using an electric servomotor on each of the blades.

Each blade has a complete, fully independent pitch system that is designed to be fail-safe. This construction negates the need for a mechanical rotor brake. The pitch system is the primary method of controlling the aerodynamic power input to the turbine.

At below rated wind speed the blade pitch setting is constant at optimum aerodynamic efficiency. At above rated wind speed the fast-acting control system keeps the average aerodynamic power at the rated level by keeping the rotor speed close to nominal, even in gusty winds.

The rigid rotor hub is a nodular cast iron structure mounted on the main bearing. Each rotor blade is connected to the hub using a pre-stressed ball bearing. It is sufficiently large to provide a comfortable working environment for two service technicians during maintenance of the pitch system, the three pitch bearings and the blade root from inside the structure.

2.1.5 Rotor blade set

The rotor blades are made of fibreglass-reinforced epoxy. The aerodynamic design represents state-of-the-art technology and is based on a pitch-regulated concept. No extenders are used and the aerodynamic design is optimal for this rotor diameter.

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2.1.6 Main bearing

The large-diameter main bearing is a specially designed three row cylindrical roller bearing. The inner non-rotating ring is mounted to the generator stator. The outer rotating ring is mounted between the hub and generator rotor. The bearing takes axial and radial loads as well as bending moments. Entrance to the hub is through the inner-bearing ring. The bearing is greased by a fully automatic lubrication system controlled by the turbine PLC.

2.1.7 Nacelle

The nacelle is a compact welded construction which houses the yaw mechanism, a service hoist and a control cabinet. Both the generator and the tower are flanged to the nacelle. The geometry of the construction assures an ideal transfer of loads to the tower and, with the absence of a shaft and gearbox, results in a simple design ensuring easy personnel access.

2.1.8 Yaw system

The yaw bearing is an internally geared ring with a pre-stressed four point contact ball bearing. Electric planetary gear motors yaw the nacelle. The yaw brake is passive and is based on the friction of brake pads sitting directly on the bearing ring, keeping the yaw system rigid under most loading conditions.

2.1.9 Tower

The nacelle assembly is supported on a tubular steel tower, fully protected against corrosion. The tower allows access to the nacelle via a secure hinged access door at its base. The tower is fitted with an internal ladder with safety wire and optional climb assistance, rest platforms and lighting. Standard hub heights are 40, 50 and 75 metres.

2.1.10 Anchor

The turbine is supported by a concrete foundation. The connection to this foundation is provided by means of a cast-in tube or rod anchor.

2.1.11 Control System

Bachmann PLC: The M1 controller perfectly combines the openness of a PC-based controller with the reliability of industrial hardware platforms. Designed to withstand the toughest ambient conditions it guarantees error-free use over long periods of time, at subzero temperatures and without fans.

A modern system architecture designed for consistent network-capability permits the easy integration of the M1 into the environment of the controller and system peripherals. Real-time ethernet permits the real-time networking of the controllers, and the support of all standard Fieldbus systems permits the connection of standard external components.

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DWMS: *DIRECTWIND* Monitoring System – EWT’s proprietary HMI featuring local monitoring and control at the turbine, integrated into a remote-access or park-access SCADA. The three DWMS applications: Turbine, Park and Remote offer individual turbine control and total park monitoring and data logging from your Wind Turbine, Wind Park or internet access point.

The DWMS turbine software is placed in the turbines themselves.

The DWMS park software is placed on a master park PC that can be either in one of the turbines, or on a separate PC connected to the park network. The DWMS park software also contains the DWMS turbine windows, which are used when a turbine is accessed over the park network.

The DWMS remote software can be placed on any PC with a modem. The DWMS remote software is able to contact to any park or turbine. For this purpose, the DWMS remote software also contains both the DWMS Park as the DWMS turbine windows.

2.1.12 Grounding and lightning protection

The complete grounding system of the wind turbine incorporates:

- *Safety grounding*
Grounding system to prevent dangerous voltages for humans between parts of the wind turbine which can be touched by humans.
- *Lightning protection*
To provide predictable way for the overvoltage / over current in case of a lightning struck or lightning induction and to minimize dangerous situations for humans.
- *Electronics grounding*
Grounding system to minimize the interference of electric disturbances into sensitive electric and/or electronic circuits.

Since the *DIRECTWIND* 900 mechanical construction is made of metal (steel), all grounding systems are combined.

2.1.13 Special Editions

The following special editions of the *DIRECTWIND* 900 are available:

- Cold Weather edition
 - minimum operating temperature: -40°C
- Desert edition
 - maximum operating temperature: +50°C
 - capable of withstanding sandstorms
- Marine edition
 - for operation in saline environments

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3 Technical Data

Where data are separated by "/" this refers to the respective rotor diameter (51.5 / 52.5 / 54 m).

3.1 Wind and Site Data

Wind class	II / II / III according to IEC 61400 – 1
Max 50-year extreme	59.5 / 59.5 / 52.5 m/s
Turbulence class	A ($I_{15} = 0.16$)
Maximum flow inclination (terrain slope)	8°
Maximum mean air density	1.225 kg/m ³
Max ann. mean wind speed at hub height	8.5 / 8.5 / 7.5 m/s

3.2 Temperature Data

	Standard	Cold Weather
Min ambient design	-20°C	-40°C
Min ambient operating	-20°C	-40°C
Min ambient cold start	-20°C	-30°C
Max ambient operating	+40°C	+40°C
Max ambient design	+50°C	+50°C

The Desert edition can withstand sandstorms and operating temperatures of +50°C

The Marine edition can operate in a saline environment

3.3 Operational Data

Cut in wind speed	3 m/s
Cut out wind speed	25 m/s
Rated wind speed	14 / 13.9 / 13.5 m/s
Rotor speed	13 to 33 rpm, rated 26 rpm
Power output	900kW
Power factor	1.0 (adjustable 0.95 lagging to 0.95 leading) Measured at LV terminals

3.4 Rotor

Diameter	51.5 / 52.5 / 54 m
Type	3-Bladed, horizontal axis
Position	Up-wind
Swept area	2,083 / 2,165 / 2,290 m ²
Power regulation	Pitch control; Rotor field excitation
Rotor tilt angle	5°

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3.5 Blade Set

Type	PMC 24.5 / 25.0 / 25.8
Blade length	24.5 / 25.0 / 25.75 m
Chord @ 23.5m	0.723 m
Chord Max @ 5.5m	2.402 m
Aerodynamic profile	DU 91, DU 98 and NACA 64618
Material	Glass reinforced epoxy
Surface colour	Light grey RAL 7035
Twist Distribution	11.5° from root to 5.5m then decreases linearly to 0.29°, then non-linearly to 0°

3.6 Transmission System

Type	Direct drive
Couplings	Flange connections only

3.7 Controller

Type	Bachmann PLC
Remote monitoring	Direct Wind Monitoring System, proprietary SCADA

3.8 Pitch Control and Safety System

Type	Independent blade pitch control
Activation	Variable speed DC motor drive
Safety	Redundant electrical backup

3.9 Yaw System

Type	Active
Yaw bearing	4 point ball bearing
Yaw drive	3 x constant speed electric geared motors
Yaw brake	Passive friction brake

3.10 Tower

Type	Tapered tubular tower
Tower height options	30.5, 36.4, 46.4, 70.5 m
Hub height options	35, 40, 50, 75 m
Surface colour	Interior: White RAL 9010, Exterior: Light grey RAL 7035

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3.11 Mass Data

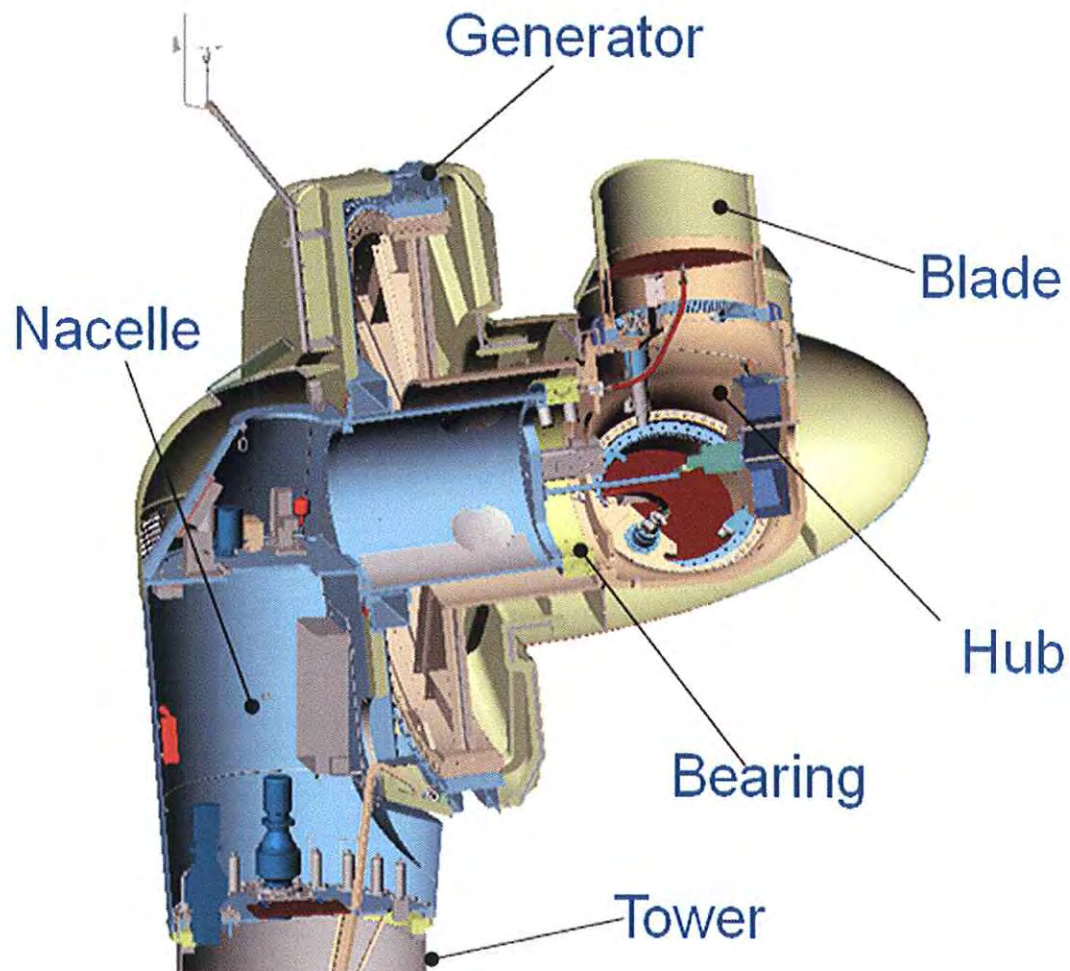
Hub	9,303 kg
Blade – each	1,919 / 1,931 kg
Rotor assembly	15,060 / 15,096 kg
Generator	30,000 kg
Nacelle assembly	10,000 kg
Tower 36.5 m	34,000 kg
Tower 46.5 m	46,000 kg
Tower 70.5 m	86,500 kg

3.12 Service Brake

Type	Maintenance brake
Position	At hub flange
Calipers	Hydraulic 1-piece

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APPENDIX 1 - 3-D assembly of main turbine components



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1 Introduction

The information contained in this Guideline is for the purpose of determining the requirements needed for transport, handling and storage of the *DIRECTWIND* 750 and 900 wind turbine building blocks.

In each of the following chapters the dimensions and weight of the building blocks is listed.

For some of the building blocks special equipment/tools are available for transport and lifting purposes.

Depending on the means of transport the requirements for the access and service roads in and around and to the site can be determined.

The information contained in this guideline does not intend to be complete and in case of any doubt or questions EWT should be contacted.

When using cranes and lifting equipment, these should be certified as required by the Authorities in the country of use.

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2 Tower

The tower comprises 2 or 3 sections, depending on the height of the tower.

Tower 35, 40, 50 and 75 m Hub Height				
Hub Height 75 m	Tower height 70.5 m (nominal)			
	Dimensions			Weight [ton]
	Max diam. [m]	Min diam. [m]	Length [m]	
Top section	2.53	1.92	23.75	17.0
Middle section	3.14	2.53	23.05	25.0
Bottom section	3.60	3.14	23.70	48.0
Hub Height 50 m	Tower height 46.4 m (nominal)			
	Dimensions			Weight [ton]
	Max diam. [m]	Min diam. [m]	Length [m]	
Top section	2.76	1.92	23.23	15.5
Bottom section	3.60	2.76	23.20	30.5
Hub Height 40 m	Tower height 36.4 m (nominal)			
	Dimensions			Weight [ton]
	Max diam. [m]	Min diam. [m]	Length [m]	
Top section	2.76	1.92	23.22	15.4
Bottom section	3.60	2.76	13.20	16.5
Hub Height 35 m	Tower height 30.5 m (nominal)			
	Dimensions			Weight [ton]
	Max diam. [m]	Min diam. [m]	Length [m]	
Top section	2.76	1.92	15.28	10.0
Bottom section	3.60	2.76	15.25	18.3
Lifting	The tower sections should be lifted using special lifting tools (such as swivels). In case no swivels are used, but slings, precautions are to be taken to avoid damage to the tower surface (conservation).			
Storage				
Transport	For transport standard truck and trailer combinations can be used. Tower sections need to be covered with tarpaulins at both ends during transport and storage, to eliminate dust and dirt getting inside the tower.			

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3 nacelle

Nacelle				
Nacelle for 750 and 900 kW				
	Dimensions			Weight [ton]
	Length [m]	Width [m]	Height [m]	
Nacelle, assembled incl. transport/support frame	5.2	2.58	2.22	10.0
Lifting	The nacelle should be lifted using special lifting tools. In case slings are used, precautions are to be taken to avoid damage to the nacelle surface (conservation).			
Storage	When storing the nacelle, this should be in a dry place.			
Transport	Typically the nacelle is placed on a flat-rack. In case transport is over sea, the packing needs to be seaworthy, including dehumidifying materials. All openings are to be sealed to prevent dust and dirt entering the nacelle.			

4 Hub

Hub				
Hub for 750 and 900 kW				
	Dimensions			Weight ton]
	Diameter [m]		Height [m]	
Hub	3.00		2.50	9.2
Lifting	The hub should be lifted using the Eye bolts provided.			
Storage	When storing the hub, this should be in a dry place. In case of high humidity, dehumidifying materials should be included.			
Transport	Typically the hub is placed on a flat-rack. In case transport is over sea, the packing is to be seaworthy, including dehumidifying materials. All openings are to be sealed to prevent dust and dirt entering the hub.			

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5 Generator

Generator				
Generator for 750 and 900 kW				
	Dimensions			Weight [ton]
	Diameter [m]		Height [m]	
Generator	5.6		2.8	29.6
Lifting	The generator should be lifted using special lifting frame supplied by EWT.			
Storage	When storing the generator, this should be in a dry place. In case of high humidity, dehumidifying materials should be included.			
Transportation	Typically the generator is packed on a flat-rack. In case transport is overseas, the packing is seaworthy.			

6 Blades

Blades 24.5 and 25.8 m				
Blades for 750 and 900 kW				
	Dimensions			Weight [ton]
	Length [m]	Width [m]	Height [m]	
PMC 25.8 - Set of 3 Blades including transport frames	26.2	2.72	2.5	Approx. 7.5
PMC 24.5 - Set of 3 Blades including transport frames	24.9	2.72	2.5	Approx. 7.5
Lifting	Single blade: using a forklift and sling Set of 3 blades: set is packed in a frame (used for transportation). Lifting only by the frames. Under no circumstance the blades are to be lifted using slings!			
Storage	Use the special blade stands			
Transportation	Typically the blades are fitted with transport frames and grouped in sets of 3 blades. In case transport is overseas, the packing is seaworthy.			

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7 Converter

Converter Setec				
Converter for 750 and 900 kW				
	Dimensions			Weight [kg]
	Length [mm]	Width [mm]	Height [mm]	
Converter	800	1000	1000	Approx. 750
Coil box	1000	1000	1000	Approx. 250
Lifting	The converter should be lifted using a forklift.			
Storage	When storing the converter, this should be in a dry place. In case of high humidity, dehumidifying materials should be included.			
Transportation	Typically the converter is packed on a pallet. In case transport is overseas, the packing is to be seaworthy.			
Converter AETI				
Converter for 750 and 900 kW				
	Dimensions			Weight [kg]
	Length [mm]	Width [mm]	Height [mm]	
Converter cabinet	2000	610	2200	Approx. 750
Control Cabinet	1450	410	2800	Approx. 250
Lifting	The converter should be lifted using a forklift.			
Storage	When storing the converter, this should be in a dry place. In case of high humidity, dehumidifying materials should be included.			
Transportation	Typically the converter is packed on a pallet. In case transport is overseas, the packing is to be seaworthy.			

Among the converter other smaller parts and components will have to be packaged and transported to the site. Packaging and logistics of these components will be project specific.

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8 Cranes

Guidelines for Tower Hub Height 35, 40 and 50 m	
Main Crane	
Requirements	Depending on the type of crane used the tonnage of the crane needed is between 250 to 400 metric tons. Typically the type of crane, the age of the crane and the set-up will determine what crane is suitable.
Typically used crane	Liebherr LTM 1400-5, Liebherr LTM 1300-1, Demag AC 350 OR Liebherr LR 1250, Demag CC 1500
Tail crane	
Requirements	Hydraulic crane with minimum capacity of 90 metric tons
Typically used crane	Liebherr LTM 1090
Guidelines for Tower Hub Height 75 m	
Main Crane	
Requirements	Depending on the type of crane used the tonnage of the crane needed is between 400 to 600 metric tons. Typically the type of crane, the age of the crane and the set-up will determine what crane is suitable.
Typically used crane	Liebherr LTM 1500, Demag AC 500-1 or AC 500-2, Liebherr LTM 1650 OR Liebherr LR 1350, Demag CC 1800
Tail crane	
Requirements	Hydraulic crane with minimum capacity of 90 metric tons
Typically used crane	Liebherr LTM 1090
Max ground pressure	150 kN/m²

IMPORTANT NOTE:

The information above is an indication of requirements. It is the crane contractor's responsibility to perform an appropriate site survey before the works commences.

The site survey will determine exact location where the main crane and the tail crane will be placed in relation to the base of the WTG tower, the access route for the building blocks, and the construction area at the place of erection.

For each WTG a different crane plan will need to be made, as for each WTG position the soil conditions, the access route and site conditions the position of cranes can be different in relation to the WTG.

It is the crane contractor's responsibility to make, on the basis of the site survey, a crane plan for each WTG location. The type of crane to be used is dependent on the make and the technical data.

The site survey will also determine if any civil works need to be undertaken. These civil works are not limited to flattening any (rough) surface for easy access, but will also determine the soil conditions and the need for any additional work to be carried (e.g. civil ground works, steel tracks) in order the underground can carry the loads from the building blocks, the transport equipment that carry these to the place of installation and the equipment (cranes) used to do this job. The crane plan will be submitted to EWT for review. The final lay-out remains the responsibility of the crane contractor.

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8 Cranes

Guidelines for Tower Hub Height 35, 40 and 50 m	
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Tail crane	
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Typically used crane	Liebherr LTM 1090
Guidelines for Tower Hub Height 75 m	
Main Crane	
Requirements	Depending on the type of crane used the tonnage of the crane needed is between 400 to 600 metric tons. Typically the type of crane, the age of the crane and the set-up will determine what crane is suitable.
Typically used crane	Liebherr LTM 1500, Demag AC 500-1 or AC 500-2, Liebherr LTM 1650 OR Liebherr LR 1350, Demag CC 1800
Tail crane	
Requirements	Hydraulic crane with minimum capacity of 90 metric tons
Typically used crane	Liebherr LTM 1090
Max ground pressure	150 kN/m²

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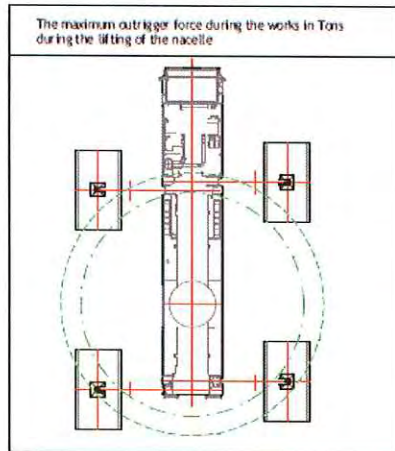
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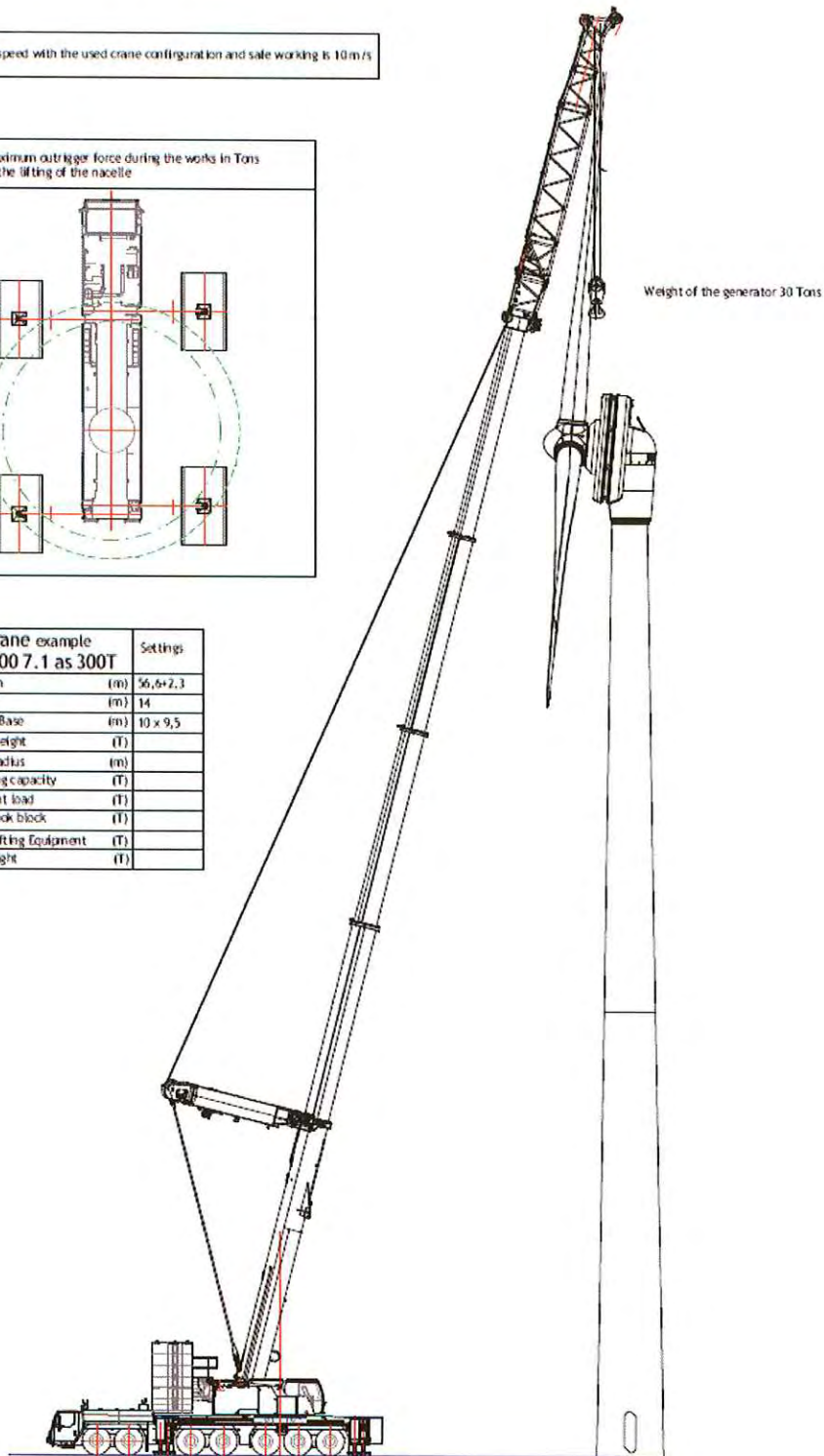
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8.1 Example of Site layout / Crane plan

Max windspeed with the used crane configuration and safe working is 10 m/s

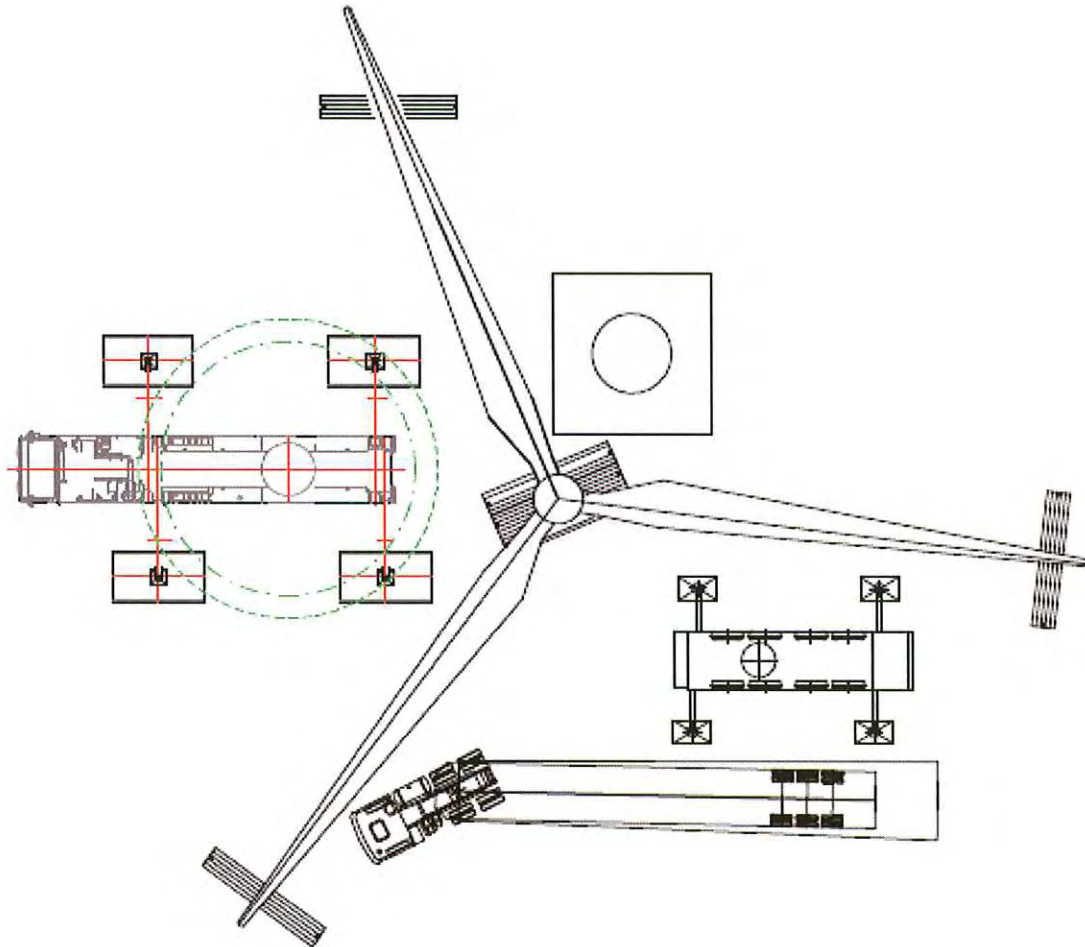


Main crane example LTM 1400 7.1 as 300T		Settings
Main boom	(m)	56,6+2,3
Jib boom	(m)	14
Outrigger Base	(m)	10 x 9,5
Counter weight	(t)	
Working radius	(m)	
Max. lifting capacity	(t)	
Max weight load	(t)	
Weight hook block	(t)	
Weight Lifting Equipment	(t)	
Total Weight	(t)	

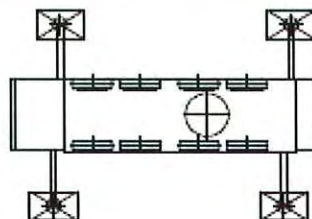




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The maximum outrigger force during the works
in Tons during the lifting of tower section 1



90T Tail crane example lifting tower section 1		Settings
Main boom	(m)	18
Jib boom	(m)	∞
Outrigger Base	(m)	
Counter weight	(T)	
Working radius	(m)	
Max. lifting capacity	(T)	
Max weight load	(T)	
Weight hook block	(T)	
Weight Lifting Equipment	(T)	
Total Weight	(T)	

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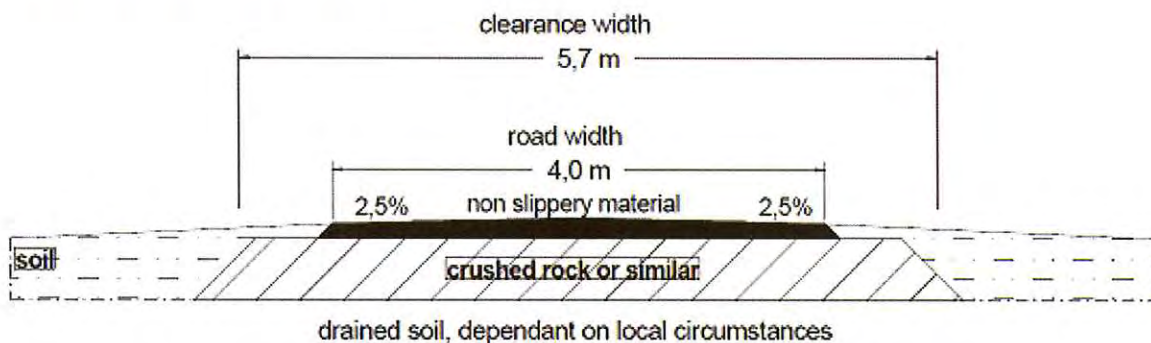
9 roads

Access roads including bridges have to be able to withstand the movement of heavy equipment and trucks with heavy exceptional cargo up to a maximum axle load of 15T and a maximum overall weight of 120T. Access has to be kept clear at all times. The EWT Project Manager has to be informed in case problems are expected.

Minimum Road requirements	
Useful width of carriage way	4,0m
Clearance width	5,7m
Clearance height	4,6m
Minimum Bend radius *	20m
Maximum longitudinal slope *	8 °
Maximum lateral slope *	0-2°
Maximum axle load	15T

* Deviations To the acceptance of the Transport Company and Crane Hire Company

9.1 Example of road construction



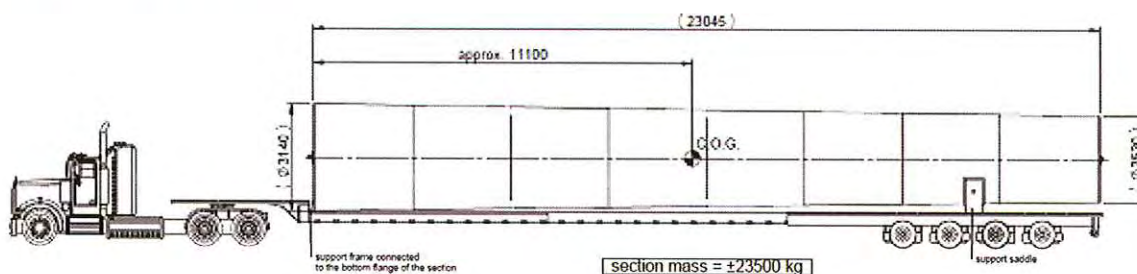
The construction illustrated above is an example, constructed on solid soil. Other circumstances might require other constructions to meet the minimum requirements, for example use more crushed rock or similar, install a geogrid or other solutions. EWT has always to be informed prior to access road construction and in case of changes to the existing situation.

The important part of access road construction is drainage and water discharge. Always prevent water to be near the access roads and construction area.

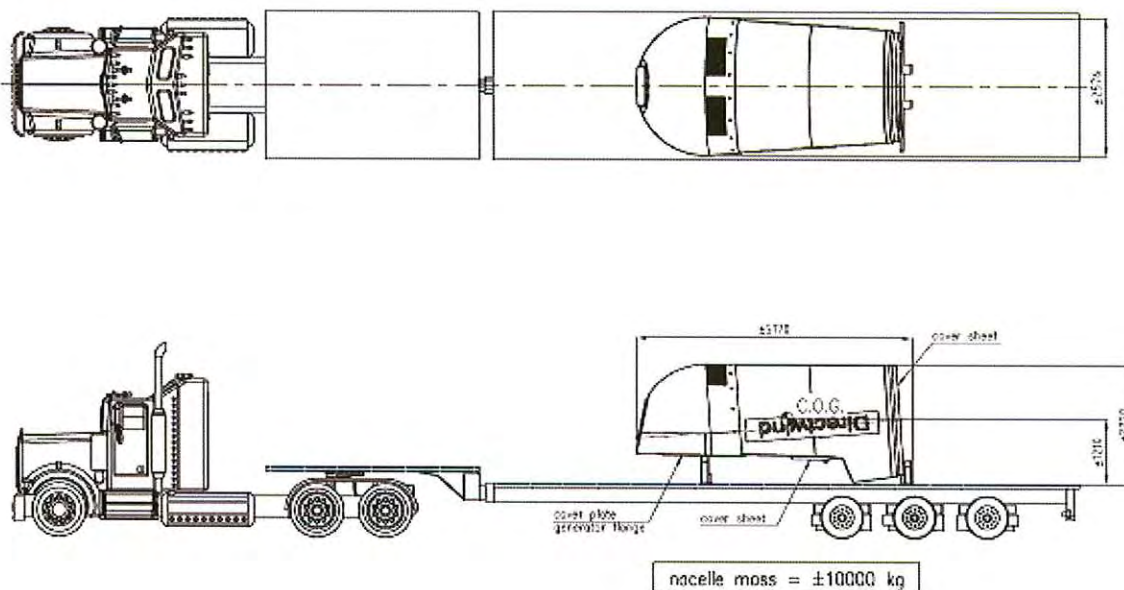
	Category:	Specification	08-07-09
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10 Overview of transport vehicles examples

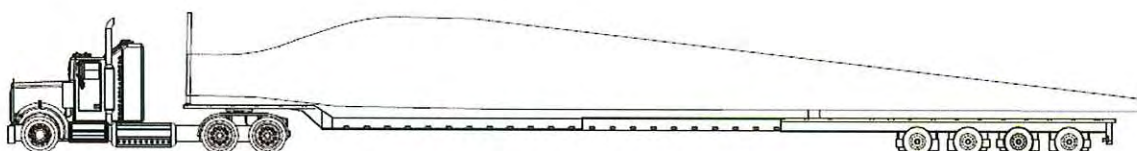
Tower section example



Nacelle

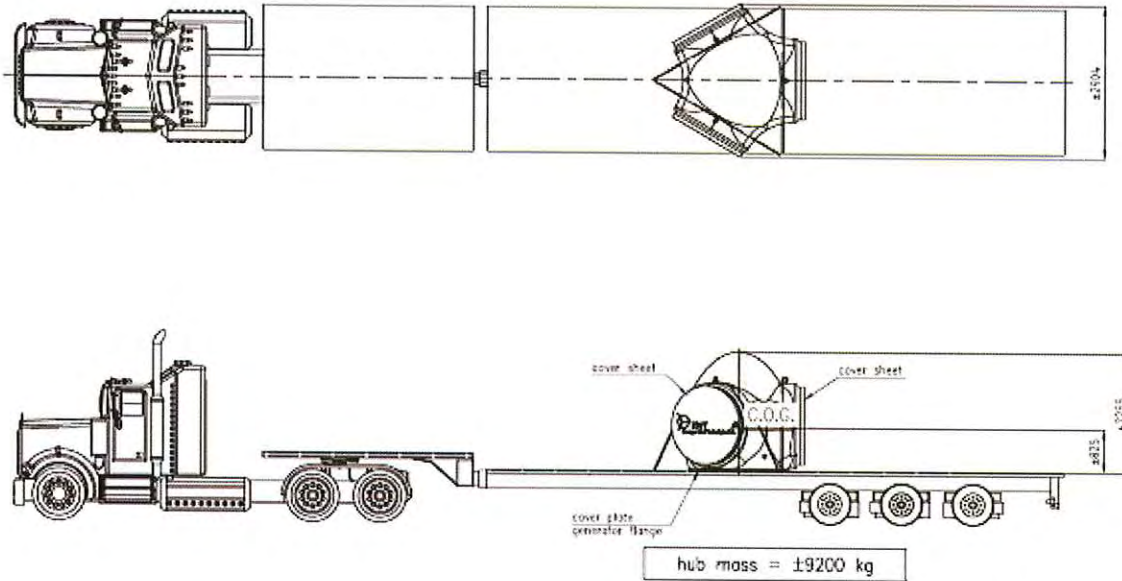


Blades

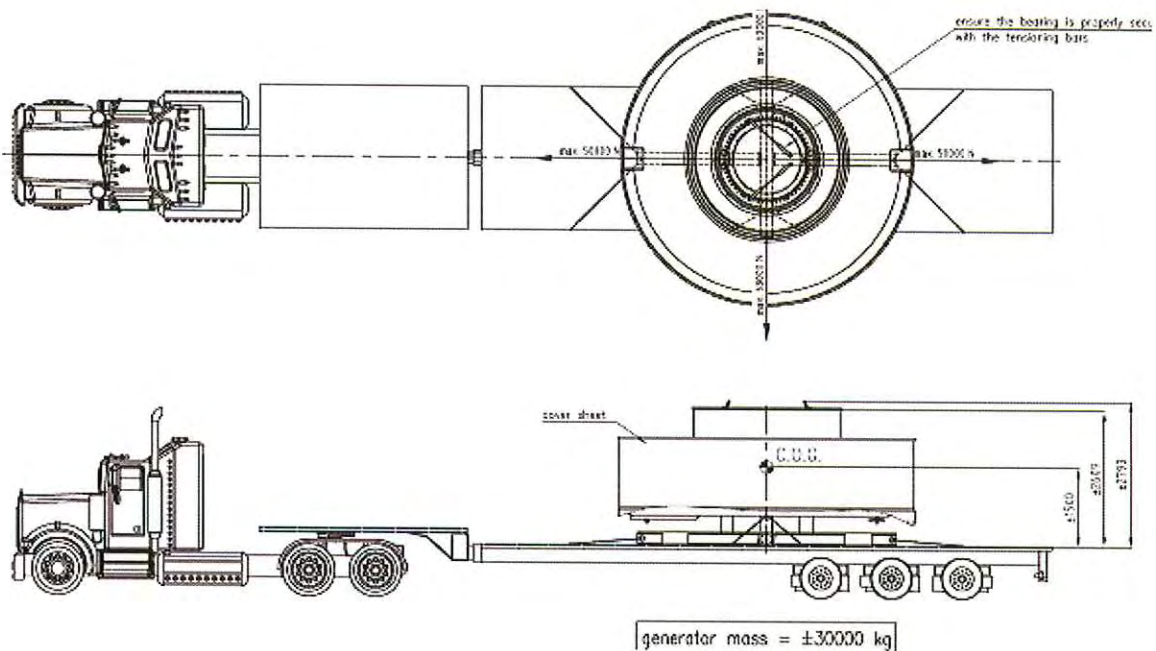


	Category:	Specification	08-07-09
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	Doc code:	S-1000910.docx	

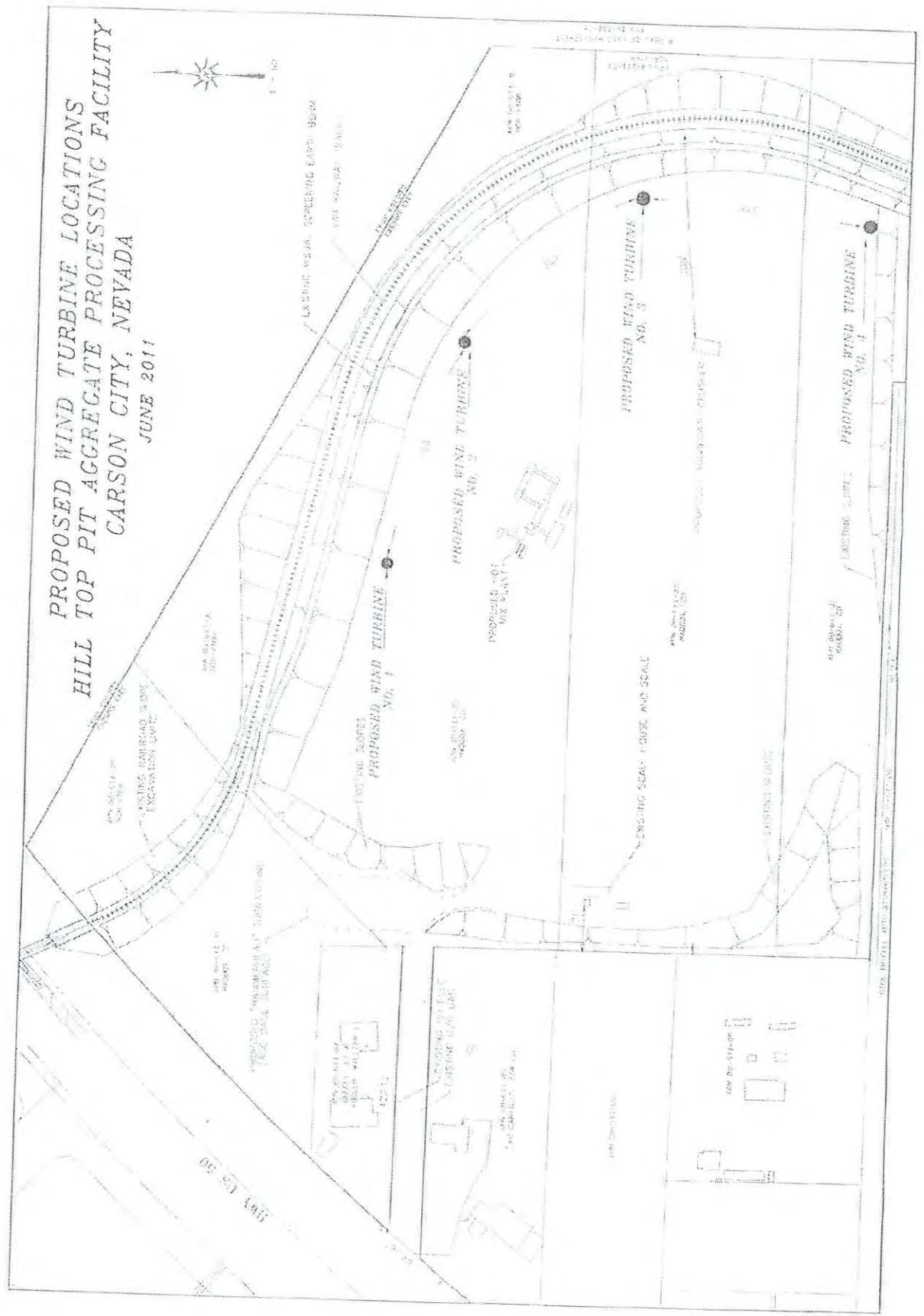
Hub

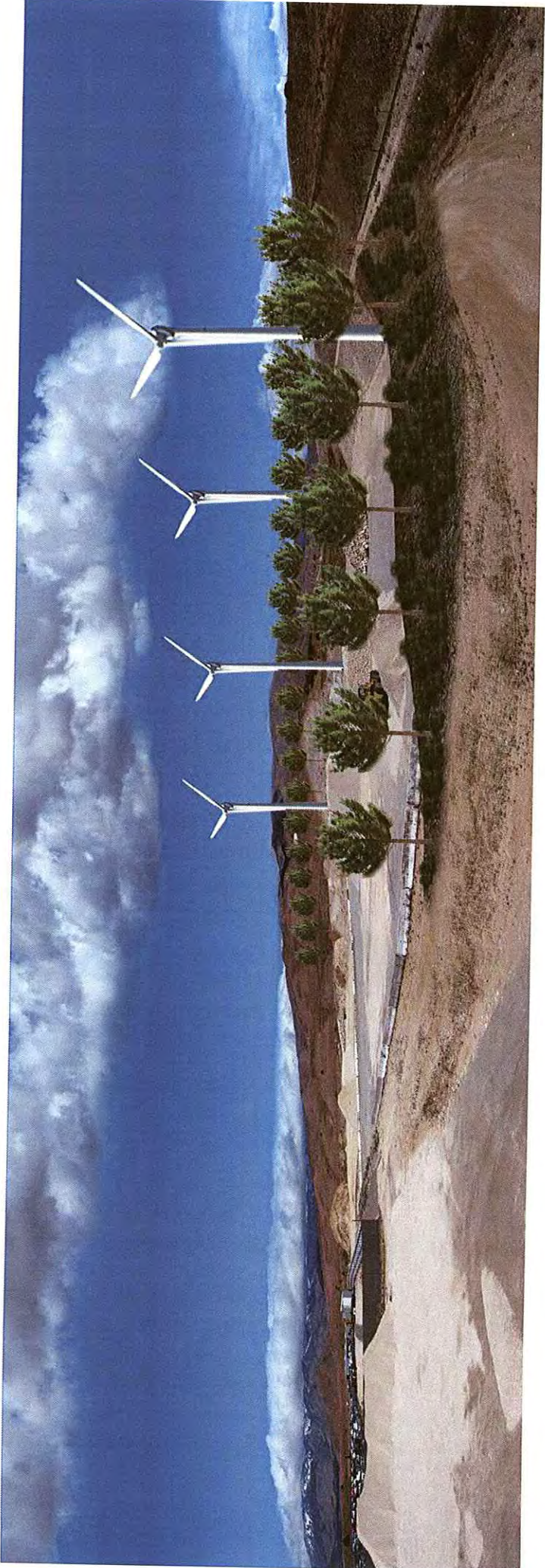


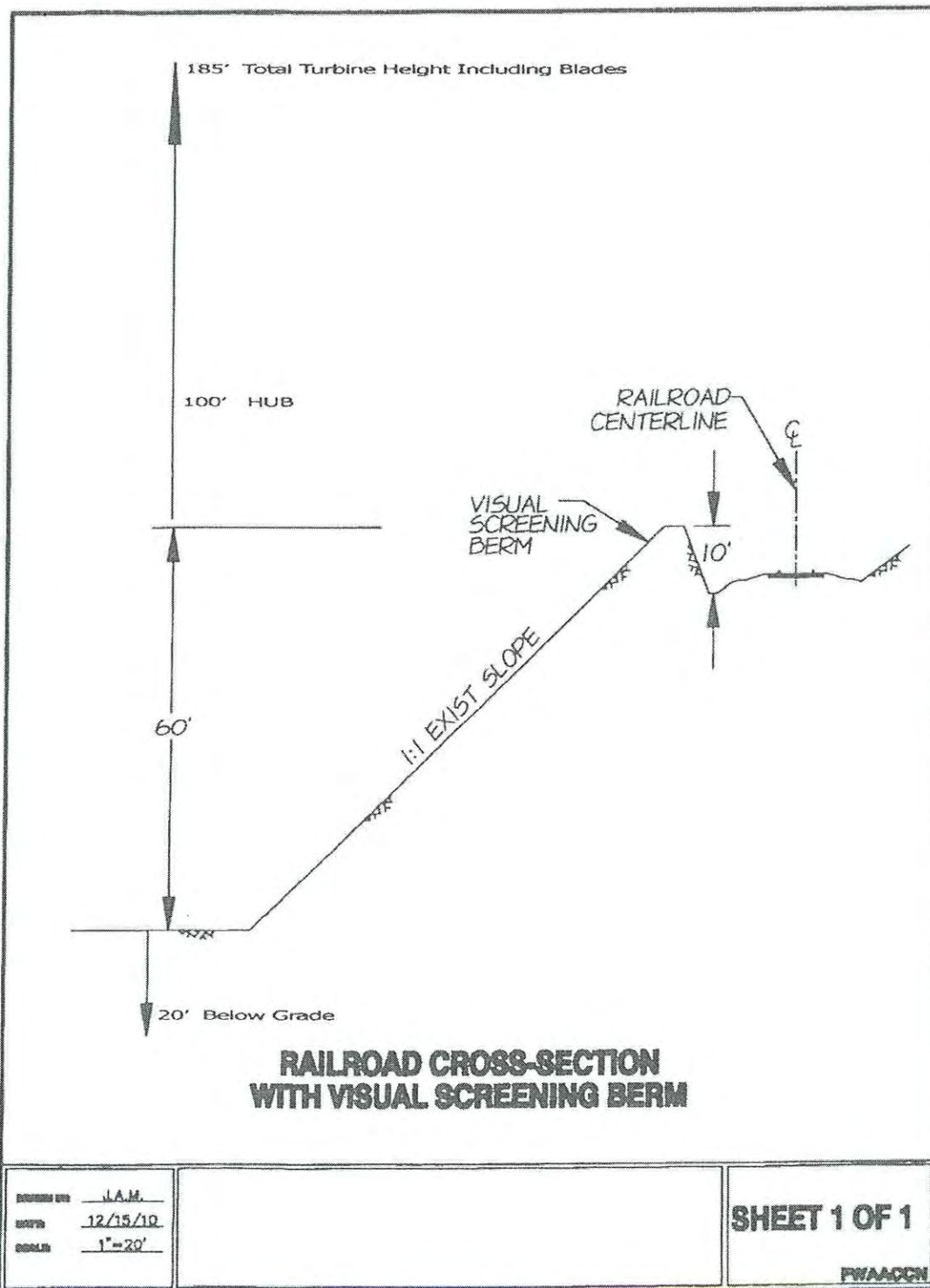
Generator



PROPOSED WIND TURBINE LOCATIONS HILL TOP PIT AGGREGATE PROCESSING FACILITY CARSON CITY, NEVADA JUNE 2011









2600 COLLEGE PKWY #6, CARSON CITY, NV 89706 | P: 775-841-2255 | F: 775-841-2254 | WWW.CARSONCITY-AIRPORT.COM

August 19, 2011

Carson City Planning Commission
108 East Proctor Street
Carson City, Nevada 89701

RE: PROPOSED WIND TURBINE PROJECT

Gentlemen:

During the past few months, Mr. Robert Matthews of Far West Aggregate and Asphalt has asked us to consider his proposed development of four wind turbines at a site located 2116 feet northeast of the Parker Carson Airport and 2.59 nautical miles east of the Carson City Airport. This site is a gravel pit, immediately adjacent to the northeast boundary of Pick-N-Pull Auto Dismantlers, 7777 Hwy 50 East.

There have been several proposed configurations, however, the four turbine design with a maximum blade arc height of 199 feet above ground level is the latest and final proposal. Accordingly, Mr. Matthews has submitted a request to the Federal Aviation Administration (FAA) under 14 CFR Part 77 for a determination as to whether these turbines would constitute a hazard to navigation. The following Aeronautical Study Numbers (ASN's) have been assigned by the FAA for each turbine: 2011-WTW-6009-OE, 2011-WTW-8741-OE, 2011-WTW-8742-OE, and 2011-WTW-8743-OE. These studies can be tracked at <http://oeaaa.faa.gov>.

Until this point in time, the Carson City Airport Authority (CCAA) has opposed this project due to Standard Instrument Approach Procedures (SIAP's) that are currently under development by the FAA for Runway 27. After a great deal of communication with the FAA, we have been able to determine that the height of the blade arc (199 ft.) as proposed in the aforementioned ASN's, lies 241 feet below the controlling obstacle used by the FAA to design the SIAP's for Carson City. Therefore, the CCAA, acting at its regular meeting on August 17, 2011, has voted to drop our opposition to this project. There are however, other factors involved, such as the distance from the Parker Carson Airport, over which we have no purview. Obviously, the FAA's position will not be official until the ASN's have been completed.

Please do not hesitate to call if I can be of further assistance.

Sincerely,



Harlow W. Norvell, Chairman
Carson City Airport Authority
2600 East College Parkway, #6
Carson City, Nevada 89706
(775) 240-1622

Cc: Robert Matthews, Larry Werner

**KAEMPFER
CROWELL**

ATTORNEYS AT LAW

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CARSON CITY OFFICE
510 W. Fourth Street
Carson City, NV 89703
Tel: 775.884.8300
Fax: 775.882.0257

July 22, 2011

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

SENT VIA FED EX
Destination phone 817-222-5002

*Re: Aeronautical Study No.
2010-WTW-16651-OE*

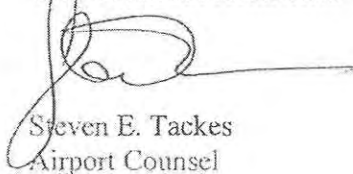
Dear Ms. ONeill and FAA Regional Office:

This firm is retained as Airport Counsel to the Carson City Airport Authority and was requested to supply the attached Comments in response to the circulation Public Notice as regards the proposed wind turbine(s) to be located near the Carson City Airport (CXP).

If you have any questions, do not hesitate to contact me directly. Or you may contact Harlow Norvell, Chairman, Carson City Airport Authority at 775-841-2255.

Sincerely,

KAEMPFER CROWELL RENSHAW
GRONAUER & FIORENTINO



Steven E. Tackes
Airport Counsel

ELECTRONIC CC:

HARLOW NORVELL, CHAIRMAN,
CARSON CITY AIRPORT AUTHORITY

TIM ROWE, MANAGER
CARSON CITY AIRPORT

ROBERT MATTHEWS
7460 APPLICANT



COMMENTS OF THE CARSON CITY AIRPORT AUTHORITY

Page 1 of 3

These comments are submitted on behalf of the CARSON CITY AIRPORT AUTHORITY, owners and managers of the Carson City Airport (CXP) located in Carson City, Nevada (Nevada's Capitol City). We offer the following in response to the invitation for comment as to all facts relevant to "the effect of the structure on existing and planned airspace use, air navigation facilities, airports, aircraft operations, procedures and minimum flight altitudes, and the air traffic control system." [2011 06 17 FAA-OEG Notice and Investigation].

The Carson City Airport Authority (CCAA) was approached by the Carson City Planning Commission and by Mr. Robert Matthews (Matthews) as to input regarding a special use permit to place a wind turbine at the location identified in the 7460 under study. The CCAA took evidence and comment at its publicly noticed meetings on November 17, 2010, June 15, 2011, and July 20, 2011. During that time period the proposal presented to the CCAA changed. Originally, Matthews proposed a wind turbine with a hub tower of 225' and an additional blade reach of 135' for a total obstruction height of 360'. In response to that proposal, the CCAA strongly opposed its construction as a safety hazard and concerns that it would frustrate current plans for a straight-in (or modified straight-in) approach to Runway 27, the Airport's sole runway being 27-9 (ie. east-west alignment). The structure was proposed to be in the general traffic corridor. As set forth below, Matthews subsequently proposed a series of 4 wind turbines of an approximate total height of 200' each.

CXP sits at 4700 ft, MSL, in a mountainous valley and is surrounded by mountains on 3 sides. To the west are the high Sierra Nevada mountains with terrain obstructions to approximately 10,800 ft. To the north are a series of mountains including McClellan Peak at 7415 ft ground elevation plus multiple antenna installations. To the east are the generally north-south range of the Pine Nut Mountain Range which climb to 7,375 ft. To the south is an open valley for a considerable length. The various passes to the west, north and east result in natural aviation corridors for pilots descending into CXP or climbing out of CXP. To the west, traffic generally flies over Spooner Summit (approx 7100 MSL) and then climb to altitude over Lake Tahoe. To the north, climbing or descending traffic generally flies over US 395 which represents a lowest point over that range. To the east, and relevant to these comments, traffic generally follows the corridor over US 50 adjacent to the proposed site of the wind turbines. [These can be seen on the San Francisco Sectional Chart; FAA Product ID: SSF, NGA Ref. SECXXFRISCO]. The initial concerns expressed by the CCAA were that the turbines would present a hazard to VFR traffic descending into CXP or climbing out of CXP through that traffic corridor. The CCAA also was concerned that its efforts for a straight-in (or modified straight-in) approach to Runway 27 would be hampered by the wind turbines. As to the former concern, we do have a significant number of student/low time pilots and occasional low ceilings which would likely result in pilots flying low through the corridor when they saw sufficient airspace clear around CXP. (Eg. a 5800 ft ceiling would be sufficient for operations in the CXP pattern but could squeeze the aircraft toward an obstruction if it was entering through one of the corridors, and thusly tend to risk obstruction collision.)

While we expect all pilots to operate safely, we are cognizant that many, through lack of experience or otherwise, will fly in marginal VFR conditions so long as they can see their destination or return to their destination (or otherwise meet flight standards criteria but still represent marginal conditions). This problem is exacerbated if the pilot is flying into the sun (morning departure to the east; afternoon arrival from the east); has rough engine on climbout or other lack of performance; or high density altitude, particularly since our summer temperatures are often in the 90s (F). When added to the elevations, this is a significant consideration for all pilots in the mountainous western states. CCAA members, Airport Counsel and others have independently flown the area and confirmed that these concerns are real. Against that background, the CCAA voted unanimously twice to oppose the wind turbine proposal on the basis that it is a hazard to aviation.

However, the CCAA has worked with Matthews to try to come up with solutions and thus has expressly less opposition to the most recent proposal by Matthews.

In his most recent proposal, Matthews proposes construction of 4 turbines, each about 200 ft in height. He proposed use of the American Wind Energy AWE 52-900 wind turbines using a 35m nacelle/ hub height. (copy of his proposal attached) Together with the 52m blade diameter, this would result in a height of approximately 200 ft. On representations from Matthews, the base of the turbines are to be set at 4960. Matthews invited the Airport Engineer, Airport Manager and Airport Counsel to visit the site, during which time we observed adjacent hills which will shelter a portion of the structures. Matthews provided (copy attached) survey results showing that the adjacent hill to the Northeast is 5067 MSL and the adjacent hill to the southeast is 5159 MSL. Thus the structures would be no higher than the hill to the southeast. However, the hill to the northeast would shelter about 1/2 of the height and the area between the 2 hills would expose an even greater portion of the obstruction. Based on that representation, the CCAA considered the project as presenting an obstruction of about 100 ft greater than the terrain. While this was still a concern, it is certainly less of a concern than the original proposal.

Under the newer proposal, the CCAA still has concerns as to the effects on instrument approaches to, and published departures from, CXP. The CCAA has worked for over 4 years to obtain a straight-in (or modified straight-in, eg. visual descent point and turn to runway heading) approach. This is widely accepted by the aviation community as the safest and best way to approach for landing in instrument (including marginal VFR) conditions. To that end, the CCAA continued the matter to its August 20, 2011 meeting so that the CCAA can better determine the effects of the proposed wind turbines on the approach under study by the FAA. The concerns expressed were both the limitations that the wind turbines would place on altitudes and on the landing course. As such, the CCAA is seeking from the FAA Flight Operations that the proposed wind turbines will not impact the RNAV GPS RWY 27 approach to LNAV minimums.

Similar concerns were expressed as to the departure procedures. At present, the single departure at CXP has been of limited use (JIMPA departure). The state pilot, who flies a Cessna Citation daily, as well as occasional other state aircraft, reports that there is often confusion by the air traffic control over this departure. A departure to the east that would allow flying to the VIKES intersection would be a safer and more orderly transition from the departure to the enroute portion of instrument flight plans. The Chairman of the CCAA, who is also a high time ATP, confirmed this concern. Thus the departure procedure under study should also be examined for impact.

The most critical issue to the CCAA is the viability of the RNAV GPS RWY 27 approach and potential departure procedure (DP) to the east/northeast that would intercept the enroute structure somewhere between VIKES and YERIN intersection rather than JIMPA.

While the VFR aspects may still represent problems, the CCAA members expressed their focus on the instrument aspects and their hopes that VFR issues might be solved. In that regard, there is an outstanding concern about lighting. Per AC 70/7460-1, the sole lighting appears to be on the support tower at hub height. Here the hub height may be close to the surrounding hills and thus beacon may not provide adequate warning. In addition, the unlit blades may be the bulk of the area above the surrounding hills, and thus some 75 to 100 feet of obstruction not easily seen. A solution to this problem may be spot lights on the blades or some other method of lighting which does not hamper the aerodynamics of the blades.

Ultimately, the CCAA continued the matter until its August meeting, at the request of Matthews. However, recognizing the comment deadline, the CCAA wanted to share with you their thoughts and provide the basis for their concerns, and in doing so, convey local aviations' considerations with you.

If there are any questions, please do not hesitate to contact the undersigned.

As an aside, we should mention that the CCAA is made up of 7 appointed community members all with an aviation background. Several are active ATPs, whose daily jobs involve commercial aviation; several are GA pilots; several work in aviation businesses and/or high tech industries in aviation. One is a city official (law enforcement). As a result, they bring a very practical viewpoint to operations around the Airport. The CCAA has invested well over \$50million into the Airport over the last 7 years, including a complete replacement of the runway and taxiways. The Airport is an important economic engine in Carson City and has an excellent track record for operations, growth and safety.

Contact information:

Steven E. Tackes, Esq. 775-884-8306 direct line

Harlow Norvell, Chairman 775-841-2255 (Airport Office)

Tim Rowe, Airport Manager 775-841-2255 (Airport Office)

2011 06 15

Presentation by Robert Matthews to Carson City Airport Authority at the Authority meeting June 15, 2011 regarding new proposal for wind turbine project.

Pg 1- Cover page

Pg 2- photo of pit area

Pg 3- photo of pit area modified to show future turbines and landscaping

Pg 4- area map

Pg 5- arial photo showing pit area and Carson Parker Airport

Pg 6- site schematic from Manhard

Pg 7- aerial photo/Google Earth view of Project Site location

Pg 8- site schematic showing proposed turbine locations; Turbines Nos. 1-4

Pg 9- excerpt from Sectional Map

Pg 10-12 - FAA Notice

Pg 13-15- AWE 52-900 Turbine specifications