

INFINITE GREEN ENERGY

ARROWSMITH HYDROGEN PLANT WIND FARM

ARROWSMITH GREEN

Appendix 2

NOISE IMPACT ASSESSMENT

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1. INTRODUCTION

Herring Storer acoustics were commissioned to carry out a noise impact assessment for the proposed Arrowsmith Hydrogen Energy Plant.

This report assesses the noise impact with the proposed wind farm associated with the development.

This will assist in informing the design team, and the development approval process for the project.

The proposed development site is located 30km south of Dongara between the Brand Highway and Indian Ocean Drive.

The project produces hydrogen through an electrolysis process, with the energy for this process supplied by onsite solar and wind farms.

The proposed wind farm consists of 18 wind turbines.

See Appendix A for locations of turbines and noise sensitive premises.

The noise impact assessment has been carried out in accordance with the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines) which is the guidelines recognised by the Department of Environment and Conservation for the assessment of wind farms.

This assessment has been undertaken to accompany the development application for the project.

2. SUMMARY

Noise levels were assessed at the nearest identified receiver points, with these locations shown in Appendix A.

On the basis of following the assessment procedures outlined for the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines) and the *Environmental Protection (Noise) Regulations 1997*, noise emissions at all noise sensitive locations has been calculated to comply with both the Guidelines and the *Environmental Protection (Noise) Regulations 1997*.

3. CRITERIA

According to the Western Australian Planning Position Statement : Renewable energy facilities - March 2020, the noise impact of proposed wind farms in Western Australia should be assessed in accordance with the criteria and approach of assessing wind farms described in the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines)

Whilst the Western Australian Planning Position Statement additionally refers to the requirement of wind farms to meet the standards prescribed under the *Environmental Protection (Noise) Regulations 1997*, which relates to “unreasonable noise”. The Environmental Protection Act 1986 under Part 1, Section 3, Clause 3 defines “unreasonable noise” as follows :

For the purposes of the Act, noise is to be unreasonable if –

- a) *It is emitted, or the equipment emitting it is used, in contravention of –*
 - i) *this Act;*
 - ii) *any subsidiary legislation made under this Act; or*
 - iii) *any requirement or permission (by whatever name called) made or given by or under this Act;*
- b) *having regard to the nature and duration of the noise emissions, the frequency of similar noise emissions from the same sources (or a source under the control of the same person or persons) and the time of day at which the noise is emitted, the noise unreasonably interferes with the health, welfare, convenience, comfort or amenity of any person; or*
- c) *it is prescribed to be unreasonable for the purposes of the Act.*

Given that the Regulations, and associated guidelines, were established prior to wind farms being a realistic consideration in Western Australia, and the meteorological conditions dictated within the DWER guidance on environmental noise for the modelling and assessment of proposed noise sources does not align with the maximum noise generated by wind turbines, the SA Guidelines is considered to provide an appropriate criteria to utilise for assessment purposes, and determination of if wind turbine noise is “unreasonable”, based upon part b) of Clause 3 of the Act above.

Notwithstanding the above an assessment against both the SA Guidelines and the *Environmental Protection (Noise) Regulations 1997* has been undertaken, with the relevant criteria listed below.

3.1 SOUTH AUSTRALIAN GUIDELINES

The Guidelines recommend the following criteria for the assessment of noise levels associated with proposed wind farms.

The predicted equivalent noise level ($L_{Aeq, 10 \text{ minutes}}$), adjusted for tonality in accordance with the Guidelines, should not exceed :

- 35 dB(A), or
- 40 dB(A) in a primary production / rural industry zone, or
- the “Alternative Minimum Criteria” (Varying with Wind Speed); or
- the background noise ($L_{A90, 10 \text{ minutes}}$) by more than 5 dB(A).

Based on the results of background noise monitoring undertaken during March/June 2021 (presented in Herring Storer Report ref: 27498-5-21074), the criteria for wind turbine noise are as presented in Table 3.1.

See Appendix D for the background noise monitoring location.

TABLE 3.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

Background Monitoring Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)												
	3	4	5	6	7	8	9	10	11	12	13	14	15
1	40	36	37	35	37	41	40	42	42	44	45	47	48
2	43	44	47	45	46	46	45	45	45	47	48	48	49

The background monitoring locations were located at the receiver points considered in this assessment, with the exception of the Cliff Head Campsite, which being close to 2000m from the nearest turbine proposed within the development, was not considered necessary for assessment.

Notwithstanding the distance from the proposed development, the background noise level at the Cliff Head Campsite has been assumed as similar to Background Monitoring Location 2 – due to the proximity to the ocean of this location. As the camp site is closer again to the ocean (essentially on the beach) this would be considered a conservative assumption of background noise levels at the camp site location (i.e. under estimate the background noise levels).

3.2 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997

The *Environmental Protection (Noise) Regulations 1997* stipulate the allowable noise levels at any noise sensitive premises from other premises. The allowable or assigned noise levels for noise sensitive premises are determined by the calculation of an influencing factor, which is added to the baseline criteria set out in Table 1 of the Regulations. The baseline assigned noise levels are listed in Table 3.1. For commercial premises, the allowable or assigned noise levels are the same for all hours of the day. Table 3.1 also lists the assigned noise levels for commercial premises.

TABLE 3.1 – ASSIGNED NOISE LEVELS

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L _A 10	L _A 1	L _A max
Noise sensitive premises within 15 metres of a dwelling	0700 - 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35 + IF	45 + IF	55 + IF

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

It is a requirement that noise from the site be free of annoying characteristics (tonality, modulation and impulsiveness) at other premises, defined below as per Regulation 9.

“impulsiveness” means a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax Slow} is more than 15dB when determined for a single representative event;

“modulation” means a variation in the emission of noise that –

- (a) is more than 3dB $L_{A \text{ Fast}}$ or is more than 3dB $L_{A \text{ Fast}}$ in any one-third octave band;
- (b) is present for more at least 10% of the representative assessment period; and
- (c) is regular, cyclic and audible;

“tonality” means the presence in the noise emission of tonal characteristics where the difference between –

- (a) the A-weighted sound pressure level in any one-third octave band; and
- (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A \text{ Slow}}$ levels.

Where the above characteristics are present and cannot be practicably removed, the following adjustments are made to the measured or predicted level at other premises.

TABLE 3.2 – ADJUSTMENTS FOR ANNOYING CHARACTERISTICS

Where tonality is present	Where modulation is present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB

The area surrounding the proposed development is considered likely to be zoned rural, and the surrounding road network is not considered to be classified as a major or secondary road – hence the influencing factor in the surrounding area would be estimated at 0 dB.

Hence the assigned noise levels would be as listed in Table 3.3.

TABLE 7.3 - ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises within 15 metres of a dwelling	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55

Note: L_{A10} is the noise level exceeded for 10% of the time.
 L_{A1} is the noise level exceeded for 1% of the time.
 L_{Amax} is the maximum noise level.

4. MODELLING

Noise immissions at residential premises, due to the proposed wind farm, were determined by noise modelling, using the computer program “SoundPlan” version 9.1.

SoundPlan uses the theoretical sound power levels determined from measured sound pressure levels to calculate the noise level at any location.

The following input data was used in the SoundPlan model:

- a) Topographical Information – Ground contours of the development area;
- b) Residential and Wind Turbine Locations – See Appendix A; and
- c) Sound Power Levels, of the wind turbines understood to be utilised, namely:

Vestas V162-7.2 MW, 150m hub height
Blades with serrated trailing edges in normal operating mode (Noise Mode 0).

4.1 SOUTH AUSTRALIAN GUIDELINES MODELLING

The SA Guidelines indicate that noise immissions should be modelled to reflect typical, (but not extreme) “worst case” meteorological conditions for sound propagation towards the receiver.

After a review of the literature available on the subject, noise level emissions were modelled using the ISO 9613-2:2024 algorithm, with the conditions listed in Table 4.1. These conditions, and calculating noise levels utilising a “G=0” ground absorption have been found to provide a generally realistic, but conservative assessment of noise levels associated with wind turbines. This is also listed in Annex D of ISO 9613-2:2024 “Calculation of sound pressure levels caused by wind turbines” – hence is considered appropriate.

TABLE 4.1 – METEOROLOGICAL CONDITIONS

Condition	Value
Temperature	10 °C
Relative humidity	80%
Atmospheric Pressure	101.325 kPa

Noise levels attributable to the proposed wind farm were calculated for integer wind speeds 3 – 15m/s at a height of 150m above ground level (proposed hub height).

The sound power level of the turbines were varied for each integer wind speed, however the other weather conditions within the model remained constant at the conditions stipulated in Table 4.1 above.

4.2 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997 MODELLING

Noise modelling for assessment against the Regulations is required to be undertaken utilising the conditions stipulated to be utilised by the DWER to be used in prediction of noise impacts for developments – these conditions being listed in the DWER *“Guideline Assessment of Environmental Noise Emissions”*. These conditions are listed in the extract below :

Parameter	'Day' 0700–1900	'Night' 1900–0700
Wind speed	4 m/s	3 m/s
Temperature inversion lapse rate	0 °C /100 m	2 °C /100 m
Pasquill stability (CONCAWE)	E	F
Temperature	20 °C	15 °C
Relative humidity	50%	50%

The above table is accompanied with the following note :

“Wind speeds greater than those in Table 4 may elevate background noise levels from local vegetation and can dominate the noise emission”.

The above meteorological conditions specify a “Pasquill stability” that is in reference to the CONCAWE algorithms for noise prediction. The DWER *“Guideline Assessment of Environmental Noise Emissions”* also states that “the method described by ISO 9613:1996 may also be used for the purpose of modelling. Note the method does not allow the input of specific meteorological conditions but does predict for moderate temperature inversions under downwind conditions. In applying the ISO method, it is expected the model inputs and options will be selected with a view to achieve comparable modelling output to the SoundPLAN implementation of CONCAWE”

On the basis of the above noise level emissions were modelled using the ISO 9613-2:2024 algorithm, with the conditions listed in Table 4.2. These conditions, and calculating noise levels utilising a “G=0” ground absorption have been found to provide a generally realistic, but conservative assessment of noise levels associated with wind turbines. This is also listed in Annex D of ISO 9613-2:2024 “Calculation of sound pressure levels caused by wind turbines” – hence is considered appropriate.

TABLE 4.2 – METEOROLOGICAL CONDITIONS

Condition	Value
Temperature	10 °C
Wind Speed	3 and 4 m/s
Relative humidity	80%
Atmospheric Pressure	101.325 kPa

5. RESULTS

5.1 SOUTH AUSTRALIAN GUIDELINES RESULTS

Noise contour plots are attached in Appendix C.

The predicted noise level at each identified residential premises are listed in Table 5.1 below for each of the hub height wind speeds considered.

TABLE 5.1 – PREDICTED NOISE LEVELS AT IDENTIFIED RECEIVER LOCATIONS – SA GUIDELINES

Receiver ID#	Predicted Noise Level, L_{Aeq} [dB(A)]												
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s	14m/s	15m/s
R1	30	30	30	31	34	37	40	40	41	41	41	41	41
R2	21	21	21	22	25	29	31	32	32	32	32	32	33
Cliff Head Campsite	21	21	21	22	25	28	31	31	32	32	32	32	32

5.2 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997

Noise contour plots are attached in Appendix D.

TABLE 5.2 – PREDICTED NOISE LEVELS AT IDENTIFIED RECEIVER LOCATIONS – EP(N)R 1997

Receiver ID#	Predicted Noise Level, L_{Aeq} [dB(A)]	
	3m/s	4m/s
R1	30	30
R2	21	21
Cliff Head Campsite	21	21

6. ASSESSMENT

6.1 SOUTH AUSTRALIAN GUIDELINES ASSESSMENT

Table 6.1 below summarises the level of exceedance to the noise criteria based on background noise monitoring, with the predicted levels exceeding the criteria highlighted in red and the level of exceedance listed in brackets adjacent. The noise criteria at each location is based upon the background noise levels listed in Table 3.1

TABLE 6.1 – ASSESSMENT OF NOISE LEVELS AT IDENTIFIED RECEIVER LOCATIONS

ID#	Predicted Noise Level, L_{Aeq} [dB(A)] Compared to Background Noise Criteria												
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s	14m/s	15m/s
R1	30	30	30	31	34	37	40	40	41	41	41	41	41
R2	21	21	21	22	25	29	31	32	32	32	32	32	33
Cliff Head Campsite	21	21	21	22	25	28	31	31	32	32	32	32	32

As can be seen from the above tables, calculated noise levels at all identified noise sensitive locations have been found to be in compliance with the noise criteria based on background noise monitoring.

6.2 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997 ASSESSMENT

Predicted noise levels associated with the wind farm were considered for the presence of annoying characteristics.

On the basis of the predicted noise levels, and the one-third octave band data for the sound power levels, the noise emissions associated with the wind farm are not considered to contain annoying characteristics, hence, Table 6.2 below summarises the predicted noise levels determined in accordance with the DWER *“Guideline Assessment of Environmental Noise Emissions”*.

TABLE 6.2 – ASSESSMENT

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L _{A10} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	30	Day	45	Complies
		Sundays	40	Complies
		Evening	40	Complies
		Night	35	Complies
R2	21	Day	45	Complies
		Sundays	40	Complies
		Evening	40	Complies
		Night	35	Complies
Cliff Head Campsite	21	Day	45	Complies
		Sundays	40	Complies
		Evening	40	Complies
		Night	35	Complies

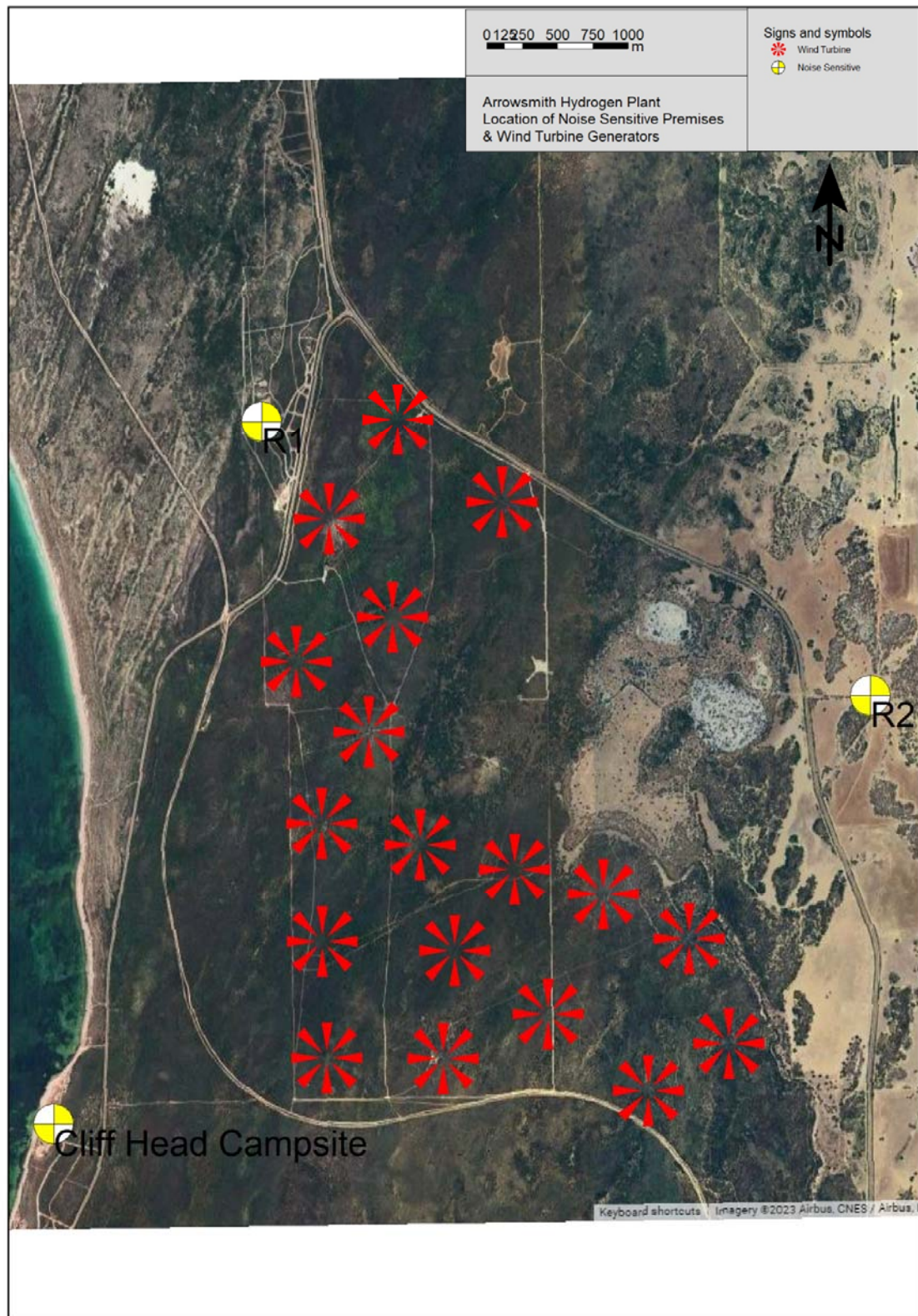
As can be seen from the above table, noise levels associated with the wind farm associated with the proposed development are calculated to comply with the relevant Assigned Noise Levels at all times.

7. CONCLUSION

On the basis of following the assessment procedures outlined for the EPA of South Australia *“Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021”* (Guidelines) and the *Environmental Protection (Noise) Regulations 1997*, noise emissions at all noise sensitive locations has been calculated to comply with both the Guidelines and the *Environmental Protection (Noise) Regulations 1997*.

APPENDIX A

RESIDENTIAL AND WIND TURBINE LOCATIONS



APPENDIX B

TURBINE SPECIFICATIONS

Restricted
Document no 0116-1715_03

Third octave noise emission

EnVentus™

V162-7.2MW 50/60 Hz

Original Instruction: T05 0116-1715 VER 03



T05 0116-1715 Ver 03 - Approved- Exported from DMS: 2023-04-20 by JTYLR

Classification: Restricted

Abstract

This document serves as a paper behind the General Specification.

The document describes the measured/estimated third octave spectra for noise levels according to the General Specification.

The document is a living document and will be updated regularly.

When new measurements exist, the document might be updated.

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1. Introduction

The purpose of this document is to present the expected third octave noise spectra for the V162 EnVentus™ turbine.

Test results for this turbine are not yet available, so data are based on test results from turbines with rotors that are as close as possible in size the V162. All results are thus based upon internal measurement results obtained on V136 turbines.

2. Method

2.1 Procedure

During measurements, a very large number of correlated values for noise emission spectra and turbine operating parameters are identified.

From these a relation between noise emission within each 1/3 octave band, wind speed and operational conditions are extracted. By combination of these extracted values and the actual turbine operation and rotor size, an estimate of the actual 1/3 octave performance is obtained.

The frequency content is limited to the frequency range 6.3 Hz to 16 kHz to secure that measurement system limitations are not influencing the findings. The stated spectral values are thus representative for the expected noise emission from the turbine at each wind speed.

The method is verified as giving results corresponding to direct measured values.

The reported wind speed range cover hub height wind speeds from 3 to 15 m/s. Extrapolations outside this wind speed range is not possible due to limitations in the measured input data.

The stated values do not in any way enable issuing guarantees.

2.2 Physical environment

The results are valid for the downwind reference position as defined according to IEC 61400-11 Ed.3.

Applicable environmental conditions are thus corresponding to the standardized requirements as described directly and indirectly in IEC 61400-11.

These can be interpreted as air density 1.225 kg/m³, yaw errors below +/- 15 deg. and vertical inflow angles below +/- 10 deg. Blade condition is clean and undamaged.

3. Results

3.1 Results V162 PO7200

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.2	27.1	29.6	30.3	30.6	31.1	31.0	30.3	29.3
8 Hz	26.3	27.9	27.6	27.5	30.8	33.7	36.2	36.9	37.1	37.6	37.5	36.9	36.0
10 Hz	32.4	33.9	33.6	33.7	37.0	39.9	42.5	43.1	43.3	43.8	43.7	43.2	42.4
12.5 Hz	38.2	39.6	39.3	39.5	42.8	45.8	48.4	49.0	49.2	49.6	49.5	49.1	48.4
16 Hz	44.1	45.3	45.1	45.0	48.3	51.3	53.9	54.5	54.7	55.0	55.0	54.7	54.1
20 Hz	49.6	50.7	50.5	50.5	53.9	56.5	59.1	59.7	59.9	60.2	60.1	59.9	59.3
25 Hz	55.1	56.0	55.9	55.7	59.0	61.7	64.3	64.9	65.0	65.3	65.3	65.1	64.7
31.5 Hz	60.1	61.0	60.9	60.8	64.2	66.5	69.1	69.7	69.8	70.1	70.1	70.0	69.6
40 Hz	64.7	65.4	65.4	65.5	68.9	71.3	73.9	74.5	74.6	74.9	74.9	74.8	74.5
50 Hz	68.7	69.3	69.3	69.7	73.1	75.7	78.3	78.8	79.0	79.2	79.2	79.2	79.0
63 Hz	72.2	72.7	72.8	73.4	76.8	79.5	82.2	82.7	82.8	83.0	83.1	83.1	82.9
80 Hz	75.1	75.6	75.6	76.5	79.9	82.8	85.5	86.0	86.1	86.3	86.4	86.4	86.4
100 Hz	77.5	77.9	78.0	79.1	82.4	85.6	88.2	88.8	88.9	89.0	89.1	89.2	89.2
125 Hz	79.4	79.7	79.8	81.1	84.5	87.8	90.5	91.0	91.1	91.2	91.3	91.5	91.5
160 Hz	80.8	81.0	81.1	82.6	86.0	89.5	92.1	92.6	92.7	92.8	93.0	93.2	93.2
200 Hz	81.8	81.9	82.0	83.6	86.9	90.6	93.2	93.7	93.8	93.9	94.1	94.3	94.4
250 Hz	82.7	82.8	82.8	84.1	87.5	91.2	93.9	94.4	94.5	94.5	94.7	95.0	95.1
315 Hz	83.3	83.3	83.4	84.7	88.0	91.4	94.0	94.5	94.6	94.7	94.9	95.2	95.4
400 Hz	83.9	83.9	83.9	84.8	88.2	91.5	94.2	94.7	94.8	94.8	95.0	95.3	95.6
500 Hz	84.2	84.1	84.2	85.0	88.4	91.3	93.9	94.4	94.5	94.6	94.8	95.2	95.4
630 Hz	84.1	84.1	84.1	84.9	88.2	91.2	93.8	94.2	94.3	94.4	94.7	95.0	95.3
800 Hz	83.7	83.6	83.6	84.4	87.7	90.6	93.2	93.7	93.8	93.9	94.1	94.5	94.8
1 kHz	83.0	82.9	82.8	83.6	86.8	89.8	92.3	92.8	92.9	93.0	93.3	93.6	93.9
1.25 kHz	81.9	81.7	81.7	82.4	85.6	88.5	91.0	91.5	91.6	91.8	92.0	92.4	92.7
1.6 kHz	80.4	80.3	80.2	80.9	84.1	86.9	89.4	89.9	90.0	90.2	90.5	90.8	91.1
2 kHz	78.7	78.5	78.4	79.0	82.1	85.0	87.4	87.9	88.1	88.2	88.5	88.9	89.2
2.5 kHz	76.5	76.4	76.2	76.8	79.9	82.7	85.1	85.6	85.7	85.9	86.2	86.6	86.9
3.15 kHz	74.1	73.9	73.7	74.2	77.2	80.0	82.4	82.9	83.0	83.3	83.6	84.0	84.2
4 kHz	71.2	71.1	70.8	71.3	74.3	77.0	79.4	79.9	80.0	80.3	80.6	81.0	81.2
5 kHz	68.1	68.0	67.6	68.0	70.9	73.6	76.0	76.5	76.6	76.9	77.3	77.6	77.8
6.3 kHz	64.6	64.5	64.1	64.3	67.2	69.9	72.2	72.7	72.9	73.2	73.6	73.9	74.1
8 kHz	60.7	60.7	60.2	60.4	63.2	65.8	68.1	68.6	68.8	69.1	69.5	69.9	70.0
10 kHz	56.5	56.6	56.0	56.0	58.8	61.4	63.6	64.1	64.3	64.7	65.1	65.4	65.5
12.5 kHz	52.0	52.1	51.4	51.3	54.1	56.6	58.8	59.3	59.5	59.9	60.4	60.6	60.7
16 kHz	47.1	47.2	46.5	46.3	49.0	51.4	53.6	54.1	54.3	54.8	55.3	55.5	55.5
A-wgt	94.0	94.0	94.0	95.0	98.3	101.5	104.1	104.6	104.7	104.8	105.0	105.3	105.5

Table 1: V162 PO7200, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.2 Results V162 PO7200-0S

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	12.7	10.5	9.1	11.6	15.7	19.2	22.1	22.7	22.8	23.3	24.4	25.5	26.7
8 Hz	19.9	17.9	16.6	19.1	23.1	26.7	29.6	30.2	30.2	30.7	31.6	32.7	33.8
10 Hz	26.7	24.8	23.7	26.2	30.2	33.8	36.6	37.2	37.3	37.6	38.5	39.5	40.5
12.5 Hz	33.1	31.4	30.4	32.9	36.9	40.4	43.3	43.8	43.9	44.2	45.1	46.0	46.9
16 Hz	39.5	38.0	37.1	39.2	43.2	46.7	49.5	50.1	50.2	50.5	51.2	52.0	52.8
20 Hz	45.6	44.2	43.4	45.6	49.5	52.6	55.4	56.0	56.0	56.3	56.9	57.7	58.4
25 Hz	51.6	50.4	49.7	51.5	55.4	58.5	61.3	61.9	61.9	62.1	62.7	63.4	64.0
31.5 Hz	57.1	56.1	55.4	57.4	61.3	64.0	66.8	67.3	67.4	67.6	68.1	68.7	69.2
40 Hz	62.2	61.2	60.7	62.7	66.6	69.4	72.2	72.7	72.8	72.9	73.4	73.9	74.4
50 Hz	66.6	65.8	65.3	67.6	71.4	74.4	77.1	77.7	77.7	77.8	78.2	78.7	79.1
63 Hz	70.5	69.8	69.4	71.9	75.7	78.8	81.5	82.1	82.1	82.2	82.5	82.9	83.3
80 Hz	73.9	73.3	72.9	75.6	79.4	82.6	85.4	85.9	85.9	86.0	86.3	86.6	86.9
100 Hz	76.6	76.1	75.9	78.7	82.5	85.9	88.6	89.2	89.2	89.2	89.4	89.7	90.0
125 Hz	78.8	78.4	78.2	81.2	84.9	88.6	91.3	91.8	91.8	91.9	92.0	92.2	92.5
160 Hz	80.5	80.2	80.0	83.1	86.9	90.7	93.3	93.9	93.9	93.9	94.0	94.2	94.4
200 Hz	81.7	81.5	81.4	84.6	88.3	92.2	94.9	95.4	95.4	95.4	95.5	95.6	95.7
250 Hz	82.9	82.7	82.6	85.5	89.2	93.2	95.8	96.3	96.3	96.3	96.4	96.5	96.5
315 Hz	83.7	83.6	83.5	86.4	90.0	93.7	96.3	96.8	96.8	96.8	96.8	96.9	96.9
400 Hz	84.5	84.4	84.4	86.8	90.5	94.1	96.7	97.2	97.2	97.2	97.2	97.2	97.2
500 Hz	84.9	84.9	84.9	87.3	90.9	94.1	96.7	97.2	97.2	97.2	97.2	97.2	97.1
630 Hz	84.9	85.0	85.1	87.4	91.0	94.2	96.8	97.3	97.3	97.2	97.2	97.1	97.1
800 Hz	84.6	84.7	84.8	87.1	90.7	93.8	96.4	96.9	96.9	96.9	96.8	96.7	96.7
1 kHz	83.9	84.1	84.1	86.4	90.0	93.1	95.6	96.1	96.1	96.1	96.1	96.0	95.8
1.25 kHz	82.8	83.0	83.1	85.4	88.9	92.0	94.5	95.0	95.0	95.0	94.9	94.8	94.7
1.6 kHz	81.4	81.6	81.7	83.9	87.4	90.5	93.0	93.5	93.5	93.5	93.4	93.2	93.1
2 kHz	79.6	79.8	79.8	82.0	85.5	88.6	91.0	91.5	91.5	91.5	91.5	91.3	91.2
2.5 kHz	77.4	77.6	77.6	79.8	83.2	86.3	88.7	89.2	89.2	89.2	89.2	89.0	88.9
3.15 kHz	74.8	75.0	75.1	77.2	80.6	83.6	86.0	86.5	86.5	86.5	86.5	86.3	86.2
4 kHz	71.9	72.1	72.1	74.2	77.5	80.5	82.9	83.4	83.4	83.5	83.4	83.3	83.1
5 kHz	68.6	68.8	68.7	70.7	74.1	77.0	79.4	79.9	79.9	80.0	80.0	79.8	79.7
6.3 kHz	64.9	65.1	65.0	67.0	70.2	73.2	75.6	76.1	76.1	76.1	76.1	76.0	75.8
8 kHz	60.8	61.0	60.8	62.8	66.0	68.9	71.3	71.8	71.8	71.9	71.9	71.8	71.6
10 kHz	56.3	56.5	56.3	58.2	61.4	64.3	66.6	67.1	67.2	67.3	67.3	67.2	67.1
12.5 kHz	51.5	51.6	51.4	53.2	56.4	59.3	61.6	62.1	62.1	62.3	62.3	62.3	62.1
16 kHz	46.3	46.4	46.1	47.9	51.0	53.9	56.2	56.7	56.7	56.9	57.0	56.9	56.8
A-wgt	94.5	94.2	94.5	97.0	100.6	104.0	106.6	107.1	107.1	107.1	107.1	107.1	107.1

Table 2: V162 PO7200-0S, expected 1/3 octave band performance
(Blades without serrated trailing edges)

3.3 Results V162 SO0 7200

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.2	27.1	29.6	30.3	30.6	31.1	31.0	30.3	29.3
8 Hz	26.3	27.9	27.6	27.5	30.8	33.7	36.2	36.9	37.1	37.6	37.5	36.9	36.0
10 Hz	32.4	33.9	33.6	33.7	37.0	39.9	42.5	43.1	43.3	43.8	43.7	43.2	42.4
12.5 Hz	38.2	39.6	39.3	39.5	42.8	45.8	48.4	49.0	49.2	49.6	49.5	49.1	48.4
16 Hz	44.1	45.3	45.1	45.0	48.3	51.3	53.9	54.5	54.7	55.0	55.0	54.7	54.1
20 Hz	49.6	50.7	50.5	50.5	53.9	56.5	59.1	59.7	59.9	60.2	60.1	59.9	59.3
25 Hz	55.1	56.0	55.9	55.7	59.0	61.7	64.3	64.9	65.0	65.3	65.3	65.1	64.7
31.5 Hz	60.1	61.0	60.9	60.8	64.2	66.5	69.1	69.7	69.8	70.1	70.1	70.0	69.6
40 Hz	64.7	65.4	65.4	65.5	68.9	71.3	73.9	74.5	74.6	74.9	74.9	74.8	74.5
50 Hz	68.7	69.3	69.3	69.7	73.1	75.7	78.3	78.8	79.0	79.2	79.2	79.2	79.0
63 Hz	72.2	72.7	72.8	73.4	76.8	79.5	82.2	82.7	82.8	83.0	83.1	83.1	82.9
80 Hz	75.1	75.6	75.6	76.5	79.9	82.8	85.5	86.0	86.1	86.3	86.4	86.4	86.4
100 Hz	77.5	77.9	78.0	79.1	82.4	85.6	88.2	88.8	88.9	89.0	89.1	89.2	89.2
125 Hz	79.4	79.7	79.8	81.1	84.5	87.8	90.5	91.0	91.1	91.2	91.3	91.5	91.5
160 Hz	80.8	81.0	81.1	82.6	86.0	89.5	92.1	92.6	92.7	92.8	93.0	93.2	93.2
200 Hz	81.8	81.9	82.0	83.6	86.9	90.6	93.2	93.7	93.8	93.9	94.1	94.3	94.4
250 Hz	82.7	82.8	82.8	84.1	87.5	91.2	93.9	94.4	94.5	94.5	94.7	95.0	95.1
315 Hz	83.3	83.3	83.4	84.7	88.0	91.4	94.0	94.5	94.6	94.7	94.9	95.2	95.4
400 Hz	83.9	83.9	83.9	84.8	88.2	91.5	94.2	94.7	94.8	94.8	95.0	95.3	95.6
500 Hz	84.2	84.1	84.2	85.0	88.4	91.3	93.9	94.4	94.5	94.6	94.8	95.2	95.4
630 Hz	84.1	84.1	84.1	84.9	88.2	91.2	93.8	94.2	94.3	94.4	94.7	95.0	95.3
800 Hz	83.7	83.6	83.6	84.4	87.7	90.6	93.2	93.7	93.8	93.9	94.1	94.5	94.8
1 kHz	83.0	82.9	82.8	83.6	86.8	89.8	92.3	92.8	92.9	93.0	93.3	93.6	93.9
1.25 kHz	81.9	81.7	81.7	82.4	85.6	88.5	91.0	91.5	91.6	91.8	92.0	92.4	92.7
1.6 kHz	80.4	80.3	80.2	80.9	84.1	86.9	89.4	89.9	90.0	90.2	90.5	90.8	91.1
2 kHz	78.7	78.5	78.4	79.0	82.1	85.0	87.4	87.9	88.1	88.2	88.5	88.9	89.2
2.5 kHz	76.5	76.4	76.2	76.8	79.9	82.7	85.1	85.6	85.7	85.9	86.2	86.6	86.9
3.15 kHz	74.1	73.9	73.7	74.2	77.2	80.0	82.4	82.9	83.0	83.3	83.6	84.0	84.2
4 kHz	71.2	71.1	70.8	71.3	74.3	77.0	79.4	79.9	80.0	80.3	80.6	81.0	81.2
5 kHz	68.1	68.0	67.6	68.0	70.9	73.6	76.0	76.5	76.6	76.9	77.3	77.6	77.8
6.3 kHz	64.6	64.5	64.1	64.3	67.2	69.9	72.2	72.7	72.9	73.2	73.6	73.9	74.1
8 kHz	60.7	60.7	60.2	60.4	63.2	65.8	68.1	68.6	68.8	69.1	69.5	69.9	70.0
10 kHz	56.5	56.6	56.0	56.0	58.8	61.4	63.6	64.1	64.3	64.7	65.1	65.4	65.5
12.5 kHz	52.0	52.1	51.4	51.3	54.1	56.6	58.8	59.3	59.5	59.9	60.4	60.6	60.7
16 kHz	47.1	47.2	46.5	46.3	49.0	51.4	53.6	54.1	54.3	54.8	55.3	55.5	55.5
A-wgt	94.0	94.0	94.0	95.0	98.3	101.5	104.1	104.6	104.7	104.8	105.0	105.3	105.5

Table 3: V162 SO0 7200, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.4 Results V162 SO1

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.2	27.1	28.4	27.6	28.5	29.9	29.7	28.8	27.6
8 Hz	26.3	27.9	27.6	27.5	30.8	33.7	35.0	34.3	35.2	36.4	36.2	35.4	34.3
10 Hz	32.4	33.9	33.6	33.7	37.0	39.9	41.3	40.7	41.4	42.5	42.3	41.6	40.6
12.5 Hz	38.2	39.6	39.3	39.5	42.8	45.8	47.2	46.7	47.4	48.3	48.1	47.5	46.6
16 Hz	44.1	45.3	45.1	45.0	48.3	51.3	52.8	52.3	52.9	53.8	53.6	53.0	52.2
20 Hz	49.6	50.7	50.5	50.5	53.9	56.5	58.0	57.6	58.1	58.9	58.7	58.2	57.5
25 Hz	55.1	56.0	55.9	55.7	59.0	61.7	63.2	62.9	63.4	64.0	63.8	63.4	62.8
31.5 Hz	60.1	61.0	60.9	60.8	64.2	66.5	68.1	67.8	68.2	68.8	68.6	68.2	67.7
40 Hz	64.7	65.4	65.4	65.5	68.9	71.3	73.0	72.7	73.1	73.5	73.4	73.0	72.6
50 Hz	68.7	69.3	69.3	69.7	73.1	75.7	77.4	77.2	77.5	77.9	77.7	77.4	77.0
63 Hz	72.2	72.7	72.7	73.4	76.8	79.5	81.2	81.1	81.4	81.7	81.5	81.3	81.0
80 Hz	75.1	75.6	75.6	76.5	79.9	82.8	84.6	84.5	84.7	85.0	84.8	84.6	84.4
100 Hz	77.5	77.9	78.0	79.1	82.4	85.6	87.4	87.3	87.5	87.7	87.6	87.4	87.2
125 Hz	79.4	79.7	79.8	81.1	84.5	87.8	89.6	89.6	89.7	89.9	89.8	89.7	89.5
160 Hz	80.8	81.0	81.1	82.6	86.0	89.5	91.3	91.3	91.4	91.5	91.4	91.3	91.2
200 Hz	81.8	81.9	82.0	83.6	86.9	90.6	92.4	92.4	92.5	92.6	92.6	92.5	92.4
250 Hz	82.7	82.8	82.8	84.1	87.5	91.2	93.1	93.1	93.2	93.2	93.2	93.1	93.1
315 Hz	83.3	83.3	83.4	84.7	88.0	91.4	93.2	93.2	93.3	93.4	93.4	93.3	93.3
400 Hz	83.9	83.9	83.9	84.8	88.2	91.5	93.4	93.4	93.5	93.5	93.5	93.5	93.5
500 Hz	84.2	84.1	84.2	85.0	88.4	91.3	93.2	93.2	93.3	93.3	93.3	93.3	93.4
630 Hz	84.1	84.1	84.1	84.9	88.2	91.2	93.0	93.0	93.1	93.1	93.2	93.2	93.3
800 Hz	83.7	83.6	83.6	84.4	87.7	90.6	92.4	92.5	92.5	92.6	92.6	92.7	92.8
1 kHz	83.0	82.9	82.8	83.6	86.8	89.8	91.5	91.5	91.6	91.7	91.8	91.9	92.0
1.25 kHz	81.9	81.7	81.7	82.4	85.6	88.5	90.3	90.3	90.4	90.5	90.6	90.7	90.8
1.6 kHz	80.5	80.3	80.2	80.9	84.1	86.9	88.6	88.6	88.7	88.9	89.0	89.1	89.2
2 kHz	78.7	78.5	78.4	79.0	82.1	85.0	86.7	86.6	86.8	87.0	87.1	87.2	87.3
2.5 kHz	76.5	76.4	76.2	76.8	79.9	82.7	84.3	84.2	84.4	84.7	84.8	84.9	85.0
3.15 kHz	74.1	73.9	73.7	74.2	77.2	80.0	81.6	81.5	81.7	82.1	82.2	82.3	82.4
4 kHz	71.2	71.1	70.8	71.3	74.3	77.0	78.5	78.4	78.6	79.1	79.2	79.3	79.4
5 kHz	68.1	68.0	67.6	68.0	70.9	73.6	75.1	75.0	75.2	75.7	75.9	76.0	76.0
6.3 kHz	64.6	64.5	64.1	64.3	67.2	69.9	71.3	71.1	71.4	72.0	72.3	72.3	72.3
8 kHz	60.7	60.7	60.2	60.4	63.2	65.8	67.2	66.9	67.3	68.0	68.2	68.3	68.3
10 kHz	56.5	56.6	56.0	56.0	58.8	61.4	62.7	62.4	62.8	63.6	63.9	63.9	63.8
12.5 kHz	52.0	52.1	51.4	51.3	54.1	56.6	57.8	57.5	57.9	58.8	59.1	59.2	59.1
16 kHz	47.1	47.2	46.5	46.3	49.0	51.4	52.6	52.2	52.7	53.7	54.1	54.1	53.9
A-wgt	94.0	94.0	94.0	95.0	98.3	101.5	103.3	103.3	103.4	103.5	103.5	103.5	103.5

Table 4: V162 SO1, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.5 Results V162 SO2

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.2	26.9	26.1	24.8	26.7	28.4	28.4	27.7	26.6
8 Hz	26.3	27.9	27.6	27.5	30.8	33.4	32.8	31.6	33.4	34.9	34.9	34.2	33.2
10 Hz	32.4	33.9	33.6	33.7	37.0	39.7	39.2	38.2	39.7	41.1	41.0	40.4	39.5
12.5 Hz	38.2	39.6	39.3	39.5	42.8	45.5	45.2	44.3	45.7	46.8	46.8	46.2	45.4
16 Hz	44.1	45.3	45.1	45.0	48.3	51.1	50.9	50.0	51.3	52.3	52.2	51.7	51.0
20 Hz	49.6	50.7	50.5	50.5	53.9	56.2	56.2	55.4	56.5	57.4	57.3	56.8	56.2
25 Hz	55.1	56.0	55.9	55.7	59.0	61.4	61.5	60.9	61.8	62.5	62.4	62.0	61.4
31.5 Hz	60.1	61.0	60.9	60.8	64.2	66.3	66.4	65.9	66.7	67.3	67.2	66.8	66.3
40 Hz	64.7	65.4	65.4	65.5	68.9	71.1	71.3	70.9	71.5	72.0	72.0	71.6	71.2
50 Hz	68.7	69.3	69.3	69.7	73.1	75.4	75.8	75.4	75.9	76.3	76.3	76.0	75.6
63 Hz	72.2	72.7	72.8	73.4	76.8	79.3	79.7	79.4	79.8	80.2	80.1	79.8	79.5
80 Hz	75.1	75.6	75.6	76.5	79.9	82.6	83.1	82.9	83.2	83.4	83.4	83.2	82.9
100 Hz	77.5	77.9	78.0	79.1	82.4	85.4	85.9	85.8	86.0	86.2	86.1	85.9	85.7
125 Hz	79.4	79.7	79.8	81.1	84.5	87.6	88.2	88.1	88.3	88.4	88.3	88.2	88.0
160 Hz	80.8	81.0	81.1	82.6	86.0	89.3	89.9	89.8	89.9	90.0	89.9	89.8	89.7
200 Hz	81.8	81.9	82.0	83.6	86.9	90.4	91.1	91.1	91.1	91.1	91.0	91.0	90.9
250 Hz	82.7	82.8	82.8	84.1	87.5	91.0	91.7	91.7	91.7	91.7	91.7	91.6	91.6
315 Hz	83.3	83.3	83.4	84.7	88.0	91.2	91.9	92.0	91.9	91.9	91.8	91.8	91.8
400 Hz	83.9	83.9	83.9	84.8	88.2	91.3	92.1	92.1	92.1	92.0	92.0	92.0	92.0
500 Hz	84.2	84.1	84.2	85.0	88.4	91.1	91.9	92.0	91.9	91.8	91.8	91.8	91.9
630 Hz	84.1	84.1	84.1	84.9	88.2	91.0	91.7	91.8	91.7	91.6	91.7	91.7	91.8
800 Hz	83.7	83.6	83.6	84.4	87.7	90.4	91.2	91.2	91.2	91.1	91.1	91.2	91.3
1 kHz	83.0	82.9	82.8	83.6	86.8	89.6	90.3	90.3	90.3	90.2	90.3	90.4	90.5
1.25 kHz	81.9	81.7	81.7	82.4	85.6	88.3	89.0	89.0	89.0	89.0	89.1	89.2	89.3
1.6 kHz	80.5	80.3	80.2	80.9	84.1	86.7	87.4	87.4	87.4	87.4	87.5	87.6	87.7
2 kHz	78.7	78.5	78.4	79.0	82.1	84.8	85.4	85.3	85.4	85.5	85.6	85.7	85.8
2.5 kHz	76.5	76.4	76.2	76.8	79.9	82.5	83.0	82.9	83.1	83.3	83.4	83.5	83.6
3.15 kHz	74.1	73.9	73.7	74.2	77.2	79.8	80.3	80.2	80.4	80.6	80.8	80.9	81.0
4 kHz	71.2	71.1	70.8	71.3	74.3	76.8	77.2	77.0	77.3	77.7	77.8	78.0	78.0
5 kHz	68.1	68.0	67.6	68.0	70.9	73.4	73.7	73.5	73.9	74.3	74.6	74.7	74.7
6.3 kHz	64.6	64.5	64.1	64.3	67.2	69.7	69.9	69.6	70.1	70.6	70.9	71.0	71.0
8 kHz	60.7	60.7	60.2	60.4	63.2	65.6	65.7	65.4	65.9	66.6	66.9	67.0	67.0
10 kHz	56.5	56.6	56.0	56.0	58.8	61.1	61.2	60.7	61.4	62.2	62.6	62.7	62.6
12.5 kHz	52.0	52.1	51.4	51.3	54.1	56.4	56.3	55.7	56.6	57.5	57.9	57.9	57.9
16 kHz	47.1	47.2	46.5	46.3	49.0	51.2	51.0	50.4	51.3	52.4	52.8	52.9	52.8
A-wgt	94.0	94.0	94.0	95.0	98.3	101.3	102.0	102.0	102.0	102.0	102.0	102.0	102.0

Table 5: V162 SO2, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.6 Results V162 SO3

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.1	26.1	23.9	22.9	25.4	27.4	27.6	26.9	25.9
8 Hz	26.3	27.9	27.6	27.5	30.7	32.7	30.7	29.9	32.1	33.9	34.0	33.4	32.5
10 Hz	32.4	33.9	33.6	33.7	36.9	38.9	37.2	36.4	38.5	40.0	40.1	39.6	38.7
12.5 Hz	38.2	39.6	39.3	39.5	42.7	44.8	43.3	42.6	44.4	45.8	45.9	45.4	44.6
16 Hz	44.1	45.3	45.1	45.0	48.2	50.4	49.1	48.5	50.1	51.3	51.3	50.9	50.2
20 Hz	49.6	50.7	50.5	50.5	53.8	55.6	54.4	53.9	55.3	56.4	56.4	56.0	55.4
25 Hz	55.1	56.0	55.9	55.7	58.9	60.8	59.8	59.4	60.6	61.5	61.5	61.1	60.6
31.5 Hz	60.1	61.0	60.9	60.8	64.1	65.6	64.8	64.5	65.5	66.3	66.2	65.9	65.4
40 Hz	64.7	65.4	65.4	65.5	68.8	70.5	69.8	69.6	70.4	71.0	71.0	70.7	70.3
50 Hz	68.7	69.3	69.3	69.7	73.0	74.8	74.3	74.1	74.8	75.3	75.3	75.0	74.7
63 Hz	72.2	72.7	72.8	73.4	76.7	78.7	78.3	78.2	78.7	79.1	79.1	78.9	78.6
80 Hz	75.1	75.6	75.6	76.5	79.8	82.1	81.8	81.7	82.1	82.4	82.4	82.2	81.9
100 Hz	77.5	77.9	78.0	79.1	82.3	84.8	84.7	84.6	85.0	85.2	85.1	85.0	84.8
125 Hz	79.4	79.7	79.8	81.1	84.4	87.1	87.0	87.0	87.2	87.3	87.3	87.2	87.0
160 Hz	80.8	81.0	81.1	82.6	85.9	88.7	88.7	88.8	88.9	89.0	88.9	88.8	88.7
200 Hz	81.8	81.9	82.0	83.6	86.8	89.9	89.9	90.0	90.1	90.1	90.0	90.0	89.9
250 Hz	82.7	82.8	82.8	84.1	87.4	90.5	90.6	90.7	90.7	90.7	90.7	90.6	90.6
315 Hz	83.3	83.3	83.4	84.7	87.9	90.7	90.8	91.0	90.9	90.9	90.8	90.8	90.8
400 Hz	83.9	83.9	83.9	84.8	88.1	90.9	91.0	91.2	91.1	91.0	91.0	91.0	91.0
500 Hz	84.2	84.1	84.2	85.0	88.3	90.7	90.8	91.0	90.9	90.8	90.8	90.8	90.9
630 Hz	84.1	84.1	84.1	84.9	88.1	90.5	90.7	90.8	90.7	90.6	90.6	90.7	90.7
800 Hz	83.7	83.6	83.6	84.4	87.6	90.0	90.1	90.3	90.2	90.1	90.1	90.2	90.3
1 kHz	83.0	82.9	82.8	83.6	86.7	89.1	89.2	89.4	89.3	89.3	89.3	89.4	89.5
1.25 kHz	81.9	81.7	81.7	82.4	85.5	87.8	87.9	88.1	88.0	88.0	88.1	88.2	88.3
1.6 kHz	80.5	80.3	80.2	80.9	84.0	86.2	86.3	86.4	86.4	86.5	86.6	86.7	86.8
2 kHz	78.7	78.5	78.4	79.0	82.0	84.3	84.3	84.4	84.4	84.6	84.7	84.8	84.9
2.5 kHz	76.5	76.4	76.2	76.8	79.8	82.0	81.9	81.9	82.1	82.3	82.4	82.5	82.6
3.15 kHz	74.1	73.9	73.7	74.2	77.1	79.3	79.1	79.1	79.4	79.7	79.8	80.0	80.0
4 kHz	71.2	71.1	70.8	71.3	74.2	76.3	76.0	76.0	76.3	76.7	76.9	77.0	77.1
5 kHz	68.1	68.0	67.6	68.0	70.8	72.9	72.5	72.4	72.9	73.4	73.6	73.8	73.8
6.3 kHz	64.6	64.5	64.1	64.3	67.1	69.1	68.7	68.5	69.1	69.7	70.0	70.1	70.2
8 kHz	60.7	60.7	60.2	60.4	63.1	65.0	64.4	64.2	64.9	65.7	66.0	66.1	66.2
10 kHz	56.5	56.6	56.0	56.0	58.7	60.6	59.8	59.6	60.4	61.3	61.7	61.8	61.8
12.5 kHz	52.0	52.1	51.4	51.3	54.0	55.8	54.9	54.5	55.5	56.6	57.0	57.1	57.1
16 kHz	47.1	47.2	46.5	46.3	48.9	50.6	49.5	49.1	50.3	51.5	52.0	52.1	52.0
A-wgt	94.0	94.0	94.0	95.0	98.2	100.8	100.9	101.0	101.0	101.0	101.0	101.0	101.0

Table 6: V162 SO3, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.7 Results V162 SO4

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.1	24.8	21.9	21.6	24.1	26.3	26.9	26.4	25.5
8 Hz	26.3	27.9	27.6	27.5	30.7	31.4	28.9	28.6	30.8	32.8	33.4	32.9	32.0
10 Hz	32.4	33.9	33.6	33.7	36.9	37.7	35.5	35.2	37.2	39.0	39.5	39.0	38.2
12.5 Hz	38.2	39.6	39.3	39.5	42.7	43.7	41.7	41.5	43.2	44.7	45.2	44.8	44.1
16 Hz	44.1	45.3	45.1	45.0	48.2	49.2	47.5	47.3	48.8	50.2	50.6	50.2	49.6
20 Hz	49.6	50.7	50.5	50.5	53.7	54.5	52.9	52.8	54.1	55.3	56.1	55.7	55.1
25 Hz	55.1	56.0	55.9	55.7	58.9	59.7	58.4	58.3	59.4	60.4	61.2	60.9	60.3
31.5 Hz	60.1	61.0	60.9	60.8	64.1	64.6	63.5	63.4	64.4	65.2	66.2	66.0	65.5
40 Hz	64.7	65.4	65.4	65.5	68.8	69.5	68.5	68.4	69.3	70.0	70.9	70.6	70.2
50 Hz	68.7	69.3	69.3	69.7	73.0	73.9	73.1	73.0	73.7	74.3	75.0	74.8	74.5
63 Hz	72.2	72.7	72.8	73.4	76.7	77.8	77.2	77.1	77.6	78.1	78.6	78.4	78.2
80 Hz	75.1	75.6	75.6	76.5	79.8	81.2	80.7	80.6	81.0	81.4	81.7	81.5	81.3
100 Hz	77.5	77.9	78.0	79.1	82.3	84.0	83.6	83.6	83.9	84.1	84.2	84.1	83.9
125 Hz	79.4	79.7	79.8	81.1	84.4	86.2	86.0	86.0	86.2	86.3	86.2	86.1	86.0
160 Hz	80.8	81.0	81.1	82.6	85.9	87.9	87.8	87.7	87.9	88.0	87.7	87.6	87.5
200 Hz	81.8	81.9	82.0	83.6	86.8	89.1	89.0	89.0	89.0	89.1	88.6	88.6	88.5
250 Hz	82.7	82.8	82.8	84.1	87.4	89.7	89.7	89.7	89.7	89.7	89.2	89.1	89.1
315 Hz	83.3	83.3	83.4	84.7	87.9	89.9	90.0	90.0	89.9	89.9	89.7	89.6	89.6
400 Hz	83.9	83.9	83.9	84.8	88.1	90.1	90.2	90.2	90.1	90.0	89.8	89.8	89.8
500 Hz	84.2	84.1	84.2	85.0	88.3	89.9	90.0	90.0	89.9	89.8	90.0	90.0	90.1
630 Hz	84.1	84.1	84.1	84.9	88.1	89.7	89.8	89.8	89.7	89.6	89.9	89.9	90.0
800 Hz	83.7	83.6	83.6	84.4	87.6	89.2	89.3	89.3	89.2	89.1	89.4	89.4	89.5
1 kHz	83.0	82.9	82.8	83.6	86.7	88.3	88.4	88.4	88.3	88.3	88.5	88.6	88.7
1.25 kHz	81.9	81.7	81.7	82.4	85.5	87.1	87.1	87.1	87.1	87.1	87.3	87.4	87.5
1.6 kHz	80.5	80.3	80.2	80.9	84.0	85.4	85.4	85.4	85.4	85.5	85.8	85.9	86.0
2 kHz	78.7	78.5	78.4	79.0	82.0	83.5	83.4	83.4	83.5	83.6	83.9	84.0	84.1
2.5 kHz	76.5	76.4	76.2	76.8	79.8	81.2	81.0	81.0	81.1	81.3	81.7	81.8	81.9
3.15 kHz	74.1	73.9	73.7	74.2	77.1	78.5	78.2	78.2	78.4	78.7	79.1	79.2	79.3
4 kHz	71.2	71.1	70.8	71.3	74.2	75.4	75.1	75.0	75.3	75.7	76.2	76.3	76.4
5 kHz	68.1	68.0	67.6	68.0	70.8	72.0	71.5	71.5	71.9	72.4	72.9	73.1	73.1
6.3 kHz	64.6	64.5	64.1	64.3	67.1	68.3	67.6	67.6	68.1	68.8	69.3	69.4	69.5
8 kHz	60.7	60.7	60.2	60.4	63.1	64.2	63.4	63.3	64.0	64.7	65.3	65.5	65.5
10 kHz	56.5	56.6	56.0	56.0	58.7	59.7	58.7	58.6	59.4	60.4	61.0	61.2	61.2
12.5 kHz	52.0	52.1	51.4	51.3	54.0	54.8	53.7	53.6	54.5	55.6	56.4	56.5	56.5
16 kHz	47.1	47.2	46.5	46.3	48.9	49.6	48.3	48.1	49.3	50.6	51.4	51.5	51.5
A-wgt	94.0	94.0	94.0	95.0	98.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 7: V162 SO4, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.8 Results V162 SO5

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	24.1	23.1	20.5	20.7	22.8	25.3	26.0	25.7	24.8
8 Hz	26.3	27.9	27.6	27.5	30.7	29.8	27.5	27.7	29.6	31.8	32.5	32.2	31.4
10 Hz	32.4	33.9	33.6	33.7	36.9	36.2	34.1	34.3	36.0	38.0	38.5	38.3	37.5
12.5 Hz	38.2	39.6	39.3	39.5	42.7	42.2	40.4	40.6	42.1	43.8	44.3	44.0	43.4
16 Hz	44.1	45.3	45.1	45.0	48.2	47.9	46.3	46.4	47.7	49.2	49.7	49.4	48.8
20 Hz	49.6	50.7	50.5	50.5	53.7	53.6	52.2	52.3	53.4	54.8	55.1	54.9	54.3
25 Hz	55.1	56.0	55.9	55.7	58.9	58.9	57.7	57.8	58.8	59.9	60.2	60.0	59.5
31.5 Hz	60.1	61.0	60.9	60.8	64.1	64.2	63.1	63.2	64.1	65.0	65.3	65.1	64.7
40 Hz	64.7	65.4	65.4	65.5	68.8	69.0	68.1	68.2	68.9	69.7	69.9	69.7	69.4
50 Hz	68.7	69.3	69.3	69.7	73.0	73.3	72.6	72.7	73.3	73.9	74.0	73.9	73.6
63 Hz	72.2	72.7	72.8	73.4	76.6	77.1	76.5	76.6	77.0	77.5	77.6	77.5	77.2
80 Hz	75.1	75.6	75.6	76.5	79.8	80.3	79.9	79.9	80.3	80.7	80.7	80.6	80.4
100 Hz	77.5	77.9	78.0	79.1	82.3	83.0	82.6	82.7	82.9	83.2	83.2	83.1	82.9
125 Hz	79.4	79.7	79.8	81.1	84.4	85.0	84.8	84.8	85.0	85.2	85.2	85.1	85.0
160 Hz	80.8	81.0	81.1	82.6	85.8	86.6	86.5	86.5	86.6	86.7	86.7	86.6	86.5
200 Hz	81.8	81.9	82.0	83.6	86.8	87.6	87.6	87.6	87.6	87.7	87.6	87.6	87.5
250 Hz	82.7	82.8	82.8	84.1	87.4	88.2	88.2	88.2	88.2	88.2	88.1	88.1	88.1
315 Hz	83.3	83.3	83.4	84.7	87.9	88.8	88.8	88.8	88.8	88.7	88.7	88.6	88.6
400 Hz	83.9	83.9	83.9	84.8	88.1	88.9	89.0	89.0	88.9	88.8	88.8	88.8	88.8
500 Hz	84.2	84.1	84.2	85.0	88.3	89.1	89.2	89.2	89.1	89.0	89.0	89.0	89.0
630 Hz	84.1	84.1	84.1	84.9	88.1	89.0	89.1	89.1	89.0	88.9	88.9	88.9	88.9
800 Hz	83.7	83.6	83.6	84.4	87.6	88.5	88.5	88.5	88.5	88.4	88.4	88.4	88.5
1 kHz	83.0	82.9	82.8	83.6	86.7	87.6	87.6	87.6	87.6	87.5	87.5	87.6	87.7
1.25 kHz	81.9	81.7	81.7	82.4	85.5	86.3	86.4	86.4	86.3	86.3	86.4	86.4	86.5
1.6 kHz	80.5	80.3	80.2	80.9	84.0	84.7	84.7	84.7	84.7	84.7	84.8	84.9	85.0
2 kHz	78.7	78.5	78.4	79.0	82.0	82.7	82.7	82.7	82.7	82.8	82.9	83.0	83.1
2.5 kHz	76.5	76.4	76.2	76.8	79.8	80.4	80.2	80.3	80.4	80.6	80.7	80.8	80.9
3.15 kHz	74.1	73.9	73.7	74.2	77.1	77.7	77.5	77.5	77.7	77.9	78.2	78.3	78.4
4 kHz	71.2	71.1	70.8	71.3	74.2	74.6	74.3	74.3	74.6	75.0	75.2	75.4	75.5
5 kHz	68.1	68.0	67.6	68.0	70.8	71.2	70.7	70.8	71.1	71.7	72.0	72.1	72.2
6.3 kHz	64.6	64.5	64.1	64.3	67.1	67.4	66.8	66.9	67.3	68.0	68.4	68.5	68.6
8 kHz	60.7	60.7	60.2	60.4	63.1	63.2	62.5	62.6	63.2	64.0	64.4	64.6	64.7
10 kHz	56.5	56.6	56.0	56.0	58.7	58.7	57.8	57.9	58.6	59.6	60.1	60.3	60.4
12.5 kHz	52.0	52.1	51.4	51.3	54.0	53.8	52.8	52.9	53.7	54.9	55.5	55.7	55.7
16 kHz	47.1	47.2	46.5	46.3	48.9	48.6	47.4	47.5	48.4	49.8	50.5	50.7	50.7
A-wgt	94.0	94.0	94.0	95.0	98.2	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Table 8: V162 SO5, expected 1/3 octave band performance
(Blades with serrated trailing edges)

3.9 Results V162 SO6

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
6.3 Hz	19.8	21.6	21.2	21.0	23.5	20.7	19.5	19.7	21.5	24.3	25.1	24.9	24.2
8 Hz	26.3	27.9	27.6	27.5	30.0	27.6	26.5	26.7	28.3	30.9	31.5	31.3	30.7
10 Hz	32.4	33.9	33.6	33.7	36.3	34.1	33.1	33.3	34.8	37.0	37.6	37.4	36.8
12.5 Hz	38.2	39.6	39.3	39.5	42.1	40.3	39.4	39.5	40.8	42.8	43.3	43.1	42.6
16 Hz	44.1	45.3	45.1	45.0	47.6	46.0	45.3	45.4	46.5	48.3	48.7	48.5	48.1
20 Hz	49.6	50.7	50.5	50.5	53.2	51.8	51.1	51.3	52.3	53.8	54.1	54.0	53.5
25 Hz	55.1	56.0	55.9	55.7	58.4	57.2	56.6	56.8	57.6	58.9	59.2	59.0	58.7
31.5 Hz	60.1	61.0	60.9	60.8	63.6	62.6	62.1	62.2	62.9	64.0	64.3	64.1	63.8
40 Hz	64.7	65.4	65.4	65.5	68.3	67.5	67.1	67.2	67.8	68.7	68.9	68.8	68.5
50 Hz	68.7	69.3	69.3	69.7	72.5	71.9	71.6	71.6	72.1	72.9	73.0	72.9	72.6
63 Hz	72.2	72.7	72.8	73.4	76.2	75.8	75.5	75.5	75.9	76.5	76.6	76.5	76.3
80 Hz	75.1	75.6	75.6	76.5	79.3	79.1	78.8	78.9	79.2	79.6	79.7	79.6	79.4
100 Hz	77.5	77.9	78.0	79.1	81.9	81.8	81.6	81.6	81.9	82.2	82.2	82.1	82.0
125 Hz	79.4	79.7	79.8	81.1	83.9	83.9	83.8	83.8	84.0	84.2	84.2	84.1	84.0
160 Hz	80.8	81.0	81.1	82.6	85.4	85.5	85.4	85.4	85.5	85.7	85.6	85.6	85.5
200 Hz	81.8	81.9	82.0	83.6	86.4	86.6	86.5	86.6	86.6	86.6	86.6	86.6	86.5
250 Hz	82.7	82.8	82.8	84.1	87.0	87.2	87.2	87.2	87.2	87.2	87.1	87.1	87.1
315 Hz	83.3	83.3	83.4	84.7	87.5	87.8	87.8	87.8	87.7	87.7	87.6	87.6	87.6
400 Hz	83.9	83.9	83.9	84.8	87.7	88.0	88.0	88.0	87.9	87.8	87.8	87.8	87.8
500 Hz	84.2	84.1	84.2	85.0	87.9	88.2	88.2	88.2	88.2	88.0	88.0	88.0	88.0
630 Hz	84.1	84.1	84.1	84.9	87.7	88.0	88.1	88.1	88.0	87.9	87.9	87.9	87.9
800 Hz	83.7	83.6	83.6	84.4	87.2	87.5	87.6	87.6	87.5	87.4	87.4	87.4	87.5
1 kHz	83.0	82.9	82.8	83.6	86.3	86.6	86.7	86.7	86.6	86.5	86.6	86.6	86.7
1.25 kHz	81.9	81.7	81.7	82.4	85.1	85.4	85.4	85.4	85.4	85.3	85.4	85.4	85.5
1.6 kHz	80.5	80.3	80.2	80.9	83.6	83.7	83.7	83.7	83.7	83.8	83.9	83.9	84.0
2 kHz	78.7	78.5	78.4	79.0	81.6	81.7	81.7	81.7	81.8	81.9	82.0	82.1	82.2
2.5 kHz	76.5	76.4	76.2	76.8	79.4	79.4	79.3	79.3	79.4	79.6	79.8	79.9	80.0
3.15 kHz	74.1	73.9	73.7	74.2	76.7	76.6	76.5	76.5	76.7	77.0	77.2	77.3	77.4
4 kHz	71.2	71.1	70.8	71.3	73.7	73.5	73.4	73.4	73.6	74.1	74.3	74.5	74.6
5 kHz	68.1	68.0	67.6	68.0	70.4	70.0	69.8	69.9	70.2	70.8	71.1	71.2	71.3
6.3 kHz	64.6	64.5	64.1	64.3	66.7	66.2	65.9	66.0	66.4	67.1	67.5	67.7	67.7
8 kHz	60.7	60.7	60.2	60.4	62.7	62.0	61.6	61.7	62.2	63.1	63.6	63.7	63.8
10 kHz	56.5	56.6	56.0	56.0	58.3	57.4	57.0	57.1	57.7	58.7	59.3	59.5	59.5
12.5 kHz	52.0	52.1	51.4	51.3	53.5	52.4	51.9	52.0	52.7	54.0	54.7	54.9	54.9
16 kHz	47.1	47.2	46.5	46.3	48.4	47.1	46.5	46.6	47.5	49.0	49.7	49.9	50.0
A-wgt	94.0	94.0	94.0	95.0	97.8	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0

Table 9: V162 SO6, expected 1/3 octave band performance
(Blades with serrated trailing edges)

4. Limitations

The values as stated in the present document are to be regarded as “best estimates” for the octave band performance for the turbine. The values are to be regarded as informative and cannot in any way be used as guaranteed for any projects.

The complete document can be handed out as pdf and must always be referred to using the complete document DMS number.

5. Recalculation to 10 m wind speeds

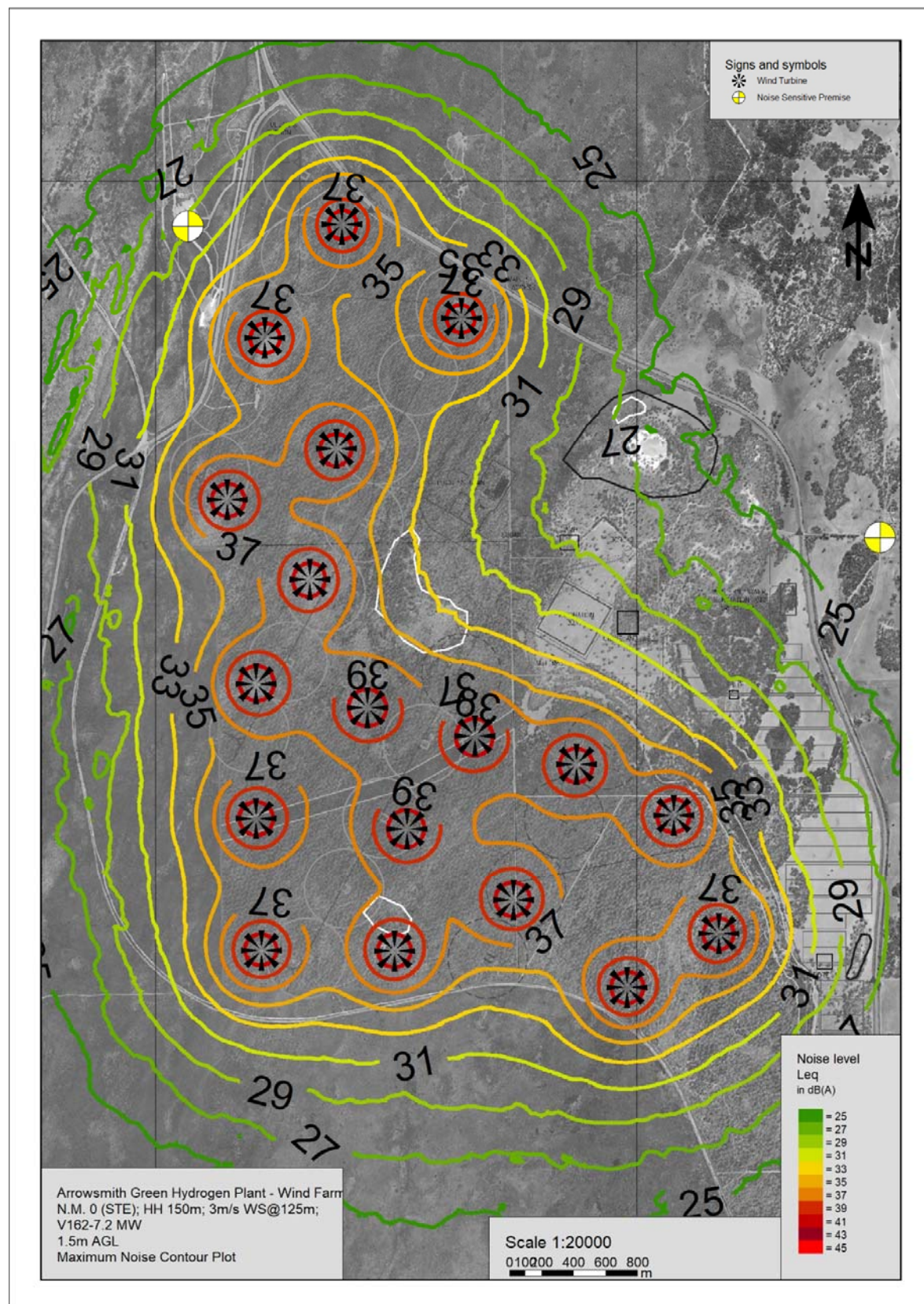
In case 10 m height wind speed references are required, recalculation of the stated values can be made using the following procedure:

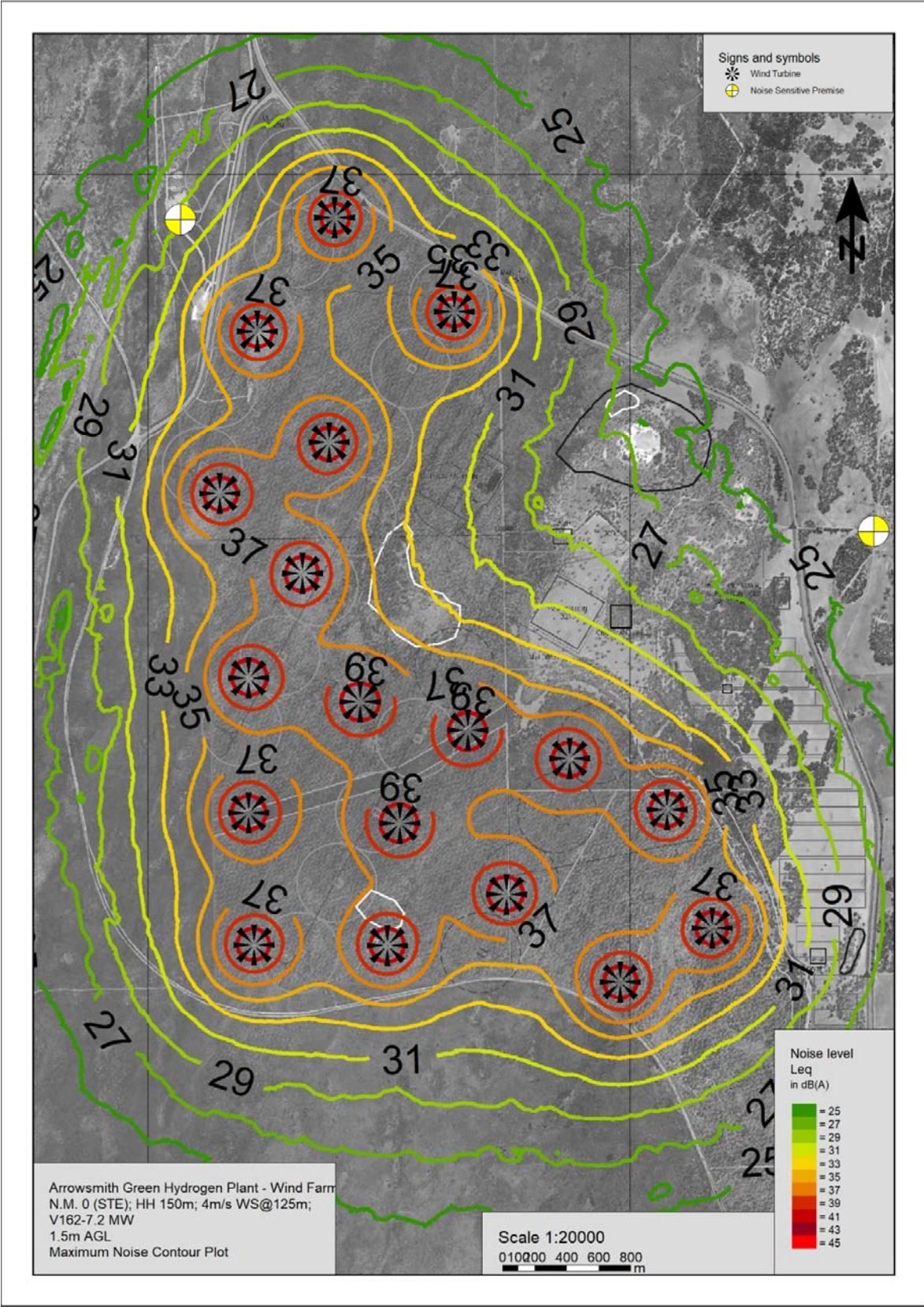
1. The stated hub height wind speeds are recalculated to 10 m reference height.
2. Integer 10 m height wind speed related sound power levels are calculated using linear interpolation between the nearest non-integer values.

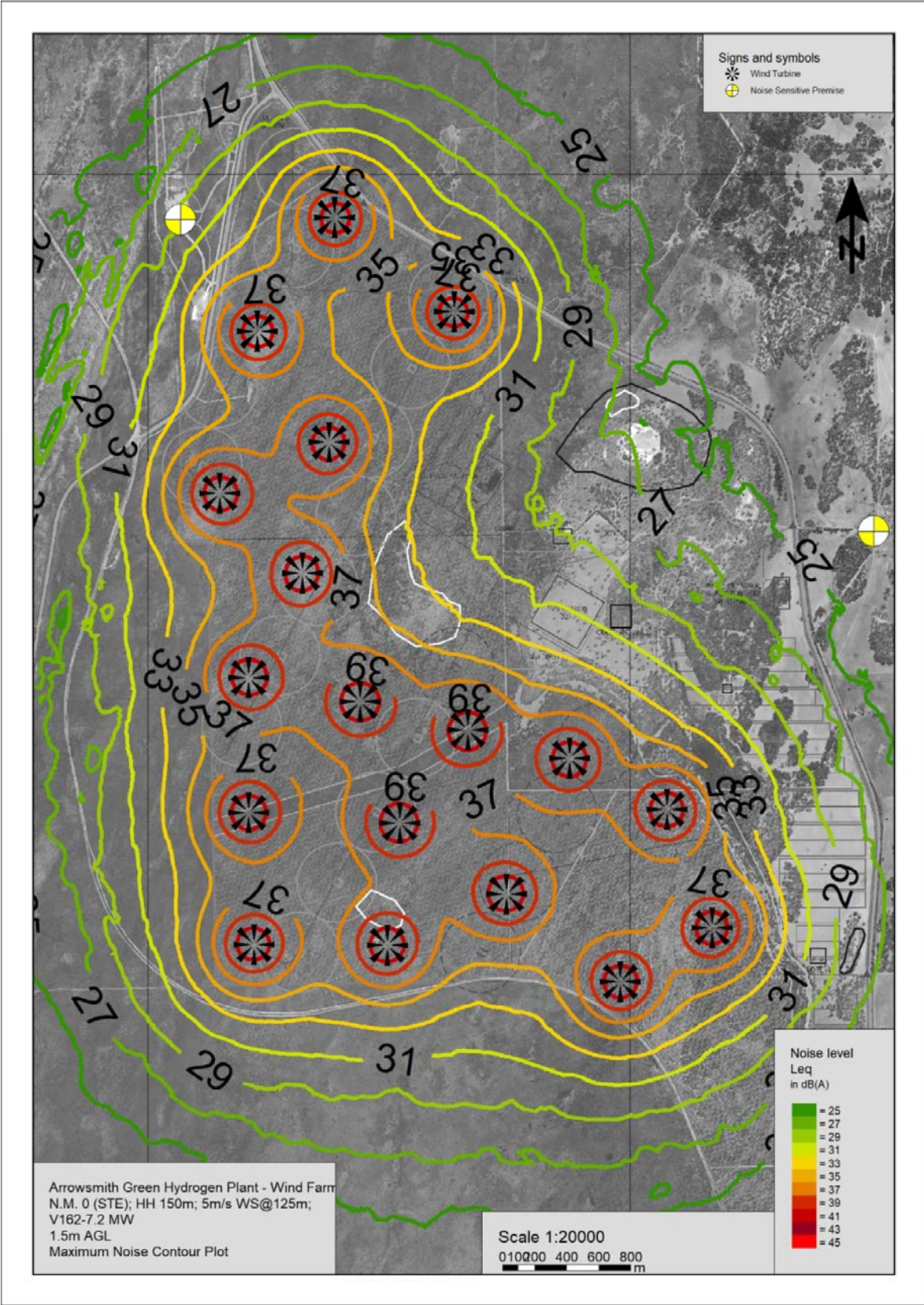
Recalculation is made using procedures as defined in IEC 61400-11 ed.3. Appendix D.

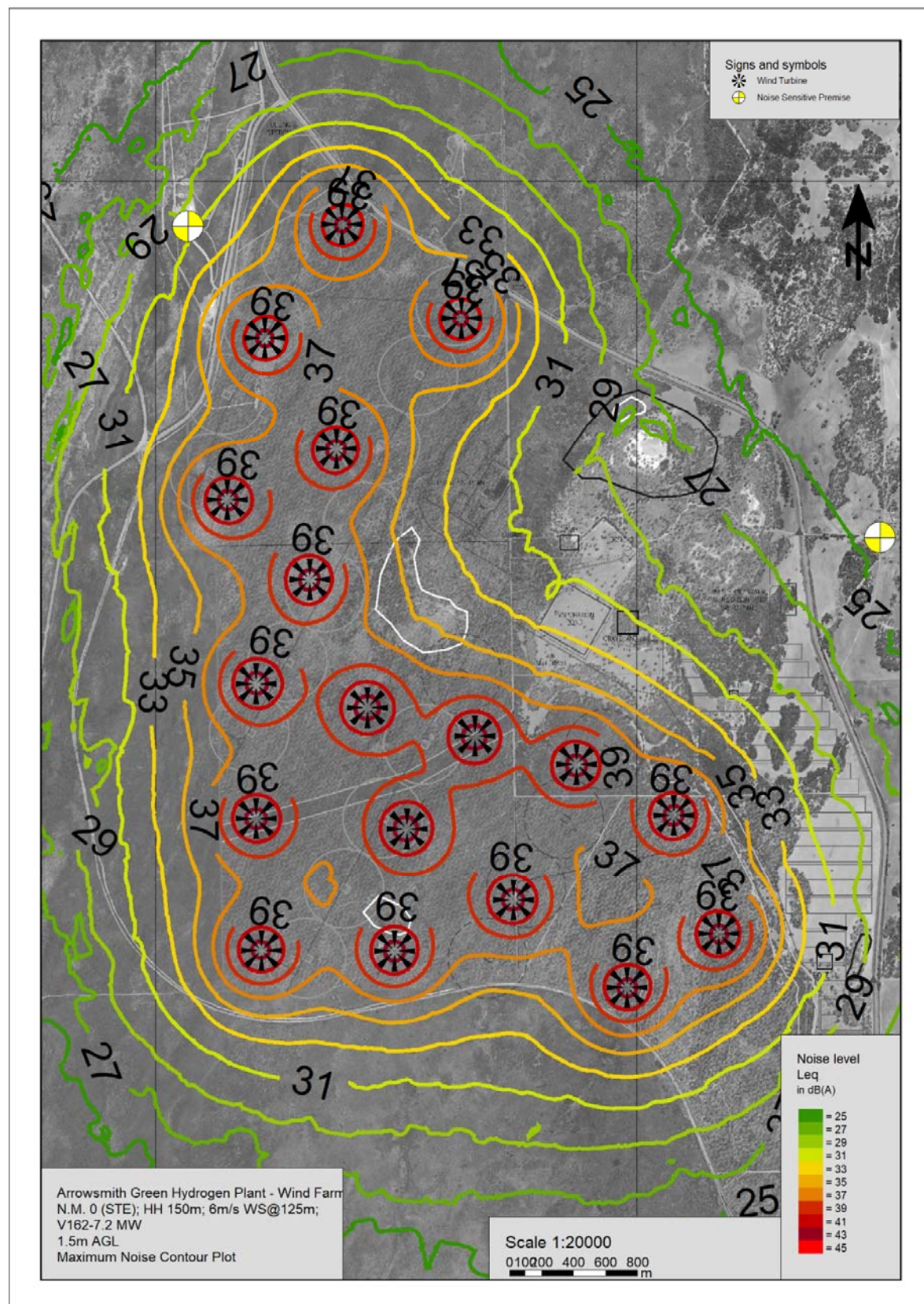
APPENDIX C

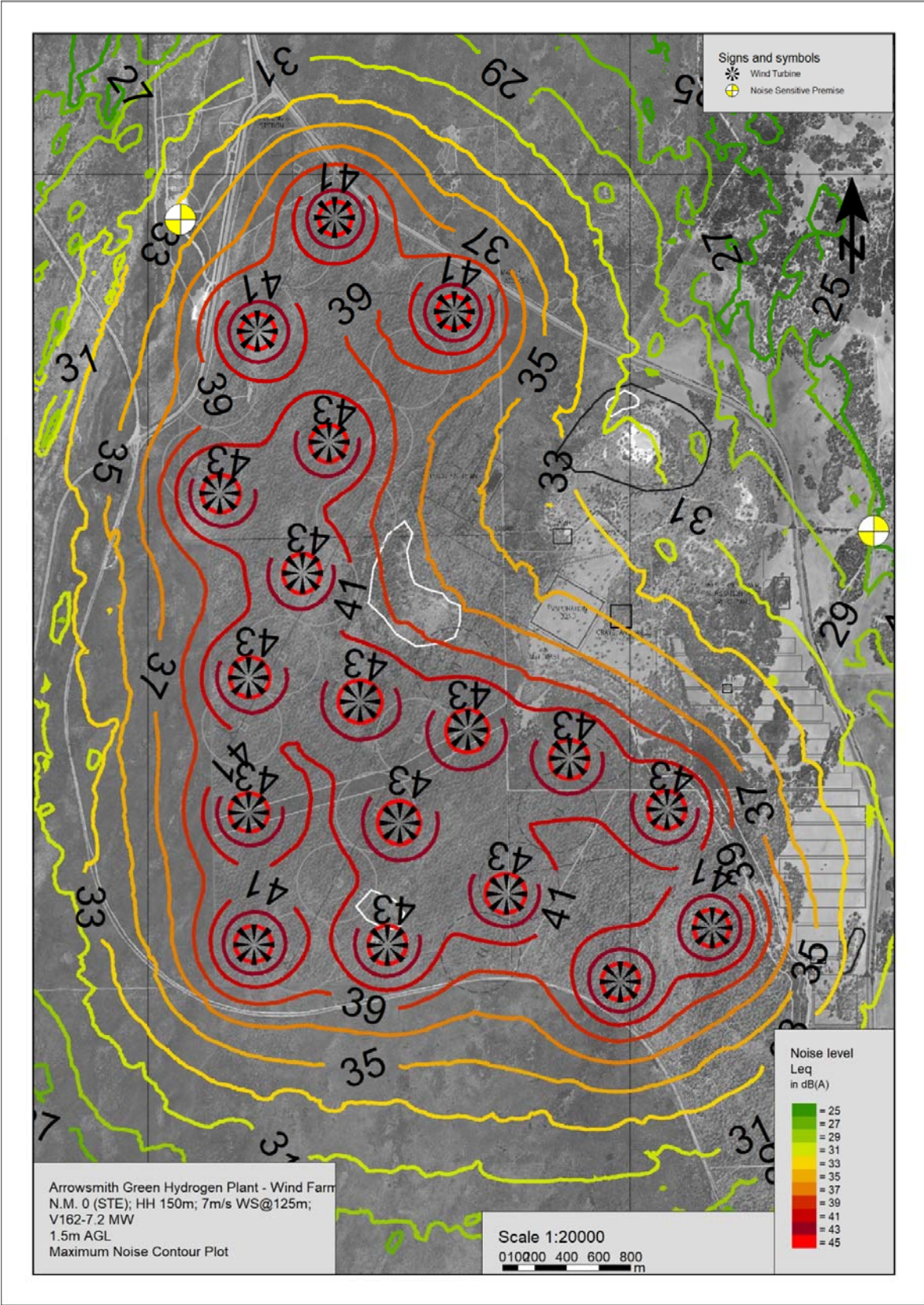
PREDICTED NOISE LEVEL CONTOURS – SA GUIDELINES

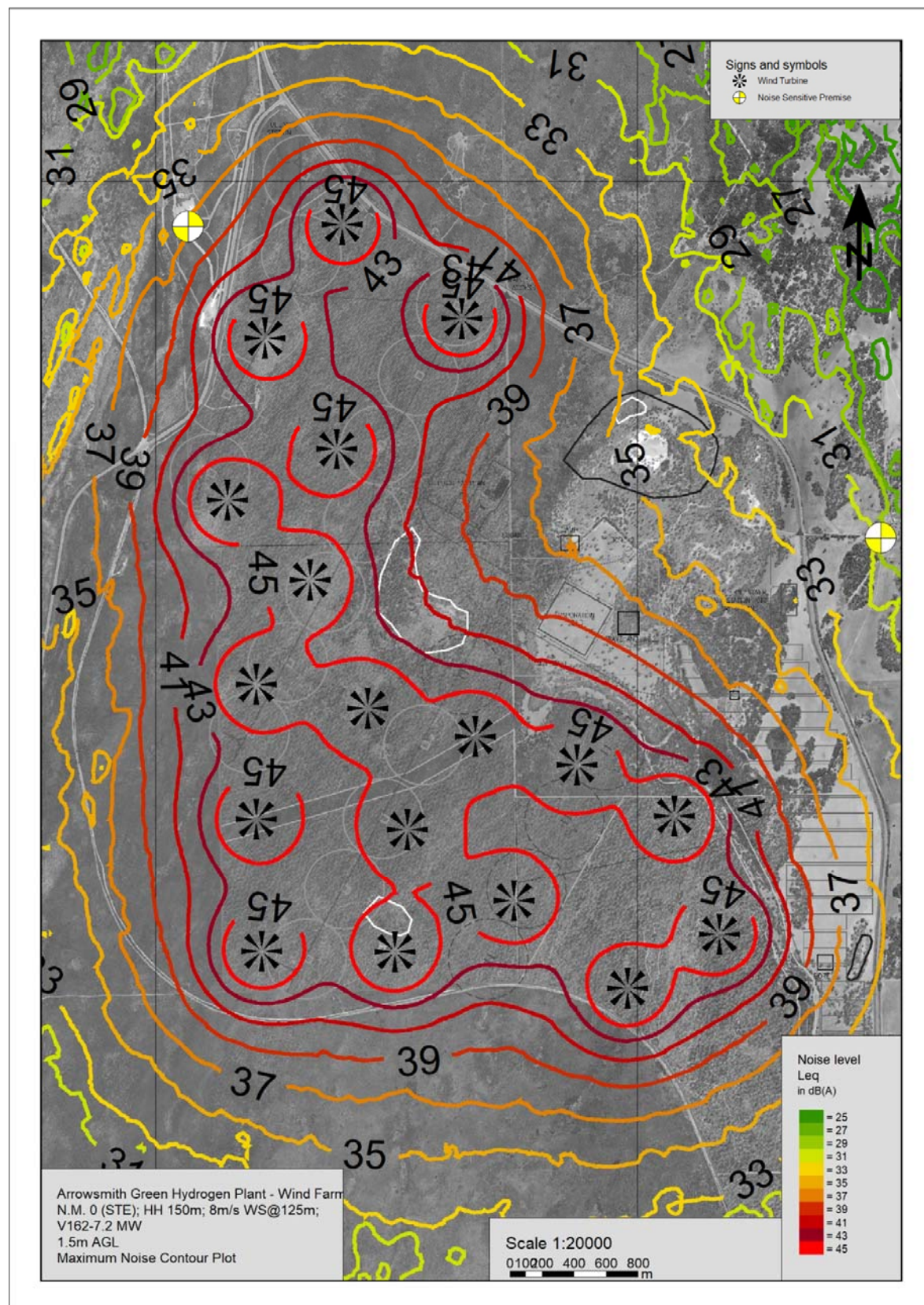


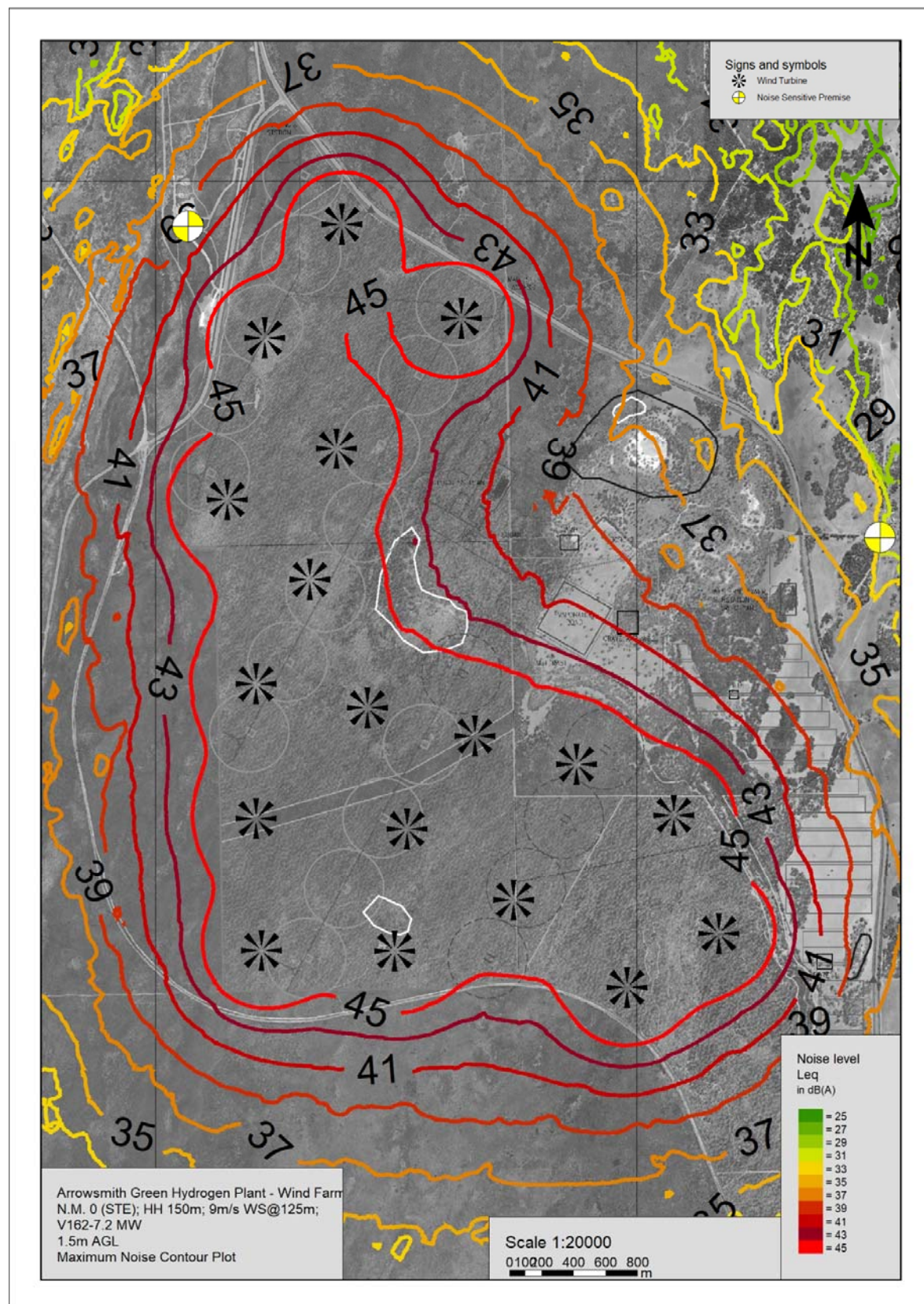


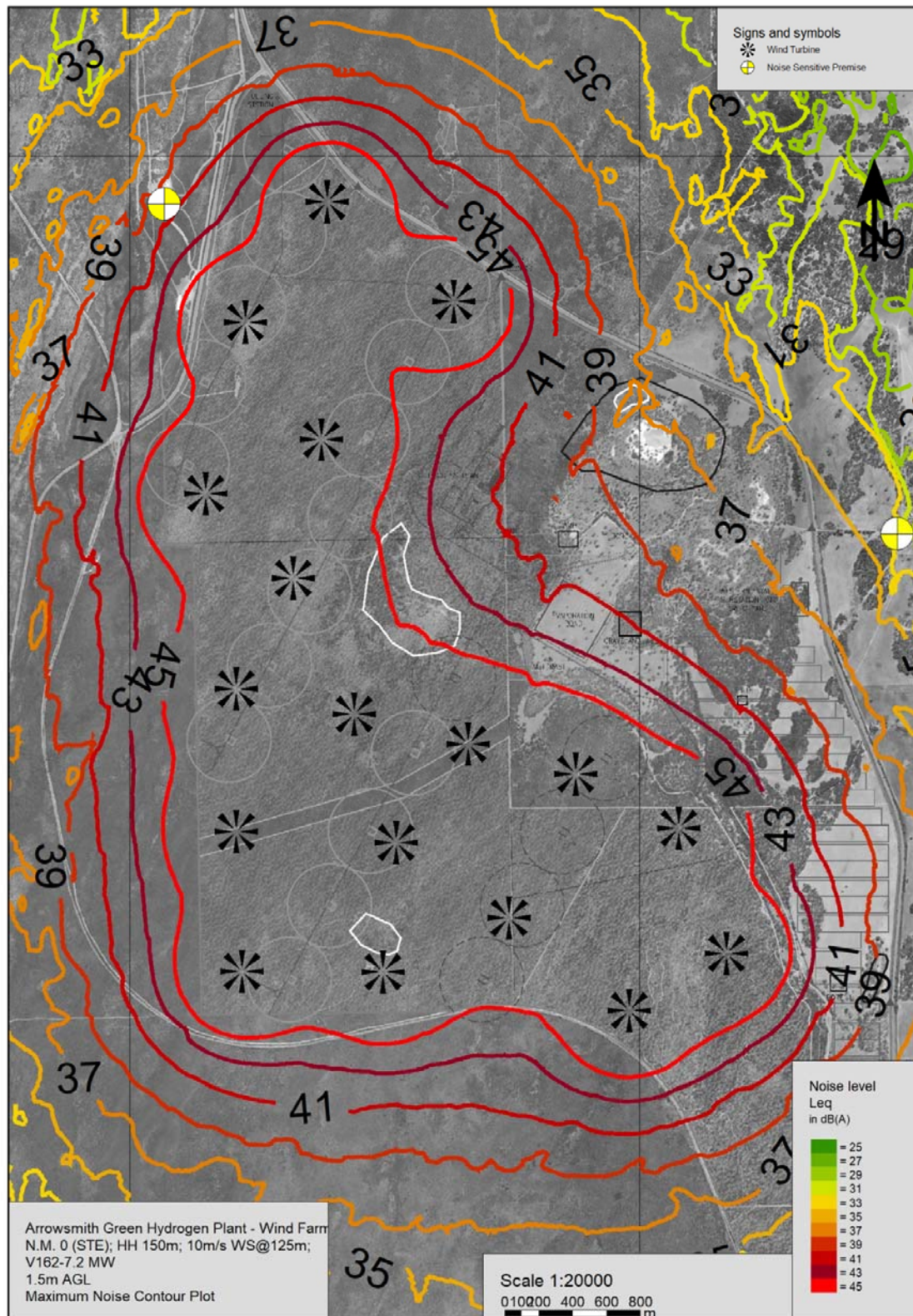


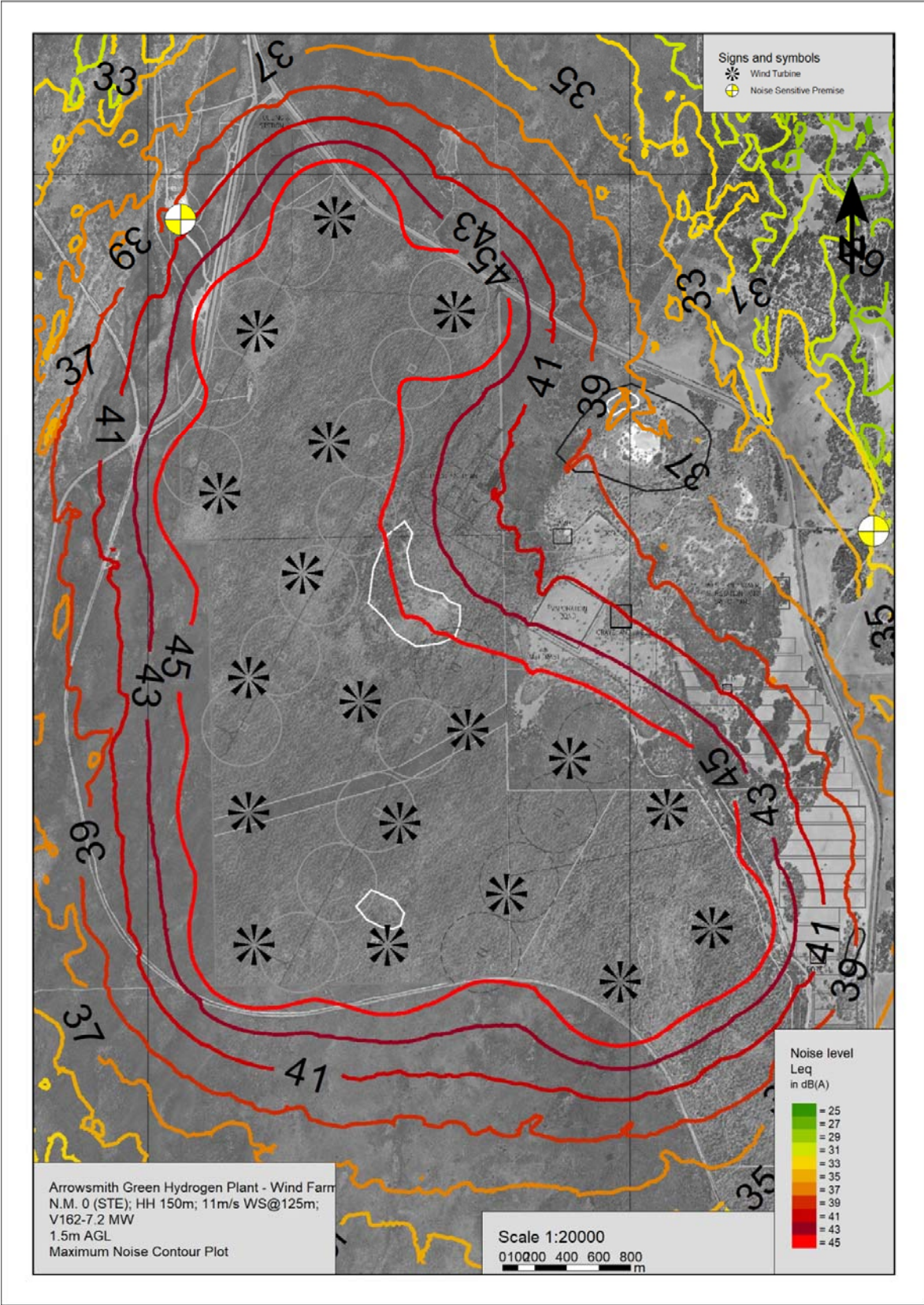


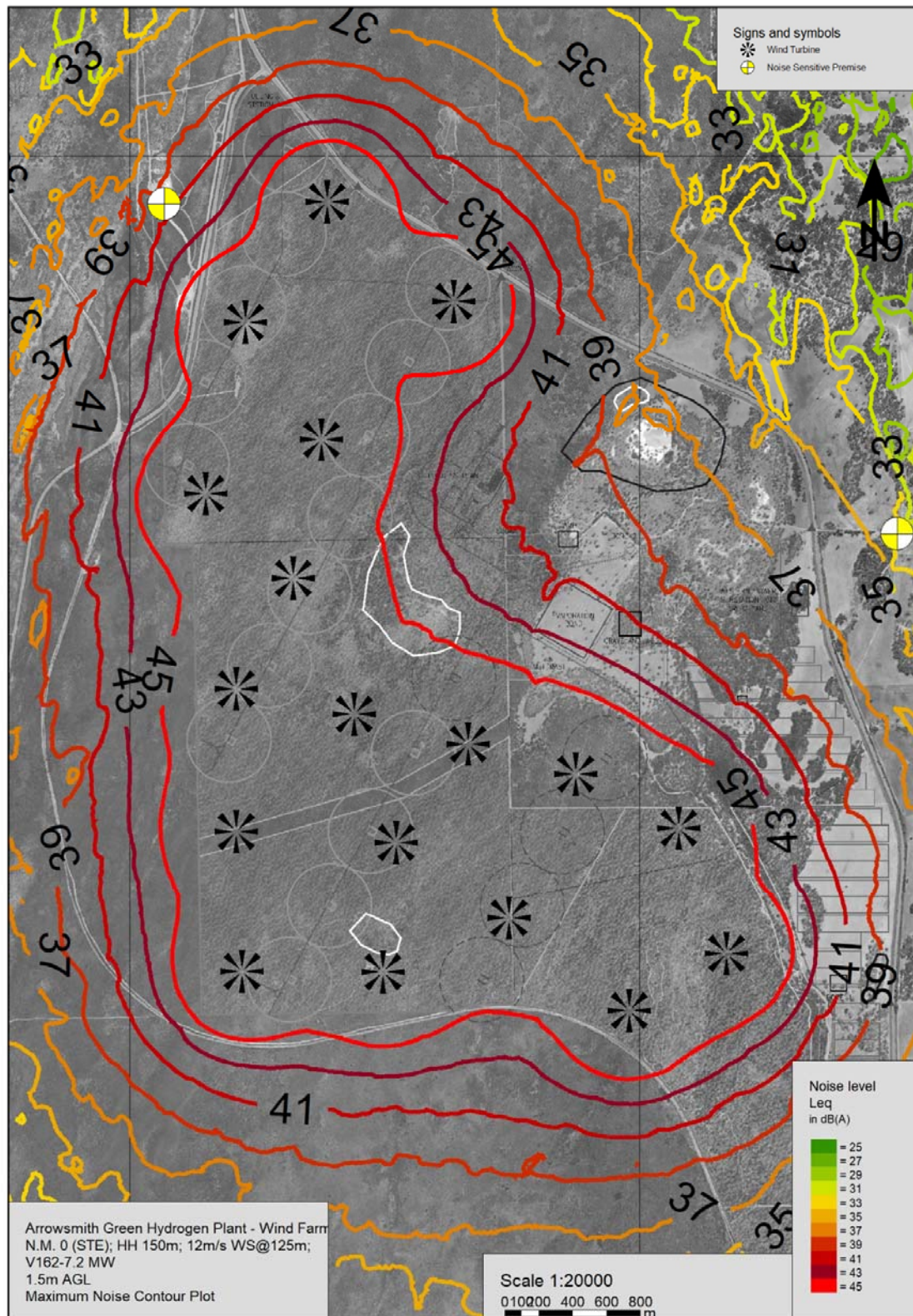


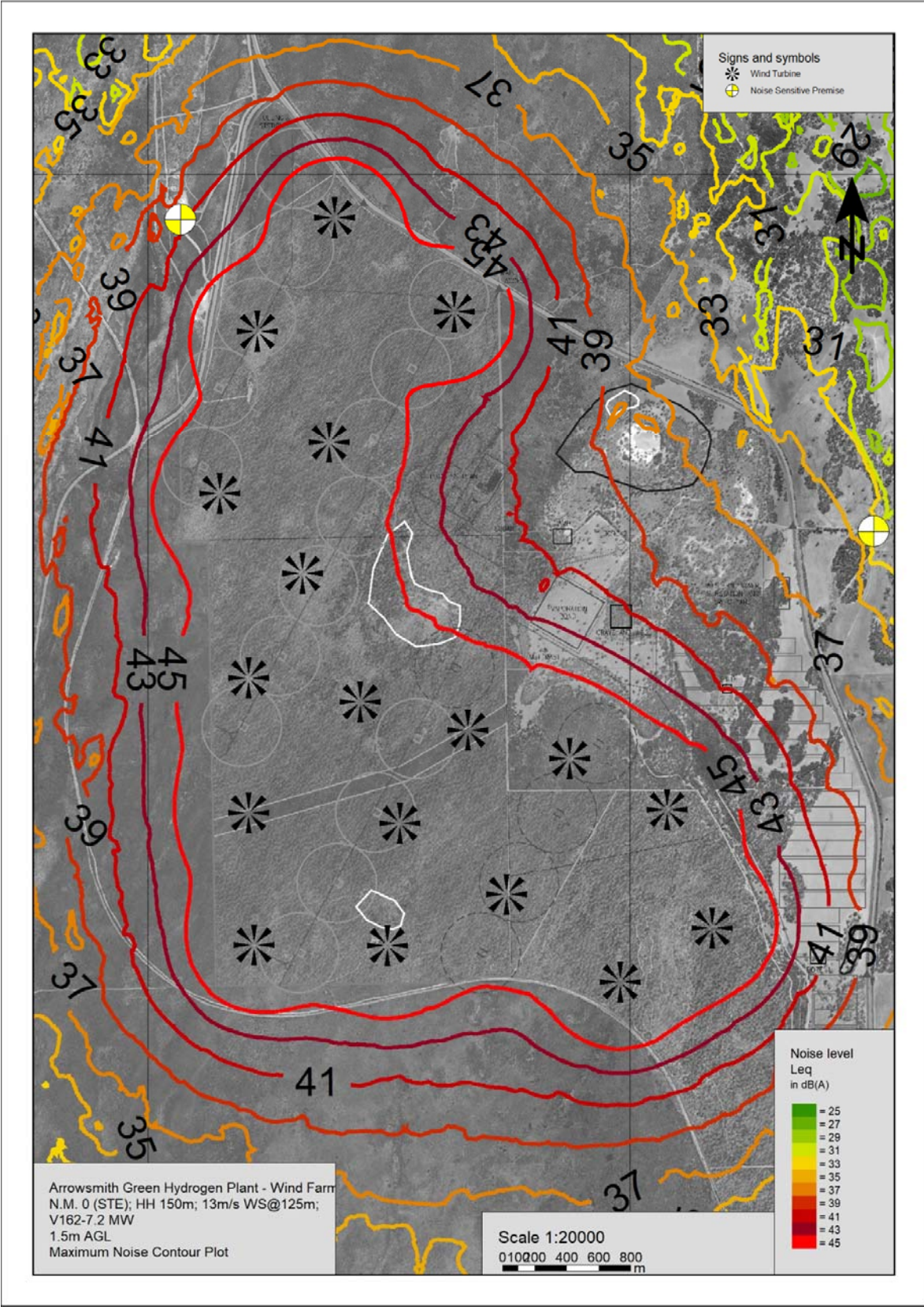


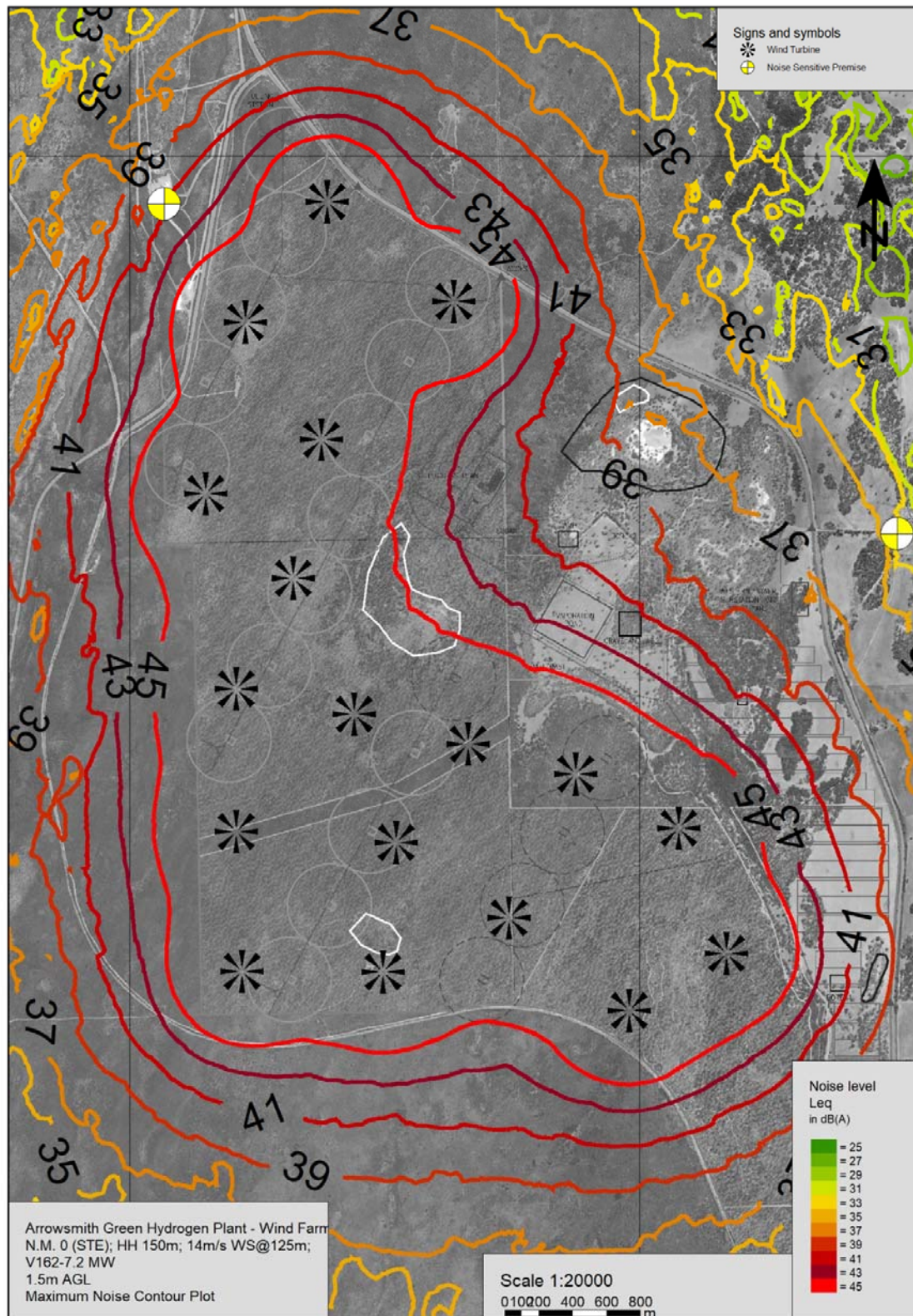


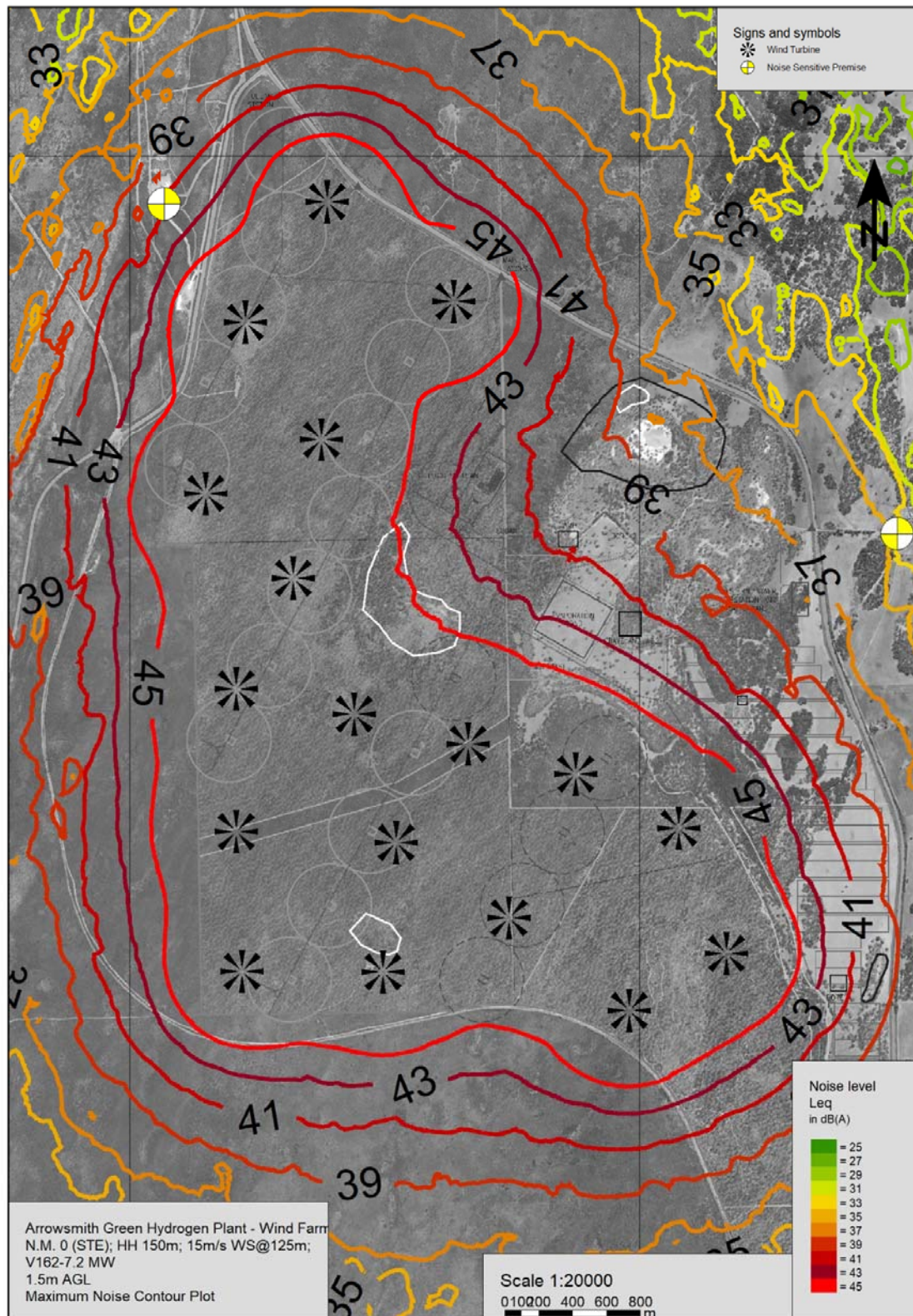






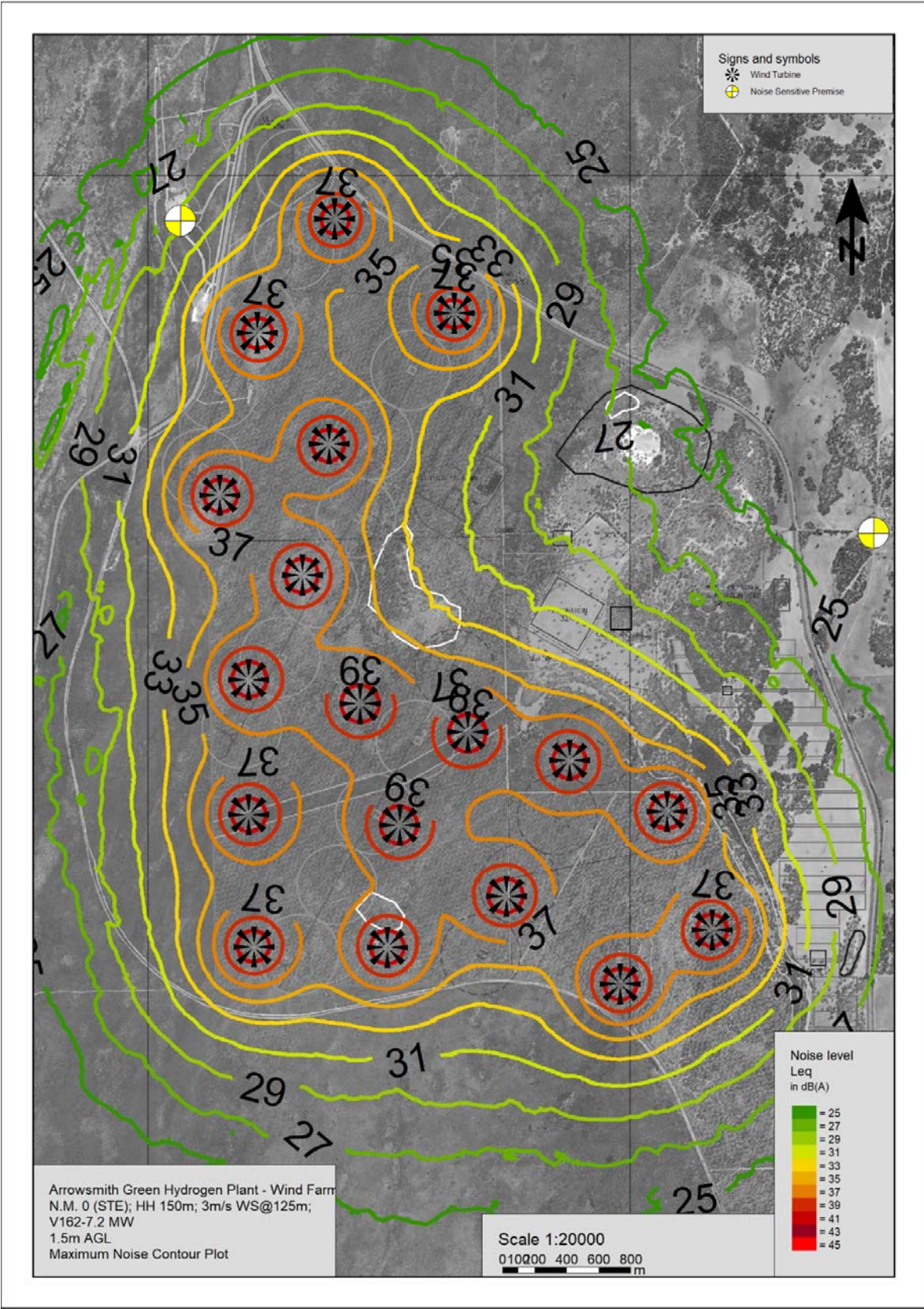


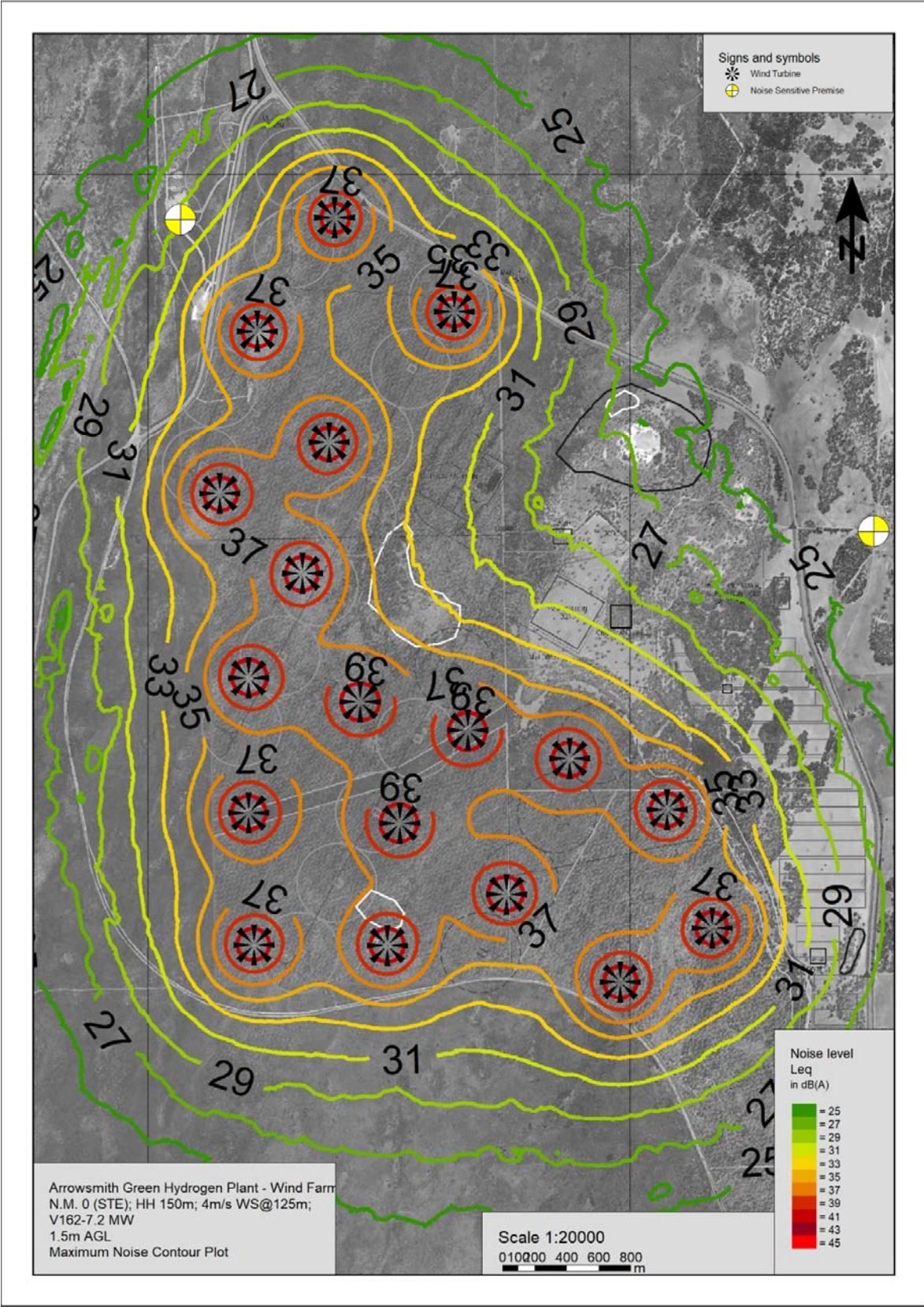




APPENDIX D

PREDICTED NOISE LEVEL CONTOURS – EP(N)R 1997





APPENDIX E

BACKGROUND MONITORING LOCATIONS

