

Teuvan Siltanevan tuulivoimameluselvitys

Meluselvitys



Muutosluettelo

Versio:	Päiväys:	Muutoksen kuvaus	Tarkastettu	Hyväksyjä
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Projekti:

Työnumero:

Asiakas:

Päiväys:

Tekijä:

Teuvan Siltanevan meluselvitys

25011894-001

Winda Energy Oy

20.12.2024

Lassi Pirttinen

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1. Johdanto

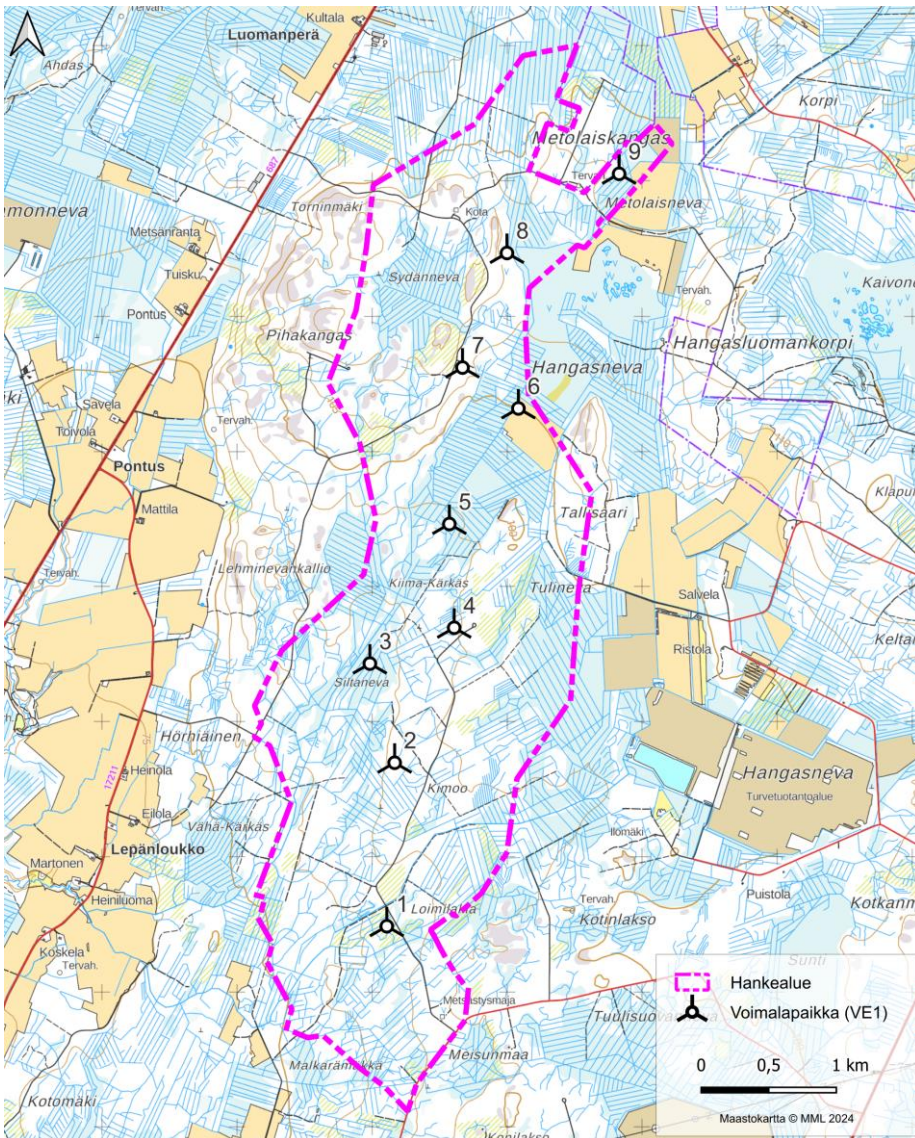
Meluselvitys on tehty Siltanevaan Teuvaan, johon Winda Energy Oy suunnittelee tuulivoimapuiston rakentamista. Tässä meluselvityksessä on arvioitu Siltanevan hankkeessa suunniteltujen tuulivoimaloiden toiminnan meluvaikutuksia laskennallisten mallien avulla.

Melumallinnukset on tehty windPRO 4.0 -ohjelmistolla ympäristöministeriön ohjeistuksen mukaisesti (Ympäristöministeriö, 2014). Melumallinnuksessa on käytetty Siltanevan tuulivoimaloissa Nordex V175/6.8 MW (blades with serrated trailing edges) tuulivoimalan taajuusjakaumia lähtömelutason ollessa 106,9 + 2 dB(A). Mallinnuksissa Siltanevan kaikkien tuulivoimaloiden napakorkeus on 200 m ja roottorin halkaisija 200 m.

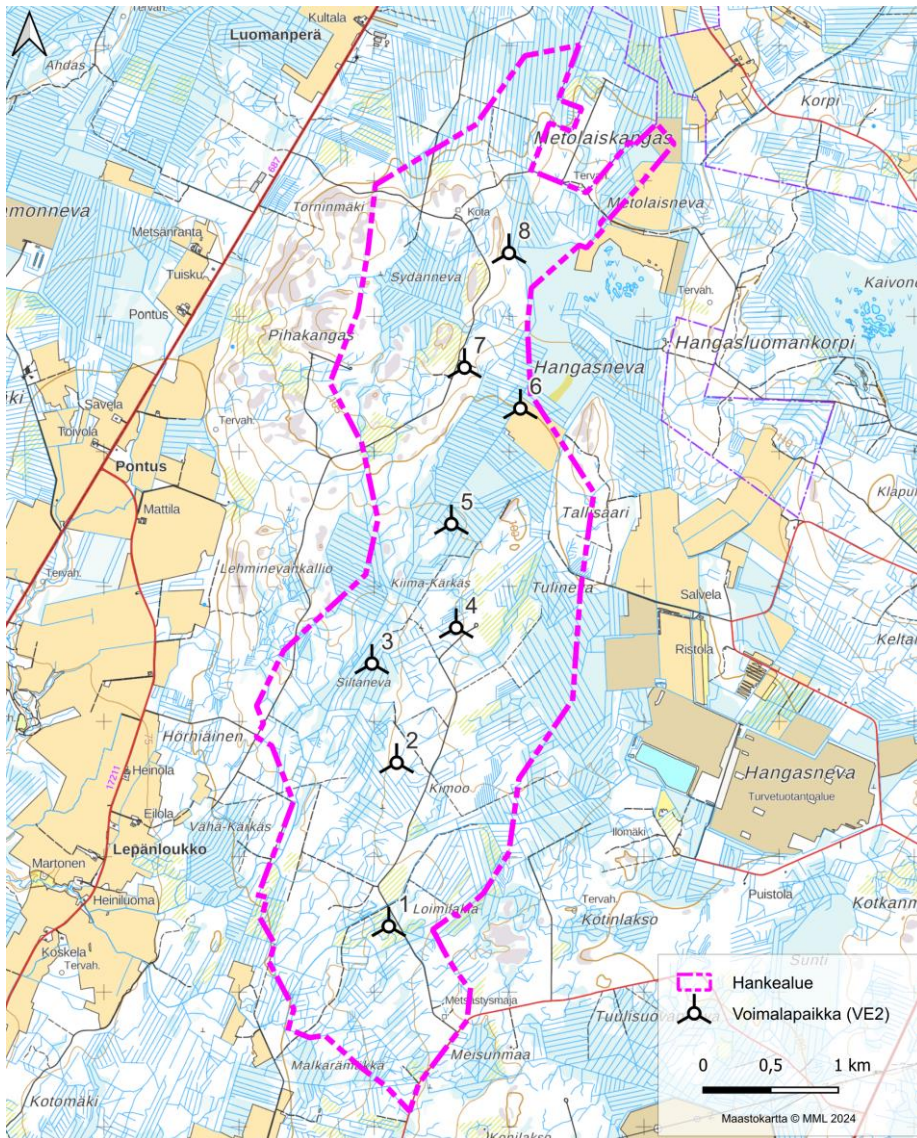
Tässä meluselvityksessä on tarkasteltu seuraavia hankevaihtoehtoja Siltanevan osalta:

- VE1: 9 tuulivoimalaa
- VE2: 8 tuulivoimalaa

Kuvissa 1 ja 2 on esitetty Siltanevan vaihtoehtojen VE1 ja VE2 tuulivoimaloiden sijainnit kartalla. Voimaloiden sijaintikoordinaatit on esitetty liitteiden mallinnustulosteissa.

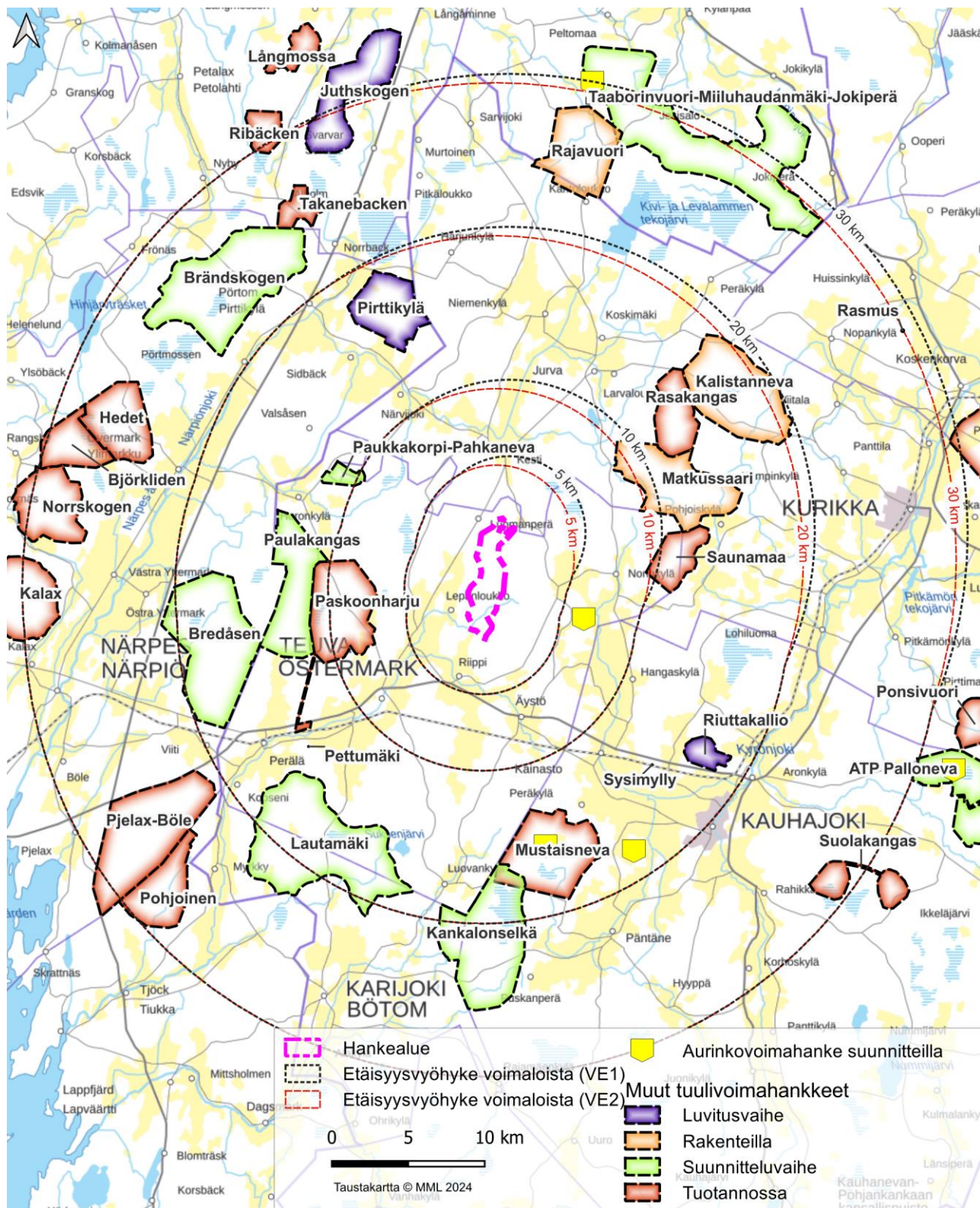


Kuva 1. Siltanevan suunniteltujen tuulivoimaloiden sijainnit hankevaihtoehdossa VE1.



Kuva 2. Siltaneva suunniteltujen tuulivoimaloiden sijainnit hankevaihtoehdossa VE2.

Tässä meluselvityksessä on lisäksi tarkasteltu tuulivoimamelun yhteisvaikutuksia tuotannossa olevan Paskoonharjun tuulivoimapuiston ja rakenteilla olevan Matkussaaren tuulivoimapuiston kanssa. Kuvassa 3 on esitetty lähialueen tuulivoimapuistojen sijainnit verrattuna Siltanevaan. Yhteisvaikutusmallinnuksen voimaloiden sijaintikoordinaatit on esitetty liitteen 2 mallinnustulosteissa. Yhteisvaikutusmallinnuksessa käytettyjen voimaloiden tietoja on esitetty taulukossa 5.



Kuva 3. Siltanevan lähialueen tuulivoimapuistojen sijainnit

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Työnumero: 25011894-001

Päiväys: 20.12.2024

Versio: 01

2. Melu

Tuulivoimalan ääni syntyy roottorin lapojen sekä voimalan koneiston osien aiheuttamasta äänestä. Lapojen pyörimisestä aiheutuva ääni on näistä merkittävämpi ja sen merkitys kasvaa tavallisesti roottorin koon kasvaessa. Melu syntyy lapojen kärjissä, kun ilmavirtaukset eri suunnista törmäävät. Ilmavirtausten törmätessä aiheutuu turbulenssia ja kohinamainen ääni. Lisäksi lavan ohittaessa tornin jää lavan sekä tornin välinen ilmamassa puristuksiin, mistä aiheutuu melua. Tuulivoimalan tuottama ääni syntyy korkealla ja se on lapojen pyörimisliikkeestä johtuen jaksottaista, joten se erottuu taustamelusta. Lisäksi se sisältää pienitaajuisia ääniä. Äänen voimakkuus, taajuus ja ajallinen vaihtelu riippuvat tuulivoimaloiden lukumäärästä, niiden etäisyyksistä toisiinsa sekä tuulen nopeudesta. Erottuvuuden takia tuulivoimaloiden melu koetaan häiritsevämpänä kuin monet muut melulähteet, kuten liikenne. (Di Napoli, 2007; Ympäristöministeriö, 2016a)

Tuulivoimalan äänen leviäminen ympäristöön riippuu maastonmuodoista, sääoloista, kuten tuulen nopeudesta ja suunnasta sekä lämpötilasta. Ääni etenee veden yllä laajemmalle kuin maalla pienemmän vaimenemisen takia. Pienitaajuinen ääni etenee muuta ääntä laajemmalle alueelle. (Ympäristöministeriö, 2016a)

Melu on ääntä, joka koetaan häiritseväksi tai epämiellyttäväksi ja joka on ihmisten terveydelle vahingollista tai haitallista. Lyhytaikainen altistuminen tuulivoimaloiden melulle ei aiheuta terveyshaittaa, mutta riittävän voimakkaana ja pitkäaikaisena altistuminen melulle saattaa vaikuttaa terveyshaitan syntymiseen. Erityisesti haitallista on rakennuksen sisälle kuuluva pienitaajuinen ääni, joka vaikuttaa uneen ja lepoon. Pienitaajuisuuden lisäksi tuulivoimalan äänen erityispiirteitä ovat äänen kapeakaistaisuus, impulssimaisuus ja merkityksellinen sykintä (amplitudimodulaatio). Erityispiirteet lisäävät tuulivoimalan äänen häiritsevyyttä. (Ympäristöministeriö, 2016a) Alle 40 dB tuulivoiman äänitasolla ei ole havaittu muita yhteyksiä terveyteen kuin melun häiritsevyys ja on epätodennäköistä, että alle 40 dB melualtistus aiheuttaa oireita tai sairauksia tuulivoima-alueilla (Hongisto ym, 2022).

Taulukossa 1 on esitetty minkälaisia tyypillisiä äänilähteitä eri äänenpainetasot tarkoittavat (Kuuloliitto ry, 2022). Yön ulkomelutason ohjearvo (40 dB) vastaa tietokoneen ääntä (Taulukko 1).

Taulukko 1. Tyypillisiä äänilähteitä eri äänenpainetasoilla (Kuuloliitto ry, 2023)

dB	Ääni
0	Ihmisen kuulokynnys
10–30	Lehtien havina
30–50	Tietokone
50–70	Keskustelu
70–85	Liikenne
80–100	Ravintola
90–100	Konsertti
125-	Kipukynnys
130–135	Suihkukone

3. Melun ohjearvot

3.1 Valtioneuvoston asetus tuulivoimaloiden ulkomelutason ohjearvoista

Suomessa tuulivoimaloiden sallittavista äänitasoista säädetään valtioneuvoston asetuksessa tuulivoimaloiden ulkomelutason ohjearvoista (1107/2015), joka on tullut voimaan vuonna 2015. Asetuksessa säädetään toimivien tuulivoimaloiden aiheuttaman laskennallisen tai mitatun melutason ohjearvot, jotka on esitetty seuraavassa taulukossa 2.

Taulukko 2. Tuulivoimaloiden ulkomelutason ohjearvot.

	ulkomelutaso L_{Aeq} päivällä klo 7–22	ulkomelutaso L_{Aeq} yöllä klo 22–7
Pysyvä asutus	45 dB	40 dB
Loma-asutus	45 dB	40 dB
Hoitolaitokset	45 dB	40 dB
Oppilaitokset	45 dB	—
Virkistysalueet	45 dB	—
Leirintäalueet	45 dB	40 dB
Kansallispuistot	40 dB	40 dB

3.2 Asumisterveysasetuksen toimenpiderajat

Sosiaali- ja terveysministeriön asumisterveysasetus (545/2015) sisältää toimenpideraja-arvot pienitaajuiselle sisämelulle. Raja-arvot on annettu yhden tunnin pienitaajuisen melun tasolle (raja-arvot eivät ole A-painotettuja). Taulukon 3 toimenpiderajat koskevat nukkumiseen tarkoitettua tilaa yöaikana (klo 22–7).

Taulukko 3. Asumisterveysasetuksen toimenpiderajat yöaikaiselle pienitaajuiselle sisämelulle.

Kaista, Hz	20	25	31,5	40	50	63	80	100	125	160	200
$L_{eq, 1 h}$, dB	74	64	56	49	44	42	40	38	36	34	32

Päiväajan (klo 7–22) pienitaajuiselle melulle sovelletaan 5 dB suurempia arvoja.

4. Lähtötiedot ja menetelmät

4.1 Lähtötiedot

Tuulivoimaloiden aiheuttamat meluvaikutukset on mallinnettu ISO 9613-2 standardin mukaisesti. Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen (Ympäristöministeriö, 2014) mukaisesti mallinnuksessa käytettiin taulukko 4 arvoja.

Taulukko 4. Mallinnuksessa käytettyjä lähtötietoja

Lähtötiedot	
Ilman lämpötila	15 °C
Tarkastelupisteen laskentakorkeus maanpinnan yläpuolella	4 m
Ilmanpaine	101,325 kPa
Ilman suhteellinen kosteus	70 %
Maanpinnan vaikutus melun etenemiseen, kerroin	0,4
Vesistöjen vaikutus melun etenemiseen, kerroin	0

Mallinnuksissa käytettyjen voimaloiden määrät, lähtömelutasot, napakorkeudet, roottorin halkaisijat sekä voimalatyypit on esitetty taulukossa 5.

Siltanevan tuulivoimaloissa on käytetty Nordex N175/6.8 MW (blades with serrated trailing edges) tuulivoimalan taajuusjakaumia lähtömelutason ollessa 106,9 + 2 dB(A). Mallinnuksissa käytetyt taajuusjakaumat perustuvat voimalavalmistajan meludokumenttiin (Nordex, 2022). Mallinnuksessa voimaloiden lähtömelutasoon on lisätty 2 dB(A):n varmuusarvo Ympäristöministeriön yhteenvetomuistion mukaisesti (Ympäristöministeriö 2016b).

Paskoonharjun tuulivoimaloissa on käytetty Paskoonharjun tuulivoimapuiston meluselvityksen mukaista voimalasijoittelua ja voimalatyyppejä (Vestas V150 5.6 MW, STE ja Vestas V136 3.45 MW, STE) (Ramboll 2019). Lähtömelutaot Paskoonharjun voimaloissa ovat Paskoonharjun meluselvityksen mukaiset 105,5 dB(A) ja 104,9 dB(A). Meluselvityksessä (Ramboll 2019) voimaloiden lähtömelutasoihin ei ole lisätty +2dB:n varmuusarvoja. Selvityksen mukaan mallinnuksessa käytetty V150-5.6:n MW:n melupäästöarvo vastaa mallinnusohjeen 2/2014 vaatimuksen mukaista äänitehotason takuuarvoa (LWAd, declared value). Meluselvityksen mukaan Vestaksen V136-3.45 MW:n laitevalmistajan meludokumentin mukaan ilmoitettujen lukujen odotetaan edustavan 95 prosentin varmuudella voimaloiden melupäästöä, mikä vastaa ympäristöministeriön mallinnusohjeessa annettua takuuarvon määritelmää. (Ramboll 2019) Näistä syistä +2dB(A):n varmuusarvoa ei myöskään tässä meluselvityksessä ole lisätty yhteisvaikutusmallinnuksiin Paskoonharjun voimaloiden lähtömelutasoon.

Matkussaaren tuulivoimaloissa on käytetty Matkussaaren tuulivoimapuiston meluselvityksen mukaista voimalasijoittelua ja voimalatyyppejä (Nordex N163 5.5/5.4/5.27/5.15 MW, STE) (EthaWind 2021). Lähtömelutasot Matkussaaren voimaloissa ovat Matkussaaren meluselvityksen mukaiset 106,4 + 1 dB(A), 106,0 + 1 dB(A), 105,5 + 1 dB(A) ja 105,0 + 1 dB(A). Matkussaaren melumallinnukseen turbiinivalmistajalta saadut äänitiedot sisältävät epävarmuusmarginaalin, mutta Nordexin käyttämä varmuusmarginaali ei kuitenkaan ole suoraan verrattavissa IEC TS 61400-14 -standardiin, johon ympäristöministeriön ohjeet viittaavat. Tästä syystä melumallinnuksen lähtömelutasoon on mallinnuksessa lisätty 1 dB:n varmuusmarginaali, joka on saatu voimalatoimittajalta. Samaa 1 dB varmuusmarginaalia on käytetty tässä meluselvityksessä Matkussaaren voimaloiden lähtömelutasoille.

Taulukko 5. Yhteenveto melumallinnusten voimaloiden lähtötiedoista

Tuulivoimapuisto	Voimaloiden määrä	Voimalan lähtömelutaso (dB(A))	Napakorkeus (m)	Roottorin halkaisija (m)	Voimalatyyppi
Siltaneva	9 (VE1)	106,9 + 2	200	200	Nordex V175/6.X-6 800 (blades with serrated trailing edges)
Siltaneva	8 (VE2)	106,9 + 2	200	200	Nordex V175/6.X-6 800 (blades with serrated trailing edges)
Paskoonharju	21	104,9	155	150	Vestas V150 5.6 MW, STE
Paskoonharju	2	105,5	142	136	Vestas V136 3.45 MW, STE
Matkussaari	20	106,4 + 1	148	163	NORDEX N163 5.5 MW, STE
Matkussaari	1	106,0 + 1	148	163	NORDEX N163 5.4 MW, STE
Matkussaari	2	105,5 + 1	148	163	NORDEX N163 5.27 MW, STE
Matkussaari	4	105,0 + 1	148	163	NORDEX N163 5.15 MW, STE

Meluvaikutuksia ja pienitaajuisia melua tarkasteltiin kolmentoista Siltanevan lähialueen rakennuksen kohdalla mallintaen. Melumallinnuksissa käytettyjen rakennusten koordinaatit ja rakennusluokka on esitetty taulukossa 6.

Hankealueen eteläpäädyssä sijaitsee metsästysmajana toimiva kiinteistö, jota ei ole maastotietokannssa. Teuvan kunnan päätöksellä kiinteistö luokitellaan lomarakennukseksi ja on näin ollen huomiotu meluvaikutusten arvioinnissa ja tämän meluselvityksen melumallinnuksissa (havainnointipiste R07).

Taulukko 6. Tarkasteltujen havainnointipisteiden rakennusluokka ja sijaintikoordinaatit

Havainnointipiste	Rakennusluokka	Itä	Pohjoinen
R01	Asuinrakennus	234 159,5	6 945 591,9
R02	Asuinrakennus	234 220,8	6 945 240,8
R03	Asuinrakennus	234 578,1	6 947 933,1
R04	Asuinrakennus	234 809,6	6 949 346,1
R05	Asuinrakennus	235 920,9	6 951 149,4
R06	Asuinrakennus	236 051,7	6 951 259,1
R07	Lomarakennus	236 548,8	6 943 843,4
R08	Lomarakennus	236 817,0	6 942 982,4
R09	Asuinrakennus	238 097,7	6 945 158,0
R10	Lomarakennus	238 178,7	6 948 810,5
R11	Asuinrakennus	238 600,1	6 946 540,4
R12	Asuinrakennus	238 604,9	6 947 020,6
R13	Lomarakennus	238 627,1	6 951 557,1

4.2 Menetelmät

Tuulivoimaloiden aiheuttama melu on mallinnettu windPRO 4.0 -ohjelman DECIBEL-moduulilla ISO 9613-2 standardin mukaisesti. Mallinnuksissa on laskettu melutasot valituissa havainnointipisteissä ja esitetty melun leviäminen meluvyöhykekarttoina. Maaston korkeusaineistona on melumallinnuksissa käytetty Maanmittauslaitoksen kahden metrin korkeusmallia. Mallinnuksien vesistötietoina on käytetty SYKE:n Jarvi10-paikkatietoaineistoa. Koska mallinnuksen tuulivoimaloiden, joiden etäisyys on alle 3 kilometriä tarkastelurakennuksista, perustukset eivät sijaitse 60 metriä korkeammalla kuin mallinnuksen tarkastelurakennukset, melupäästön takuuarvoihin ei huomioida korkeuseroista johtuvaa ylimääräistä 2 dB:n lisäystä.

Pienitaajuinen melu on mallinnettu ympäristöministeriön ohjeita noudattaen myös windPRO 4.0 -ohjelman DECIBEL-moduulilla. Rakennuksen melueristystietoina pienitaajuisen sisämelun laskennassa on käytetty taulukossa 7 esitettyjä suomalaisia mitattuja ääneneristävyysarvoja tanskalaisten arvojen sijasta.

Taulukko 7. Suomalaiset mitatut ääneneristävyyssarvot eri taajuuksilla (Hongisto ym., 2020).

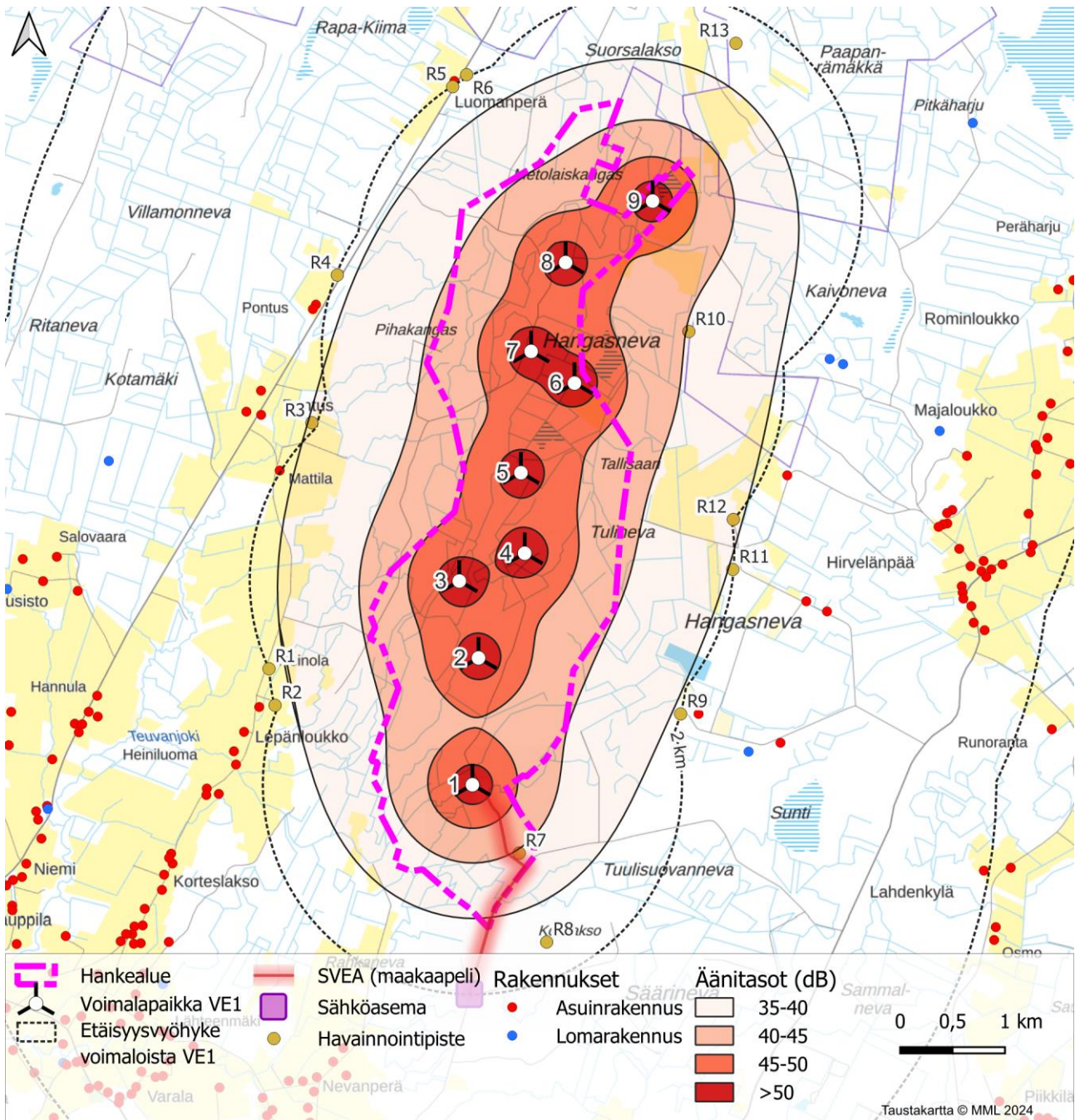
Kaista, Hz	DL _σ (dB)
20	7,6
25	8,3
31,5	9,2
40	10,3
50	11,5
63	13
80	14,8
100	16,8
125	18,8
160	21,1
200	22,8

5. Meluvaikutukset

5.1 Melumallinnus ISO 9613-2

5.1.1 Hankevaihtoehto VE1

Kuvassa 4 on esitetty Siltanevan hankevaihtoehtoon VE1 tuulivoimaloiden toiminnan aiheuttaman melun leviämislaskelman mukaiset tulokset. Mallinnustulosten perusteella VNa 1107/2015 mukainen 40 dB(A):n ohjearvo ei ylity Siltanevan tuulivoimapuiston vaikutusalueen asuin- tai lomarakennusten kohdalla Siltanevan hankevaihtoehtoon VE1 tuulivoimaloiden toiminnasta aiheutuvan melun vuoksi.



Kuva 4. Siltanevan hankevaihtoehdon VE1 melumallinnuksen mukainen meluvyöhykekartta.

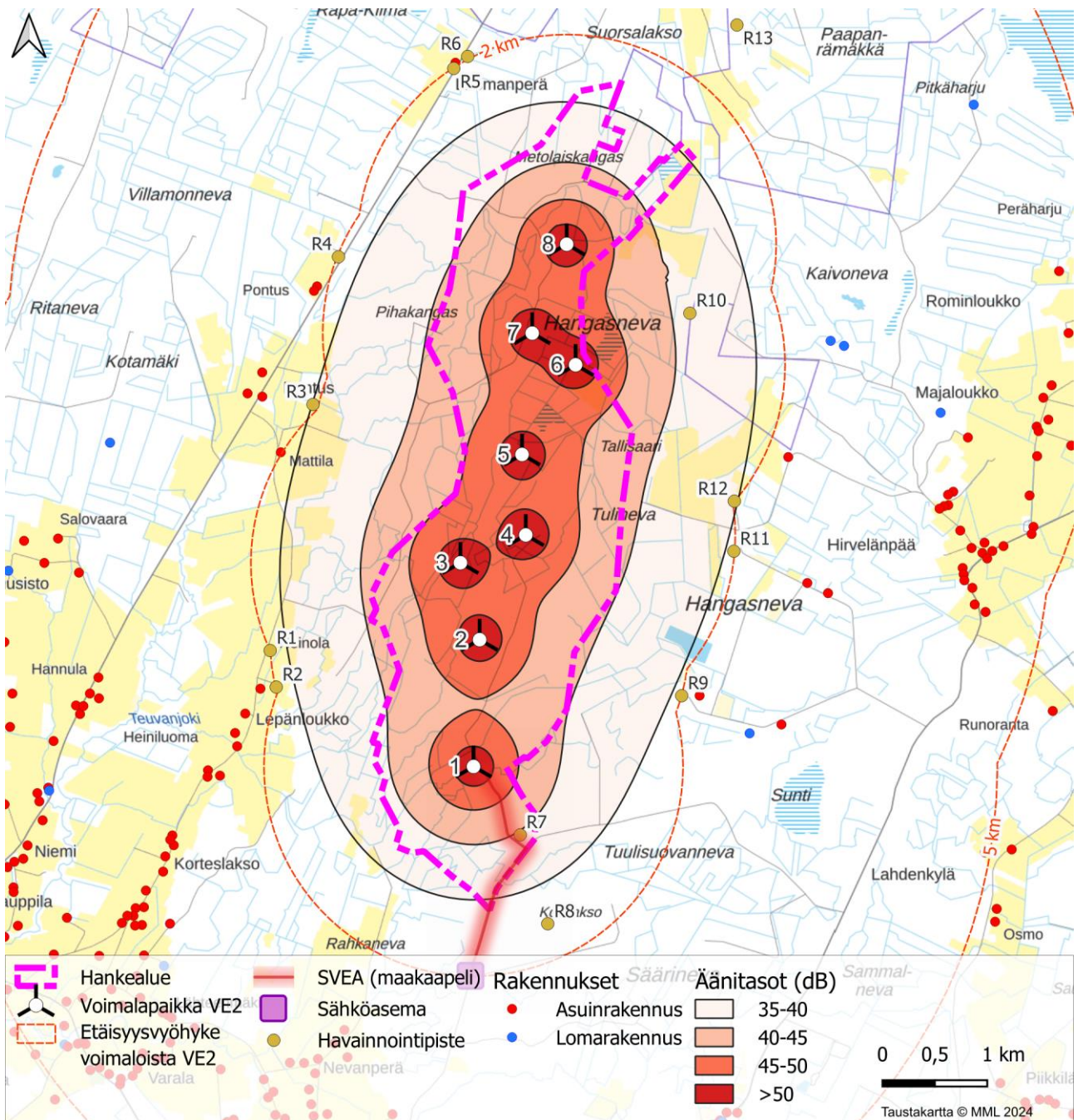
Korkein mallinnuksen melutaso havainnointipisteinä käytetyn rakennuksen kohdalla on lomarakennuksen R10 kohdalla, jossa melutaso on mallinnustuloksien perusteella 39,8 dB(A). Matalin melutaso havainnointipisteinä käytetyn rakennuksen kohdalla on lomarakennusten R08 ja R13 kohdalla, joissa melutaso on mallinnustuloksien perusteella 32,6 dB(A). Mallinnustulokset havainnointipisteittäin on esitetty taulukossa 8.

Taulukko 8. Siltanevan hankevaihtoehdon VE1 melumallinnuksen melutasot havainnointipisteittäin.

Havainnointipiste	Ohjearvo (dB)	VE1 (dB(A))
R01 (Asuinrakennus)	40	34,2
R02 (Asuinrakennus)	40	34,1
R03 (Asuinrakennus)	40	35,2
R04 (Asuinrakennus)	40	34,2
R05 (Asuinrakennus)	40	33,0
R06 (Asuinrakennus)	40	32,9
R07 (Lomarakennus)	40	39,7
R08 (Lomarakennus)	40	32,6
R09 (Asuinrakennus)	40	34,6
R10 (Lomarakennus)	40	39,8
R11 (Asuinrakennus)	40	34,8
R12 (Asuinrakennus)	40	35,4
R13 (Lomarakennus)	40	32,6

5.1.2 Hankevaihtoehto VE2

Kuvassa 5 on esitetty Siltaneva hankevaihtoehdon VE2 tuulivoimaloiden toiminnan aiheuttaman melun leviämislaskelman mukaiset tulokset. Mallinnustulosten perusteella VNa 1107/2015 mukainen 40 dB(A):n ohjearvo ei ylitä Siltaneva tuulivoimapuiston vaikutusalueen asuin- tai lomarakennusten kohdalla Siltanevan hankevaihtoehdon VE2 tuulivoimaloiden toiminnasta aiheutuvan melun vuoksi.



Kuva 5. Siltanevan hankevaihtoehdon VE2 melumallinnuksen mukainen meluvyöhykekartta.

Korkein mallinnuksen melutaso havainnointipisteenä käytetyn rakennuksen kohdalla on asuinrakennuksen R07 kohdalla, jossa melutaso on mallinnustuloksien perusteella 39,7 dB(A). Matalin melutaso havainnointipisteenä käytetyn rakennuksen kohdalla on asuinrakennuksen R13 kohdalla, jossa melutaso on mallinnustuloksien perusteella 28,7 dB(A). Mallinnustulokset havainnointipisteittäin on esitetty taulukossa 9.

Taulukko 9. Siltanevan hankevaihtoehdon VE2 melumallinnuksen melutasot havainnointipisteittäin.

Havainnointipiste	Ohjearvo (dB)	VE2 (dB(A))
R01 (Asuinrakennus)	40	34,1
R02 (Asuinrakennus)	40	34,1
R03 (Asuinrakennus)	40	35,1
R04 (Asuinrakennus)	40	33,8
R05 (Asuinrakennus)	40	31,7
R06 (Asuinrakennus)	40	31,5
R07 (Lomarakennus)	40	39,7
R08 (Lomarakennus)	40	32,6
R09 (Asuinrakennus)	40	34,5
R10 (Lomarakennus)	40	38,7
R11 (Asuinrakennus)	40	34,6
R12 (Asuinrakennus)	40	35,1
R13 (Lomarakennus)	40	28,7

5.2 Pienitaajuinen melu

Pienitaajuinen melu laskettiin mallintaen ympäristöministeriön ohjeistuksen mukaisesti käyttäen windPRO 4.0:n DECIBEL-moduulilla. Pienitaajuinen melu laskettiin mallintaen havainnointipisteiden R01-R13 kohdilla sisällä (sisämelu), missä huomioitiin suomalaiset pientalojen julkisivun ääneneristävyysarvot (Hongisto ym., 2020). Lisäksi pienitaajuinen melu laskettiin mallintaen havainnointipisteiden R01-R13 kohdilla ulkopuolella, jossa ei huomioitu rakennusten ääneneristävyyttä.

5.2.1 Hankavaihtoehto VE1

Taulukossa 10 esitettyjen mallinnustuloksien perusteella Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle eivät ylity havainnointipisteinä käytettyjen rakennuksien kohdalla hankevaihtoehdon VE1 mukaisessa tilanteessa, kun havainnointipisteissä huomioidaan suomalaiset ääneneristävyysarvot (Hongisto ym. 2020). Taulukossa 11 on esitetty pienitaajuisen melun mallinnustulokset havainnointipisteiden kohdalla ilman eristystietoja (ulkomelu).

Taulukko 10. Siltanevan hankevaihtoehdon VE1 mukaisen mallinnuksen pienitaajuinen sisämelu havainnointipisteiden R01-R13 kohdalla.

Hz	Yöaikainen toimenpideraja (klo 22-07) $L_{eq,1h}/dB$	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	74	51,8	51,8	52,7	52,0	51,0	50,9	55,0	50,3	52,2	55,8	52,5	52,9	50,3
25	64	48,5	48,4	49,4	48,6	47,6	47,5	51,6	47,0	48,9	52,5	49,1	49,5	46,9
31,5	56	44,0	43,9	44,9	44,1	43,1	43,0	47,1	42,4	44,4	47,9	44,6	45,0	42,4
40	49	39,0	38,9	39,9	39,1	38,1	38,0	42,2	37,5	39,4	43,0	39,7	40,1	37,5
50	44	35,1	35,0	36,0	35,2	34,2	34,1	38,3	33,5	35,4	39,1	35,7	36,1	33,5
63	42	33,4	33,3	34,3	33,5	32,4	32,4	36,6	31,8	33,7	37,4	34,0	34,4	31,8
80	40	29,8	29,7	30,7	30,0	28,9	28,8	33,1	28,2	30,2	33,9	30,5	30,9	28,2
100	38	25,1	25,0	26,0	25,2	24,1	24,0	28,5	23,5	25,5	29,3	25,7	26,2	23,5
125	36	21,1	21,1	22,1	21,3	20,2	20,1	24,7	19,5	21,6	25,5	21,8	22,3	19,5
160	34	15,9	15,8	16,8	16,0	14,8	14,7	19,7	14,2	16,3	20,4	16,5	17,0	14,2
200	32	12,0	11,9	13,0	12,1	11,0	10,9	16,1	10,3	12,5	16,8	12,7	13,2	10,3

Taulukko 11. Siltanevan hankevaihtoehdon VE1 mukaisen mallinnuksen pienitaajuinen melu ulkotiloissa havainnointipisteiden R01-R13 kohdalla.

Hz	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	59,4	59,4	60,3	59,6	58,6	58,5	62,6	57,9	59,8	63,4	60,1	60,5	57,9
25	56,8	56,7	57,7	56,9	55,9	55,8	59,9	55,3	57,2	60,8	57,4	57,8	55,2
31,5	53,2	53,1	54,1	53,3	52,3	52,2	56,3	51,6	53,6	57,1	53,8	54,2	51,6
40	49,3	49,2	50,2	49,4	48,4	48,3	52,5	47,8	49,7	53,3	50,0	50,4	47,8
50	46,6	46,5	47,5	46,7	45,7	45,6	49,8	45,0	46,9	50,6	47,2	47,6	45,0
63	46,4	46,3	47,3	46,5	45,4	45,4	49,6	44,8	46,7	50,4	47,0	47,4	44,8
80	44,6	44,5	45,5	44,8	43,7	43,6	47,9	43,0	45,0	48,7	45,3	45,7	43,0
100	41,9	41,8	42,8	42,0	40,9	40,8	45,3	40,3	42,3	46,1	42,5	43,0	40,3
125	39,9	39,9	40,9	40,1	39,0	38,9	43,5	38,3	40,4	44,3	40,6	41,1	38,3
160	37,0	36,9	37,9	37,1	35,9	35,8	40,8	35,3	37,4	41,5	37,6	38,1	35,3
200	34,8	34,7	35,8	34,9	33,8	33,7	38,9	33,1	35,3	39,6	35,5	36,0	33,1

5.2.2 Hankevaihtoehto VE2

Taulukossa 12 esitettyjen mallinnustuloksien perusteella Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle

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Päiväys: 20.12.2024 Versio: 01

eivät ylitä havainnointipisteinä käytettyjen rakennuksien kohdalla hankevaihtoehdon VE2 mukaisessa tilanteessa, kun havainnointipisteissä huomioidaan suomalaiset ääneneristävyyssarvot (Hongisto ym. 2020). Taulukossa 13 on esitetty pienitaajuisten melun mallinnustulokset havainnointipisteiden kohdalla ilman eristystietoja (ulkomelu).

Taulukko 12. Siltanevan hankevaihtoehdon VE2 mukaisen mallinnuksen pienitaajuinen sisämelu havainnointipisteiden R01-R13 kohdalla.

Hz	Yöaikainen toimenpideraja (klo 22–07) $L_{eq,1h}/dB$	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	74	51,7	51,6	52,5	51,6	49,9	49,7	54,9	50,2	52,1	54,8	52,2	52,6	47,9
25	64	48,4	48,3	49,2	48,2	46,5	46,3	51,6	46,9	48,7	51,4	48,9	49,2	44,5
31,5	56	43,9	43,8	44,7	43,7	42,0	41,8	47,1	42,3	44,2	46,9	44,3	44,7	40,0
40	49	38,9	38,8	39,7	38,7	37,0	36,8	42,2	37,4	39,3	42,0	39,4	39,8	35,0
50	44	34,9	34,9	35,8	34,8	33,0	32,9	38,2	33,4	35,3	38,0	35,4	35,8	31,0
63	42	33,2	33,2	34,1	33,1	31,3	31,1	36,6	31,7	33,6	36,4	33,7	34,1	29,3
80	40	29,7	29,6	30,5	29,6	27,8	27,6	33,1	28,2	30,1	32,9	30,2	30,6	25,7
100	38	25,0	24,9	25,8	24,8	23,0	22,8	28,5	23,4	25,4	28,2	25,5	25,9	20,8
125	36	21,1	21,0	21,9	20,9	19,0	18,8	24,7	19,4	21,4	24,4	21,6	22,0	16,7
160	34	15,8	15,7	16,7	15,6	13,6	13,4	19,6	14,1	16,2	19,3	16,3	16,7	11,2
200	32	12,0	11,9	12,9	11,7	9,7	9,5	16,1	10,3	12,4	15,7	12,5	12,9	7,1

Taulukko 13. Siltanevan hankevaihtoehdon VE2 mukaisen mallinnuksen pienitaajuinen melu ulkotiloissa havainnointipisteiden R01-R13 kohdalla.

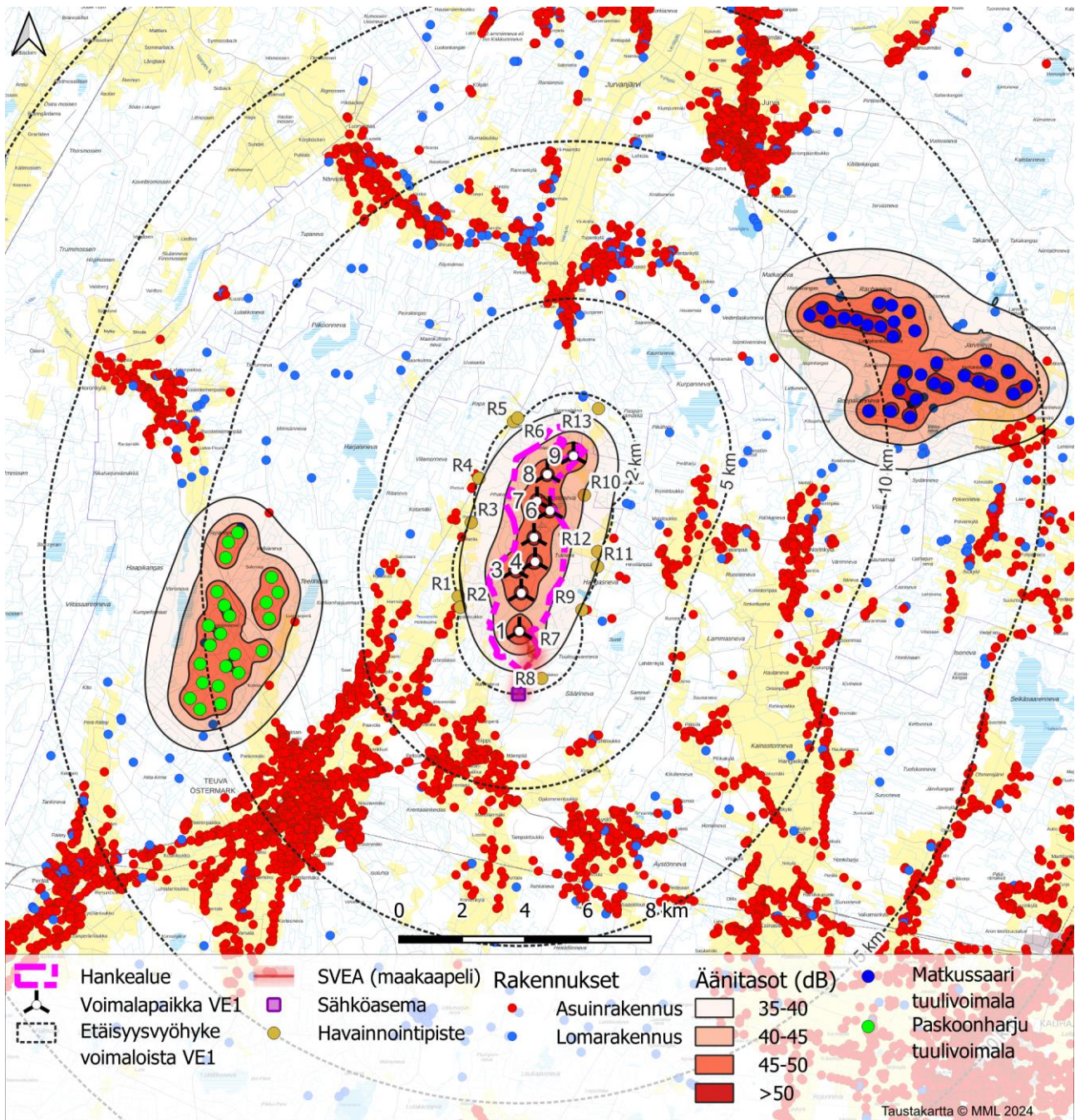
Hz	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	59,3	59,2	60,1	59,2	57,5	57,3	62,5	57,8	59,7	62,4	59,8	60,2	55,5
25	56,7	56,6	57,5	56,5	54,8	54,6	59,9	55,2	57,0	59,7	57,2	57,5	52,8
31,5	53,1	53,0	53,9	52,9	51,2	51,0	56,3	51,5	53,4	56,1	53,5	53,9	49,2
40	49,2	49,1	50,0	49,0	47,3	47,1	52,5	47,7	49,6	52,3	49,7	50,1	45,3
50	46,4	46,4	47,3	46,3	44,5	44,4	49,7	44,9	46,8	49,5	46,9	47,3	42,5
63	46,2	46,2	47,1	46,1	44,3	44,1	49,6	44,7	46,6	49,4	46,7	47,1	42,3
80	44,5	44,4	45,3	44,4	42,6	42,4	47,9	43,0	44,9	47,7	45,0	45,4	40,5
100	41,8	41,7	42,6	41,6	39,8	39,6	45,3	40,2	42,2	45,0	42,3	42,7	37,6
125	39,9	39,8	40,7	39,7	37,8	37,6	43,5	38,2	40,2	43,2	40,4	40,8	35,5
160	36,9	36,8	37,8	36,7	34,7	34,5	40,7	35,2	37,3	40,4	37,4	37,8	32,3
200	34,8	34,7	35,7	34,5	32,5	32,3	38,9	33,1	35,2	38,5	35,3	35,7	29,9

5.3 Yhteisvaikutusmallinnus

Siltanevan hankevaihtoehtojen VE1 ja VE2 tuulivoimamelun yhteisvaikutuksia arvioitiin mallintaen yhdessä Paskoonharjun ja Matkussaaren tuulivoimapuistojen kanssa. Yhteisvaikutusmallinnuksessa käytettyjen tuulivoimaloiden määrät, lähtömelutasot, napakorkeudet, roottorin halkaisijat sekä voimalatyypit on esitetty taulukossa 5. Yhteisvaikutusmallinnuksen voimaloiden sijaintikoordinaatit on esitetty liitteen 2 mallinnustulosteissa.

5.3.1 Hankevaihtoehto VE1

Kuvassa 6 on esitetty Siltanevan hankevaihtoehtojen VE1 yhteisvaikutusmallinnuksen tuloksien mukainen meluvyöhykekartta. Siltanevan hankevaihtoehtojen VE1 yhteisvaikutusmallinnustulosten perusteella VNa 1107/2015 mukainen 40 dB(A):n ohjearvo ei ylity Siltanevan vaikutusalueen asun- ja lomarakennusten kohdalla.



Kuva 6. Siltanevan hankevaihtoehdon VE1 yhteisvaikutusmallinnuksen mukainen meluvyöhykekartta.

Korkein melutaso mallinnuksen havainnointipisteiden kohdalla on lomarakennuksen R10 kohdalla, jossa melutaso on mallinnustuloksien perusteella 39,9 dB(A). Matalin melutaso mallinnuksen havainnointipisteiden kohdalla on lomarakennuksen R08 kohdalla, jossa melutaso on mallinnustuloksien perusteella 32,8 dB(A). Mallinnustulokset havainnointipisteittäin on esitetty taulukossa 14.

Taulukko 14. Siltanevan hankevaihtoehdon VE1 yhteisvaikutusmallinnuksen melutasot havainnointipisteittäin.

Havainnointipiste	Ohjearvo (dB)	VE1 (dB(A))
R01 (Asuinrakennus)	40	34,5
R02 (Asuinrakennus)	40	34,4
R03 (Asuinrakennus)	40	35,4
R04 (Asuinrakennus)	40	34,4
R05 (Asuinrakennus)	40	33,2
R06 (Asuinrakennus)	40	33,2
R07 (Lomarakennus)	40	39,8
R08 (Lomarakennus)	40	32,8
R09 (Asuinrakennus)	40	34,7
R10 (Lomarakennus)	40	39,9
R11 (Asuinrakennus)	40	34,9
R12 (Asuinrakennus)	40	35,5
R13 (Lomarakennus)	40	32,9

Taulukossa 15 esitettyjen yhteisvaikutusmallinnustuloksien perusteella Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle eivät ylity havainnointipisteinä käytettyjen rakennuksien kohdalla hankevaihtoehdon VE1 mukaisessa tilanteessa, kun havainnointipisteissä huomioidaan suomalaiset ääneneristävyysarvot (Hongisto ym. 2020). Taulukossa 16 on esitetty pienitaajuisen melun yhteisvaikutusmallinnustulokset havainnointipisteiden kohdalla ilman eristystietoja (ulkomelu).

Taulukko 15. Siltanevan hankevaihtoehdon VE1 yhteisvaikutusmallinnuksen pienitaajuinen sisämelu havainnointipisteiden R01-R13 kohdalla.

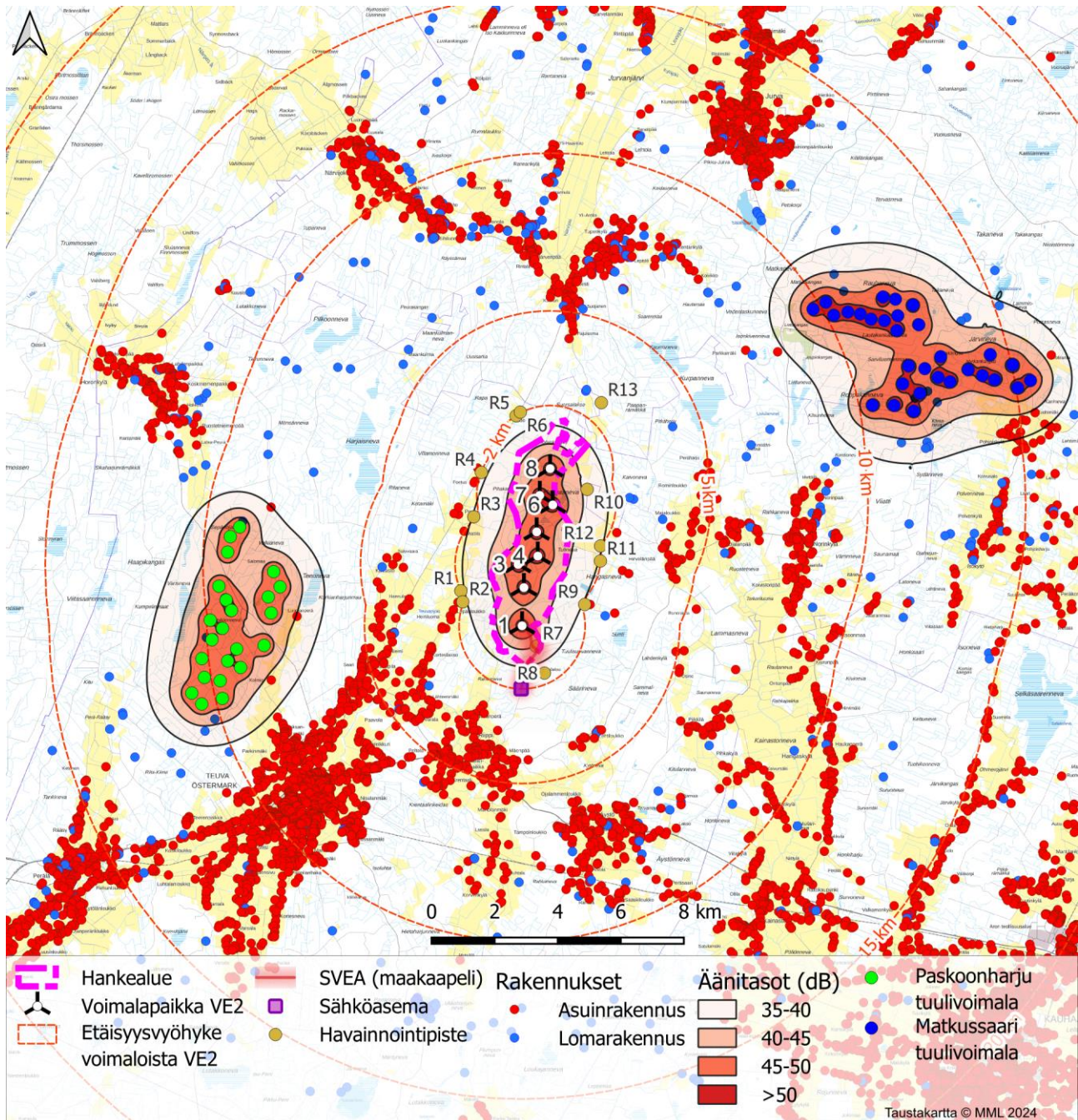
Hz	Yöaikainen toimenpide raja (klo 22-07) $L_{eq,1h}/dB$	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	74	52,0	51,9	52,8	52,1	51,1	51,0	55,0	50,4	52,3	55,8	52,6	53,0	50,5
25	64	48,7	48,6	49,5	48,8	47,8	47,7	51,7	47,1	49,0	52,5	49,2	49,7	47,2
31,5	56	44,3	44,2	45,1	44,4	43,4	43,3	47,2	42,7	44,6	48,1	44,8	45,2	42,9
40	49	39,6	39,5	40,3	39,6	38,6	38,5	42,4	38,0	39,8	43,2	40,0	40,4	38,2
50	44	35,9	35,8	36,6	35,9	35,0	34,9	38,6	34,3	36,0	39,4	36,3	36,7	34,8
63	42	33,9	33,8	34,7	33,9	32,9	32,9	36,8	32,3	34,1	37,6	34,4	34,8	32,5
80	40	30,3	30,3	31,1	30,4	29,3	29,3	33,3	28,7	30,5	34,1	30,8	31,2	28,9
100	38	25,7	25,6	26,5	25,7	24,8	24,7	28,7	24,0	25,9	29,5	26,2	26,6	24,5
125	36	21,6	21,5	22,4	21,6	20,5	20,4	24,8	19,8	21,8	25,6	22,0	22,5	19,9
160	34	16,2	16,1	17,0	16,2	15,0	14,9	19,7	14,4	16,4	20,4	16,6	17,1	14,4
200	32	12,3	12,2	13,2	12,2	11,1	11,0	16,2	10,5	12,5	16,8	12,8	13,3	10,5

Taulukko 16. Hankevaihtoehdon VE1 yhteisvaikutusmallinnuksen pienitaajuinen melu ulkotiloissa havainnointipisteiden R01-R13 kohdalla.

Hz	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	59,6	59,5	60,4	59,7	58,7	58,6	62,6	58,0	59,9	63,4	60,2	60,6	58,1
25	57,0	56,9	57,8	57,1	56,1	56,0	60,0	55,4	57,3	60,8	57,5	58,0	55,5
31,5	53,5	53,4	54,3	53,6	52,6	52,5	56,4	51,9	53,8	57,3	54,0	54,4	52,1
40	49,9	49,8	50,6	49,9	48,9	48,8	52,7	48,3	50,1	53,5	50,3	50,7	48,5
50	47,4	47,3	48,1	47,4	46,5	46,4	50,1	45,8	47,5	50,9	47,8	48,2	46,3
63	46,9	46,8	47,7	46,9	45,9	45,9	49,8	45,3	47,1	50,6	47,4	47,8	45,5
80	45,1	45,1	45,9	45,2	44,1	44,1	48,1	43,5	45,3	48,9	45,6	46,0	43,7
100	42,5	42,4	43,3	42,5	41,6	41,5	45,5	40,8	42,7	46,3	43,0	43,4	41,3
125	40,4	40,3	41,2	40,4	39,3	39,2	43,6	38,6	40,6	44,4	40,8	41,3	38,7
160	37,3	37,2	38,1	37,3	36,1	36,0	40,8	35,5	37,5	41,5	37,7	38,2	35,5
200	35,1	35,0	36,0	35,0	33,9	33,8	39,0	33,3	35,3	39,6	35,6	36,1	33,3

5.3.2 Hankevaihtoehto VE2

Kuvassa 7 on esitetty Siltanevan hankevaihtoehtoon VE2 yhteisvaikutusmallinnuksen tuloksien mukainen meluvyöhykekartta. Siltanevan hankevaihtoehtoon VE2 yhteisvaikutusmallinnustulosten perusteella VNa 1107/2015 mukainen 40 dB(A):n ohjearvo ei ylitä Siltanevan vaikutusalueen asun- ja lomarakennusten kohdalla.



Kuva 7. Siltanevan hankevaihtoehtoon VE2 yhteisvaikutusmallinnuksen mukainen meluvyöhykekartta.

Korkein melutaso mallinnuksen havainnointipisteiden kohdalla on lomarakennuksen R07 kohdalla, jossa melutaso on mallinnustulosten perusteella 39,8 dB(A). Matalin melutaso mallinnuksen havainnointipisteiden

kohdalla on lomarakennuksen R13 kohdalla, jossa melutaso on mallinnustuloksien perusteella 29,4 dB(A). Mallinnustulokset havainnointipisteittäin on esitetty taulukossa 17.

Taulukko 17. Siltanevan hankevaihtoehdon VE2 yhteisvaikutusmallinnuksen melutasot havainnointipisteittäin.

Havainnointipiste	Ohjearvo (dB)	VE2 (dB(A))
R01 (Asuinrakennus)	40	34,4
R02 (Asuinrakennus)	40	34,4
R03 (Asuinrakennus)	40	35,2
R04 (Asuinrakennus)	40	34,1
R05 (Asuinrakennus)	40	32,0
R06 (Asuinrakennus)	40	31,8
R07 (Lomarakennus)	40	39,8
R08 (Lomarakennus)	40	32,8
R09 (Asuinrakennus)	40	34,7
R10 (Lomarakennus)	40	38,8
R11 (Asuinrakennus)	40	34,7
R12 (Asuinrakennus)	40	35,3
R13 (Lomarakennus)	40	29,4

Taulukossa 18 esitettyjen yhteisvaikutusmallinnustuloksien perusteella Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle eivät ylity havainnointipisteinä käytettyjen rakennuksien kohdalla hankevaihtoehdon VE2 mukaisessa tilanteessa, kun havainnointipisteissä huomioidaan suomalaiset ääneneristävyyssarvot (Hongisto ym. 2020). Taulukossa 19 on esitetty pienitaajuisen melun yhteisvaikutusmallinnustulokset havainnointipisteiden kohdalla ilman eristystietoja (ulkomelu).

Taulukko 18. Siltanevan hankevaihtoehdon VE2 yhteisvaikutusmallinnuksen pienitaajuinen sisämelu havainnointipisteiden R01-R13 kohdalla.

Hz	Yöaikainen toimenpide raja (klo 22-07) $L_{eq,1h}/dB$	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	74	51,9	51,8	52,6	51,7	50,0	49,9	55,0	50,3	52,2	54,8	52,3	52,7	48,2
25	64	48,6	48,5	49,3	48,4	46,7	46,5	51,7	47,0	48,8	51,5	49,0	49,3	44,9
31,5	56	44,2	44,1	44,9	44,0	42,4	42,2	47,2	42,7	44,4	47,1	44,6	44,9	40,7
40	49	39,5	39,4	40,1	39,2	37,7	37,5	42,3	37,9	39,6	42,2	39,8	40,1	36,2
50	44	35,8	35,7	36,4	35,6	34,1	34,0	38,5	34,2	35,9	38,5	36,1	36,4	33,1
63	42	33,8	33,7	34,5	33,6	31,9	31,8	36,8	32,2	34,0	36,6	34,1	34,5	30,4
80	40	30,3	30,2	30,9	30,0	28,4	28,2	33,3	28,6	30,4	33,1	30,6	30,9	26,8
100	38	25,6	25,5	26,3	25,4	23,8	23,6	28,7	24,0	25,8	28,5	26,0	26,3	22,6
125	36	21,5	21,4	22,2	21,2	19,4	19,2	24,8	19,8	21,6	24,5	21,8	22,2	17,5
160	34	16,1	16,0	16,9	15,8	13,9	13,7	19,7	14,3	16,3	19,4	16,4	16,8	11,7
200	32	12,2	12,1	13,0	11,9	9,9	9,7	16,2	10,4	12,4	15,7	12,6	13,0	7,4

Taulukko 19. Siltanevan hankevaihtoehdon VE2 yhteisvaikutusmallinnuksen pienitaajuinen melu ulkotiloissa havainnointipisteiden R01-R13 kohdalla.

Hz	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
20	59,5	59,4	60,2	59,3	57,6	57,5	62,6	57,9	59,8	62,4	59,9	60,3	55,8
25	56,9	56,8	57,6	56,7	55,0	54,8	60,0	55,3	57,1	59,8	57,3	57,6	53,2
31,5	53,4	53,3	54,1	53,2	51,6	51,4	56,4	51,9	53,6	56,3	53,8	54,1	49,9
40	49,8	49,7	50,4	49,5	48,0	47,8	52,6	48,2	49,9	52,5	50,1	50,4	46,5
50	47,3	47,2	47,9	47,1	45,6	45,5	50,0	45,7	47,4	50,0	47,6	47,9	44,6
63	46,8	46,7	47,5	46,6	44,9	44,8	49,8	45,2	47,0	49,6	47,1	47,5	43,4
80	45,1	45,0	45,7	44,8	43,2	43,0	48,1	43,4	45,2	47,9	45,4	45,7	41,6
100	42,4	42,3	43,1	42,2	40,6	40,4	45,5	40,8	42,6	45,3	42,8	43,1	39,4
125	40,3	40,2	41,0	40,0	38,2	38,0	43,6	38,6	40,4	43,3	40,6	41,0	36,3
160	37,2	37,1	38,0	36,9	35,0	34,8	40,8	35,4	37,4	40,5	37,5	37,9	32,8
200	35,0	34,9	35,8	34,7	32,7	32,5	39,0	33,2	35,2	38,5	35,4	35,8	30,2

5.4 Epävarmuustekijät

Mallinnuksessa on käytetty standardien mukaista menetelmää ja se on tehty ympäristöministeriön ohjeiden mukaisesti. Mahdollista epävarmuutta voi syntyä lähtötietojen ja käytetyn aineiston epävarmuudesta.

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6. Yhteenveto

Tämä meluselvitys tehtiin Siltanevan tuulivoimapuistoon Teuvalle suunniteltujen tuulivoimaloiden osalta. Melumallinnus tehtiin windPRO 4.0-ohjelmistolla ympäristöministeriön ohjeistusta noudattaen. Mallinnuksissa tarkasteltiin Siltanevan hankevaihtoehtoja VE1 (9 voimalaa) ja VE2 (8 voimalaa). Tuulivoimaloiden toiminnan meluvaikutuksia on arvioitu melun leviämismallilaskelmien avulla. Lisäksi rakennuksien kohdalle kohdistuvia meluvaikutuksia on tarkemmin tutkittu kolmentoista eri asuin- ja lomarakennuksen kohdalla Siltanevan voimaloiden lähialueella.

Siltanevan hankevaihtoehtojen VE1 ja VE2 melumallinnustulosten perusteella Siltanevan vaikutusalueen asuin- tai lomarakennuksien kohdalla ei ylity VNa 1107/2015 mukainen 40 dB(A):n ohjearvo. Lisäksi Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle eivät ylittyneet havainnointipisteinä käytettyjen rakennuksien (R01-R13) kohdalla Siltanevan hankevaihtoehtojen VE1 tai VE2 mallinnustulosten perusteella.

Meluselvityksessä mallinnettiin myös Siltanevan tuulivoimaloiden melun yhteisvaikutuksia Paskoonharjun ja Matkussaaren tuulivoimapuistojen voimaloiden kanssa Siltanevan hankevaihtoehtojen VE1 ja VE2 osalta. Melun yhteisvaikutusmallinnusten tulosten perusteella Siltanevan vaikutusalueen asuin- tai lomarakennuksien kohdalla ei ylity VNa 1107/2015 mukainen 40 dB(A):n ohjearvo.

Sosiaali- ja terveysministeriön asumisterveysasetuksen (545/2015) sisältämät toimenpideraja-arvot yöaikaiselle pienitaajuiselle sisämelulle eivät ylittyneet havainnointipisteinä käytettyjen rakennuksien (R01-R13) kohdalla pienitaajuisen sisämelun yhteisvaikutusmallinnustulosten perusteella kummarkaan Siltanevan hankevaihtoehtojen VE1 tai VE2 yhteisvaikutusmallinnuksessa.

7. Mallinnustietojen raportti

Siltaneva

RAPORTIN JA RAPORTOIJAN TIEDOT				*tarkentavat tiedot voi esittää kartalla tai muissa liitteissä			
Mallinnusraportin numero/tunniste: 25011894-001				Raportin hyväksyntäpäivämäärä: 20.12.2024			
Tekijä/organisaatio, yhteystiedot: Sweco Finland Oy, Ilmalanportti 2, 00240 Helsinki							
Vastuuhenkilöt: Lassi Pirttinen							
Laatija: Lassi Pirttinen				Tarkastaja/hyväksyjä: Juho Ali-Tolppa			
MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: windPRO 4.0				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN) TIEDOT							
Tuulivoimalan valmistaja: Nordex				Tyyppi: N175/6.X-6 800 (blades with serrated trailing edges)		Sarjanumero/t:	
Nimellisteho: 6.8 MW		Napakorkeus: 200 m		Roottorin halkaisija: 200 m		Tornin tyyppi:	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	dB	Kyllä	dB			dB	
Ei	Ei tiedossa	Ei	Ei tiedossa			dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot Nordex N175/6.X-6 800 (blades with serrated trailing edges).							
Tiedot perustuvat dokumenttiin "Third octave sound power levels, Nordex N175/6.X, F008_278_A17_EN, Rev. 01, 2022-05-08"							
Alla esitettyihin arvoihin on lisätty 2 dB:n varmuusarvo mallinnoissa.							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
31,5		20	71,8	200	94,5	2000	94,6
63	89,7	25	75,2	250	95,0	2500	91,4
125	96,5	31,5	77,1	315	95,8	3150	88,1
250	99,9	40	78,3	400	95,7	4000	83,8
500	100,4	50	80,3	500	95,5	5000	79,7
1000	101,3	63	84,6	630	95,8	6300	72,6
2000	99,2	80	87,3	800	96,5	8000	64,9
4000	89,9	100	88,9	1000	96,5	10000	55,5

8000	73,4	125	91,5	1250	93,8		
		160	93,5	1600	92,2		
Melun erityispiirteiden mittaustiedot ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, mikä	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei
Akustiset tiedot/laskennan lähtötiedot							
Laskenta korkeus				Laskentaruudun koko [m·m]			
4,0 m		Muu, mikä ja miksi:		25 m * 25 m			
Suhteellinen kosteus				Lämpötila			
70 %		Muu, mikä ja miksi:		15 °C		Muu, mikä ja miksi:	
Maastomallin lähde ja tarkkuus							
Maastomallin lähde: Maanmittauslaitos				Vaakaresoluutio: 2 m		Pystyresoluutio: 0,3 m	
Maan- ja vedenpinnan absorptio ja heijastuksen huomioiminen, käytetyt kertoimet							
ISO 9613-2				HUOM			
Vesialueet, (0) / (G)				0			
Maa-alueet, (0,4) / (A-D/E-F)				0,4			
Maa-alueet, (0) / (G)							
Ilmakehän stabiilius laskennassa/meteorologinen korjaus							
Neutraali, (0): neutraali				Muu, mikä ja miksi:			
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen tilastollinen jakauma							
Tuulen suunta: 0–360 °				Tuulen nopeus: 8 m/s (10m korkeudella)			
Voimalan äänen suuntaavuus ja vaimentuminen							
Vapaa avaruus: kyllä				Muu, mikä ja miksi:			
Melulle altistuvat asukkaat ja kohteet. Ik (ilman meluntorjuntaa/voimalan ohjausta)							
Asuinrakennukset: 0 kpl		Vapaa-ajan rakennukset: 0 kpl			Hoito- ja oppilaitokset: 0 kpl		
Melulle altistuvat asukkaat ja kohteet, Ik (meluntorjunta/voimalan ohjaus huomioiden)							
Asuinrakennukset: 0 kpl		Vapaa-ajan rakennukset: 0 kpl			Hoito- ja oppilaitokset: 0 kpl		
Melun leviäminen virkistys- tai luonnonsuojelualueille							
Virkistysalueet: 0 kpl				Luonnonsuojelualueet: 0 kpl			
Pienitaajuisen melun laskentamenetelmä: windPRO 4.0, DECIBEL-moduuli, Finland Low Frequency - laskentamalli							
Siltanevan pienitaajuisen melun laskentatulokset on esitetty taulukkomuodossa kappaleessa 5.2.							

Yhteisvaikutusmallinnuksien voimaloiden lähtötiedot

Paskoonharju

RAPORTIN JA RAPORTOIJAN TIEDOT				*tarkentavat tiedot voi esittää kartalla tai muissa liitteissä			
Mallinnusraportin numero/tunniste: 25011894-001				Raportin hyväksyntäpäivämäärä: 20.12.2024			
Tekijä/organisaatio, yhteystiedot: Sweco Finland Oy, Ilmalanportti 2, 00240 Helsinki							
Vastuuhenkilöt: Lassi Pirttinen							
Laatija: Lassi Pirttinen				Tarkastaja/hyväksyjä: Juho Ali-Tolppa			
MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: windPRO 4.0				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN) TIEDOT							
Tuulivoimalan valmistaja: Vestas				Tyyppi: B1-B2: V136 mk3 3.45MW – STE B3-B23: V150 5.6MW		Sarjanumero/t:	
Nimellisteho: B1-B2: 3.45 MW B3-B23: 5.6 MW		Napakorkeus: B1-B2: 142 m B3-B23: 155 m		Roottorin halkaisija: B1-B2: 136 m B3-B23: 150 m		Tornin tyyppi: Putkitorni	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	dB	Kyllä	dB			dB	
Ei	Ei tiedossa	Ei	Ei tiedossa			dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot V136 mk3 3.45MW – STE (voimalat B1-B2)							
Mallinnuksessa käytetyt tiedot perustuvat Paskoonharjun meluselvitykseen (Ramboll 2019), jossa viitataan dokumenttiin ”V136 mk3 3.45MW Third octave noise emission, DMS 0055-9919_00, 2015-11-23”							
Paskoonharjun meluselvityksen (Ramboll 2019) mukaisesti +2dB varmuusarvoa ei ole lisätty 1/3-oktaaveihin.							
Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	64,0	200	90,1	2000	92,0
63	90,9	25	71,8	250	91,4	2500	90,0
125	97,0	31,5	77,1	315	92,9	3150	87,3
250	96,4	40	80,2	400	93,8	4000	88,5
500	99,1	50	83,1	500	94,1	5000	79,5
1000	100,0	63	86,1	630	95,1	6300	73,1

2000	97,3	80	88,0	800	95,2	8000	67,1
4000	91,3	100	89,2	1000	95,3	10000	62,9
8000	74,4	125	94,4	1250	95,2		
		160	95,0	91,5	94,4		
Melupäästötiedot V150 5.6 MW (voimalat B3-B23)							
Mallinnuksessa käytetyt tiedot perustuvat Paskoonharjun meluselvitykseen (Ramboll 2019), jossa viitataan dokumenttiin ” V150-5.6 MW Third octave noise emission; DMS 0079-5099_01; 2019-01-23”							
Paskoonharjun meluselvityksen (Ramboll 2019) mukaisesti +2dB varmuusarvoa ei ole lisätty 1/3-oktaaveihin.							
Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	60,9	200	92,3	2000	89,9
63	86,2	25	65,4	250	93,5	2500	87,8
125	93,7	31,5	69,7	315	94,5	3150	85,4
250	98,3	40	73,9	400	95,1	4000	82,5
500	100,0	50	77,4	500	95,4	5000	79,5
1000	98,9	63	80,7	630	95,3	6300	76,1
2000	94,8	80	83,8	800	94,9	8000	72,2
4000	87,9	100	86,4	1000	94,1	10000	68,2
8000	78,0	125	88,6	1250	93,1		
		160	90,7	1600	91,6		
Melun erityispiirteiden mittaust ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, mikä	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei
Akustiset tiedot/laskennan lähtötiedot							
Laskenta korkeus					Laskentaruudun koko [m·m]		
4,0 m	Muu, mikä ja miksi:				25 m * 25 m		
Suhteellinen kosteus				Lämpötila			
70 %	Muu, mikä ja miksi:			15 °C	Muu, mikä ja miksi:		
Maastomallin lähde ja tarkkuus							
Maastomallin lähde: Maanmittauslaitos				Vaakaresoluutio: 2 m		Pystyresoluutio: 0,3 m	
Maan- ja vedenpinnan absorptio ja heijastuksen huomioiminen, käytetyt kertoimet							
ISO 9613-2			HUOM				
Vesialueet, (0) / (G)			0				
Maa-alueet, (0,4) / (A-D/E-F)			0,4				

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Maa-alueet, (0) / (G)		
Ilmakehän stabiilius laskennassa/meteorologinen korjaus		
Neutraali, (0): neutraali	Muu, mikä ja miksi	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen tilastollinen jakauma		
Tuulen suunta: 0–360 °		Tuulen nopeus: 8 m/s (10 metrin korkeudella)
Voimalan äänen suuntaavuus ja vaimentuminen		
Vapaa avaruus: kyllä	Muu, mikä ja miksi:	
Pienitaajuisen melun laskentamenetelmä: windPRO 4.0, DECIBEL-moduuli, Finland Low Frequency - laskentamalli		
Yhteisvaikutusmallinnuksen pienitaajuisen melun laskentatulokset on esitetty kappaleessa 5.3.		

Matkussaari

RAPORTIN JA RAPORTOIJAN TIEDOT				*tarkentavat tiedot voi esittää kartalla tai muissa liitteissä			
Mallinnusraportin numero/tunniste: 25011894-001				Raportin hyväksyntäpäivämäärä: 20.12.2024			
Tekijä/organisaatio, yhteystiedot: Sweco Finland Oy, Ilmalanportti 2, 00240 Helsinki							
Vastuuhenkilöt: Lassi Pirttinen							
Laatija: Lassi Pirttinen				Tarkastaja/hyväksyjä: Juho Ali-Tolppa			
MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: windPRO 4.0				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN) TIEDOT							
Tuulivoimalan valmistaja: Nordex				Tyyppi: N163/5.X (blades with serrated trailing edges)		Sarjanumero/t:	
Nimellisteho: MN1-MN5, MN7-MN12, MS4-MS9, MS12, MS14-MS15, MS17-MS18: 5.5 MW MS10: 5.4 MW MS2, MS13: 5.27 MW MN6, MS1, MS3, MS16: 5.15 MW		Napakorkeus: 148 m		Roottorin halkaisija: 163 m		Tornin tyyppi: Putkitorni	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	dB	Kyllä	dB			dB	
Ei	Ei tiedossa	Ei	Ei tiedossa			dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot Nordex N163/5.5 MW (blades with serrated trailing edges).							
Tiedot perustuvat Matkussaaren meluselvitykseen (EthaWind 2021), jossa viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"							
Esitettyihin arvoihin on lisätty Matkussaaren selvityksen (EthaWind 2021) mukaisesti 1 dB:n varmuusarvo mallinnuksissa.							
Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	63,1	200	91,1	2000	94,1
63	88,1	25	67,0	250	92,0	2500	92,1
125	94,3	31,5	72,5	315	95,3	3150	89,4

250	98,0	40	75,1	400	94,9	4000	85,4
500	100,6	50	81,2	500	95,1	5000	80,6
1000	101,3	63	82,5	630	97,1	6300	80,4
2000	98,8	80	85,3	800	96,2	8000	78,5
4000	91,2	100	90,0	1000	97,0	10000	74,3
8000	83,2	125	88,5	1250	96,3		
		160	89,8	1600	95,3		

Melupäästötiedot Nordex N163/5.4 MW (blades with serrated trailing edges).

Tiedot perustuvat Matkussaaren meluselvitykseen (EthaWind 2021), jossa viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Esitettyihin arvoihin on lisätty Matkussaaren selvityksen (EthaWind 2021) mukaisesti 1 dB:n varmuusarvo mallinnuksissa.

Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	62,7	200	90,7	2000	93,7
63	87,7	25	66,6	250	91,6	2500	91,7
125	93,9	31,5	72,1	315	94,9	3150	89,0
250	97,6	40	75,7	400	94,5	4000	85,0
500	100,2	50	80,8	500	94,7	5000	80,2
1000	101,0	63	82,1	630	96,7	6300	80,0
2000	98,4	80	84,9	800	95,8	8000	78,1
4000	90,8	100	89,6	1000	96,9	10000	73,9
8000	82,8	125	88,1	1250	95,9		
		160	89,4	1600	94,9		

Melupäästötiedot Nordex N163/5.27 MW (blades with serrated trailing edges).

Tiedot perustuvat Matkussaaren meluselvitykseen (EthaWind 2021), jossa viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Esitettyihin arvoihin on lisätty Matkussaaren selvityksen (EthaWind 2021) mukaisesti 1 dB:n varmuusarvo mallinnuksissa.

Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	62,2	200	90,2	2000	93,2
63	87,2	25	66,1	250	91,1	2500	91,2
125	93,4	31,5	71,6	315	94,4	3150	88,5
250	97,1	40	75,2	400	94,0	4000	84,5
500	99,7	50	78,3	500	94,2	5000	79,7
1000	100,4	63	81,6	630	96,2	6300	79,5
2000	97,9	80	84,4	800	95,3	8000	77,6

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4000	90,3	100	89,1	1000	96,1	10000	73,4
8000	82,3	125	87,6	1250	95,4		
		160	88,9	1600	94,4		
Melupäästötiedot Nordex N163/5.15 MW (blades with serrated trailing edges).							
Tiedot perustuvat Matkussaaren meluselvitykseen (EthaWind 2021), jossa viitataan dokumenttiin ”Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN”							
Esitettyihin arvoihin on lisätty Matkussaaren selvityksen (EthaWind 2021) mukaisesti 1 dB:n varmuusarvo mallinnuksissa.							
Oktaaveittain [Hz]		1/3-oktaaveittain [Hz]					
31,5		20	61,7	200	89,7	2000	92,7
63	86,7	25	65,6	250	90,6	2500	90,7
125	92,9	31,5	71,1	315	93,9	3150	88,0
250	96,6	40	77,7	400	93,5	4000	84,0
500	99,2	50	79,8	500	93,7	5000	79,2
1000	99,9	63	81,1	630	95,7	6300	79,0
2000	97,4	80	83,9	800	94,8	8000	77,1
4000	89,8	100	88,6	1000	95,6	10000	74,9
8000	81,8	125	87,1	1250	94,9		
		160	88,4	1600	93,9		
Melun erityispiirteiden mittaustapa ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, mikä	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei
Akustiset tiedot/laskennan lähtötiedot							
Laskenta korkeus					Laskentaruudun koko [m·m]		
4,0 m	Muu, mikä ja miksi:				25 m * 25 m		
Suhteellinen kosteus				Lämpötila			
70 %	Muu, mikä ja miksi:			15 °C	Muu, mikä ja miksi:		
Maastomallin lähde ja tarkkuus							
Maastomallin lähde: Maanmittauslaitos				Vaakaresoluutio: 2 m		Pystyresoluutio: 1 m	
Maan- ja vedenpinnan absorptio ja heijastuksen huomioiminen, käytetyt kertoimet							
ISO 9613-2				HUOM			
Vesialueet, (0) / (G)			0				
Maa-alueet, (0,4) / (A-D/E-F)			0,4				
Maa-alueet, (0) / (G)							

Ilmakehän stabiilius laskennassa/meteorologinen korjaus	
Neutraali, (0): neutraali	Muu, mikä ja miksi
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen tilastollinen jakauma	
Tuulen suunta: 0–360 °	Tuulen nopeus: 8 m/s (10m korkeudella)
Voimalan äänen suuntaavuus ja vaimentuminen	
Vapaa avaruus: kyllä	Muu, mikä ja miksi:
Pienitaajuisen melun laskentamenetelmä: windPRO 4.0, Decibel-moduuli, Finland Low Frequency - laskentamalli	
Yhteisvaikutusmallinnuksen pienitaajuisen melun laskentatulokset on esitetty kappaleessa 5.3.	

8. Lähteet

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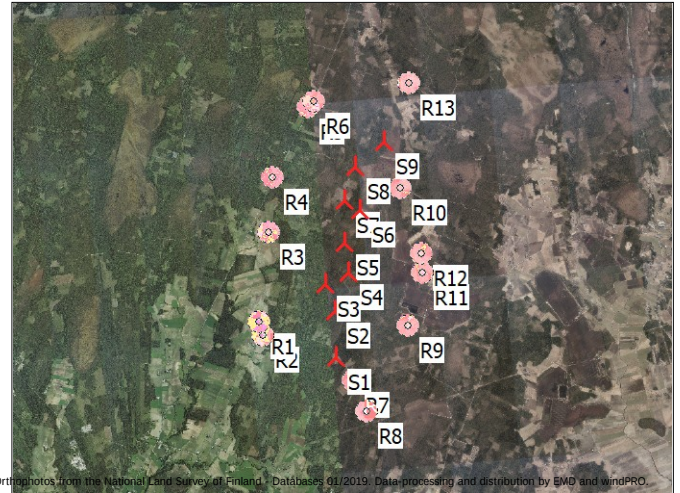
Liite 1. Siltanevan hankevaihtoehtojen VE1 ja VE2 melumallinnustulosteita

DECIBEL - Main Result

Calculation: Siltaneva VE1

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Orthophotos from the National Land Survey of Finland - Databases 01/2019; Data processing and distribution by EMD and windPRO.

WTGs

		East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]
						Valid	Manufact.				Creator	Name			
				[m]											
S1	236 109,5	6 944 485,8	86,5	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S2	236 167,6	6 945 695,3	91,6	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S3	235 984,3	6 946 428,7	88,2	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S4	236 608,1	6 946 693,8	95,0	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S5	236 572,5	6 947 461,4	95,0	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S6	237 083,4	6 948 316,2	99,7	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S7	236 669,8	6 948 618,5	107,7	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S8	236 998,7	6 949 466,1	109,6	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S9	237 828,8	6 950 051,8	103,3	NORDEX N175/6.X 6800 200....	Yes	NORDEX	N175/6.X-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0

Calculation Results

Sound level

Noise sensitive area						Demands		Sound level				Demands fulfilled ?	
No.	Name		East	North	Z	Immission height	Noise	From WTGs	Uncertainty margin	WTG+Uncertainty margin	Noise	2 dB penalty applied for one or more WTGs	
					[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]			
R1	Noise sensitive point: Finnish normal frequency - User defined (8)		234 159,5	6 945 592,0	74,4	4,0	40,0	32,2	2,0	34,2	Yes	No	
R10	Noise sensitive point: Finnish normal frequency - User defined (5)		238 178,7	6 948 810,4	109,9	4,0	40,0	37,8	2,0	39,8	Yes	No	
R11	Noise sensitive point: Finnish normal frequency - User defined (4)		238 600,0	6 946 540,4	101,7	4,0	40,0	32,8	2,0	34,8	Yes	No	
R12	Noise sensitive point: Finnish normal frequency - User defined (12)		238 604,9	6 947 020,5	103,3	4,0	40,0	33,4	2,0	35,4	Yes	No	
R13	Noise sensitive point: Finnish normal frequency - User defined (13)		238 627,0	6 951 557,2	99,9	4,0	40,0	30,6	2,0	32,6	Yes	No	
R2	Noise sensitive point: Finnish normal frequency - User defined (2)		234 220,8	6 945 240,7	75,0	4,0	40,0	32,1	2,0	34,1	Yes	No	
R3	Noise sensitive point: Finnish normal frequency - User defined (6)		234 578,1	6 947 933,1	79,5	4,0	40,0	33,2	2,0	35,2	Yes	No	
R4	Noise sensitive point: Finnish normal frequency - User defined (7)		234 809,6	6 949 346,1	85,1	4,0	40,0	32,2	2,0	34,2	Yes	No	
R5	Noise sensitive point: Finnish normal frequency - User defined (10)		235 920,9	6 951 149,4	92,3	4,0	40,0	31,0	2,0	33,0	Yes	No	
R6	Noise sensitive point: Finnish normal frequency - User defined (11)		236 051,8	6 951 259,1	93,0	4,0	40,0	30,9	2,0	32,9	Yes	No	
R7	Noise sensitive point: Finnish normal frequency - User defined (9)		236 548,8	6 943 843,3	94,7	4,0	40,0	37,7	2,0	39,7	Yes	No	
R8	Noise sensitive point: Finnish normal frequency - User defined (1)		236 817,0	6 942 982,3	98,2	4,0	40,0	30,6	2,0	32,6	Yes	No	
R9	Noise sensitive point: Finnish normal frequency - User defined (3)		238 097,7	6 945 158,0	99,4	4,0	40,0	32,6	2,0	34,6	Yes	No	

Distances (m)

WTG									
NSA	S1	S2	S3	S4	S5	S6	S7	S8	S9
R1	2240	2009	2006	2683	3050	3993	3929	4799	5770
R10	4790	3705	3236	2633	2096	1201	1520	1349	1289
R11	3226	2573	2616	1996	2225	2333	2834	3333	3592
R12	3554	2772	2684	2022	2078	1997	2508	2924	3127
R13	7500	6352	5765	5261	4578	3587	3528	2648	1703
R2	2032	1998	2125	2792	3232	4198	4169	5053	6009
R3	3769	2743	2058	2376	2048	2532	2199	2863	3877
R4	5027	3892	3142	3202	2579	2494	1996	2191	3098

To be continued on next page...

Project:

Siltaneva Teuva

Licensed user:

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FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi
Calculated:

10.9.2024 18.13/3.6.377

DECIBEL - Main Result

Calculation: Siltaneva VE1

...continued from previous page

WTG

NSA	S1	S2	S3	S4	S5	S6	S7	S8	S9
R5	6661	5455	4717	4504	3742	3060	2637	1997	2199
R6	6768	5560	4827	4595	3830	3116	2710	2026	2147
R7	778	1889	2644	2849	3615	4501	4773	5636	6334
R8	1660	2787	3543	3714	4482	5336	5633	6481	7136
R9	2097	2002	2464	2138	2760	3314	3740	4442	4897

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1

Noise calculation model:

ISO 9613-2 Finland

Wind speed (at 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Järvi10_Siltaneva_Syke

Area type with hard ground: Jarvi10_Siltaneva

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

Uncertainty added to source noise level of the WTGs in the calculation

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.X 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge

Source Source/Date Creator Edited

10.9.2024 USER 10.9.2024 17.19

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	106,9	2,0	No	89,7	96,5	99,9	100,4	101,3	99,2	89,9	73,4

Noise sensitive area: R1 Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R10 Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1

Noise sensitive area: R11 Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R12 Noise sensitive point: Finnish normal frequency - User defined (12)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R13 Noise sensitive point: Finnish normal frequency - User defined (13)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R2 Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R3 Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R4 Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R5 Noise sensitive point: Finnish normal frequency - User defined (10)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R6 Noise sensitive point: Finnish normal frequency - User defined (11)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Project:

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Calculated:

10.9.2024 18.13/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R7 Noise sensitive point: Finnish normal frequency - User defined (9)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R8 Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R9 Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Project:

Siltaneva Teuva

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Calculated:

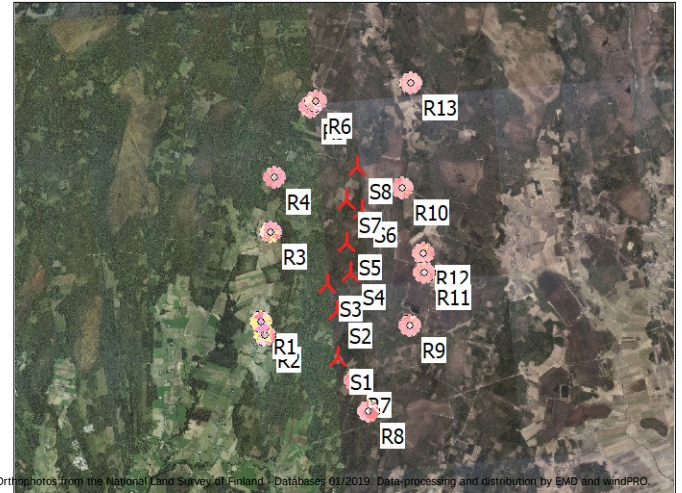
24.10.2024 9.42/4.0.552

DECIBEL - Main Result

Calculation: Siltaneva VE2

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manuf.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]
			[m]												
S1	236 109,5	6 944 485,8	86,5	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S2	236 167,6	6 945 695,3	91,6	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S3	235 984,3	6 946 428,7	88,2	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S4	236 608,1	6 946 693,8	95,0	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S5	236 572,5	6 947 461,4	95,0	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S6	237 083,4	6 948 316,2	99,7	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S7	236 669,8	6 948 618,5	107,7	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S8	236 998,7	6 949 466,1	109,6	NORDEX N175/6.x 6800 200....	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0

Calculation Results

Sound level

No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Distance to noise demand	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]	[m]		
R1	Noise sensitive point: Finnish normal frequency - User defined (8)	234 159,5	6 945 592,0	74,4	4,0	40,0	32,1	2,0	34,1	961	Yes	No
R10	Noise sensitive point: Finnish normal frequency - User defined (5)	238 178,7	6 948 810,4	109,9	4,0	40,0	36,7	2,0	38,7	179	Yes	No
R11	Noise sensitive point: Finnish normal frequency - User defined (4)	238 600,0	6 946 540,4	101,7	4,0	40,0	32,6	2,0	34,6	958	Yes	No
R12	Noise sensitive point: Finnish normal frequency - User defined (12)	238 604,9	6 947 020,5	103,3	4,0	40,0	33,1	2,0	35,1	869	Yes	No
R13	Noise sensitive point: Finnish normal frequency - User defined (13)	238 627,0	6 951 557,2	99,9	4,0	40,0	26,7	2,0	28,7	1 861	Yes	No
R2	Noise sensitive point: Finnish normal frequency - User defined (2)	234 220,8	6 945 240,7	75,0	4,0	40,0	32,1	2,0	34,1	988	Yes	No
R3	Noise sensitive point: Finnish normal frequency - User defined (6)	234 578,1	6 947 933,1	79,5	4,0	40,0	33,1	2,0	35,1	910	Yes	No
R4	Noise sensitive point: Finnish normal frequency - User defined (7)	234 809,6	6 949 346,1	85,1	4,0	40,0	31,8	2,0	33,8	1 016	Yes	No
R5	Noise sensitive point: Finnish normal frequency - User defined (10)	235 920,9	6 951 149,4	92,3	4,0	40,0	29,7	2,0	31,7	1 196	Yes	No
R6	Noise sensitive point: Finnish normal frequency - User defined (11)	236 051,8	6 951 259,1	93,0	4,0	40,0	29,5	2,0	31,5	1 230	Yes	No
R7	Noise sensitive point: Finnish normal frequency - User defined (9)	236 548,8	6 943 843,3	94,7	4,0	40,0	37,7	2,0	39,7	25	Yes	No
R8	Noise sensitive point: Finnish normal frequency - User defined (1)	236 817,0	6 942 982,3	98,2	4,0	40,0	30,6	2,0	32,6	911	Yes	No
R9	Noise sensitive point: Finnish normal frequency - User defined (3)	238 097,7	6 945 158,0	99,4	4,0	40,0	32,5	2,0	34,5	967	Yes	No

Distances (m)

WTG	NSA	S1	S2	S3	S4	S5	S6	S7	S8
R1	2240	2009	2006	2683	3050	3993	3929	4799	
R10	4790	3705	3236	2633	2096	1201	1520	1349	
R11	3226	2573	2616	1996	2225	2333	2834	3333	
R12	3554	2772	2684	2022	2078	1997	2508	2924	
R13	7500	6352	5765	5261	4578	3587	3528	2648	
R2	2032	1998	2125	2792	3232	4198	4169	5053	
R3	3769	2743	2058	2376	2048	2532	2199	2863	
R4	5027	3892	3142	3202	2579	2494	1996	2191	
R5	6661	5455	4717	4504	3742	3060	2637	1997	
R6	6768	5560	4827	4595	3830	3116	2710	2026	

To be continued on next page...

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Calculated:

24.10.2024 9.42/4.0.552

DECIBEL - Main Result

Calculation: Siltaneva VE2

...continued from previous page

WTG

NSA	S1	S2	S3	S4	S5	S6	S7	S8
R7	778	1889	2644	2849	3615	4501	4773	5636
R8	1660	2787	3543	3714	4482	5336	5633	6481
R9	2097	2002	2464	2138	2760	3314	3740	4442

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2

Noise calculation model:

ISO 9613-2 Finland

Wind speed (at 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Järvi10_Siltaneva_Syke

Area type with hard ground: Jarvi10_Siltaneva

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

Uncertainty added to source noise level of the WTGs in the calculation

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge

Source Source/Date Creator Edited

10.9.2024 USER 10.9.2024 17.19

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	106,9	2,0	No	89,7	96,5	99,9	100,4	101,3	99,2	89,9	73,4

Noise sensitive area: R1 Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R10 Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2

Noise sensitive area: R11 Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R12 Noise sensitive point: Finnish normal frequency - User defined (12)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R13 Noise sensitive point: Finnish normal frequency - User defined (13)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R2 Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R3 Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R4 Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R5 Noise sensitive point: Finnish normal frequency - User defined (10)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R6 Noise sensitive point: Finnish normal frequency - User defined (11)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R7 Noise sensitive point: Finnish normal frequency - User defined (9)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R8 Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R9 Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

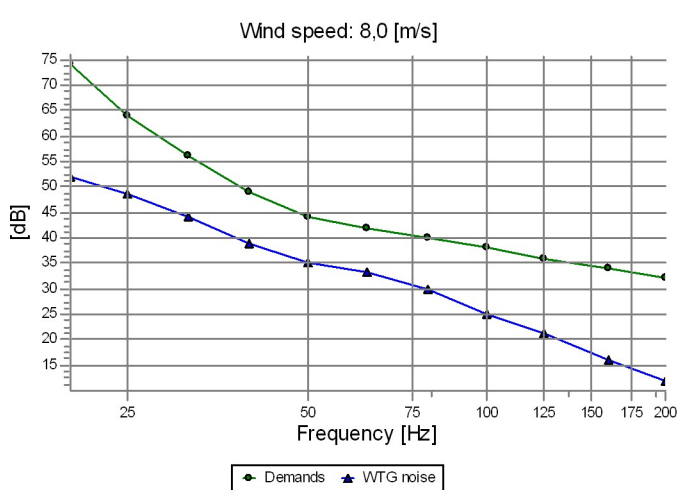
No distance demand

Pure tone penalty: 0 dB

DECIBEL - Detailed results, graphic

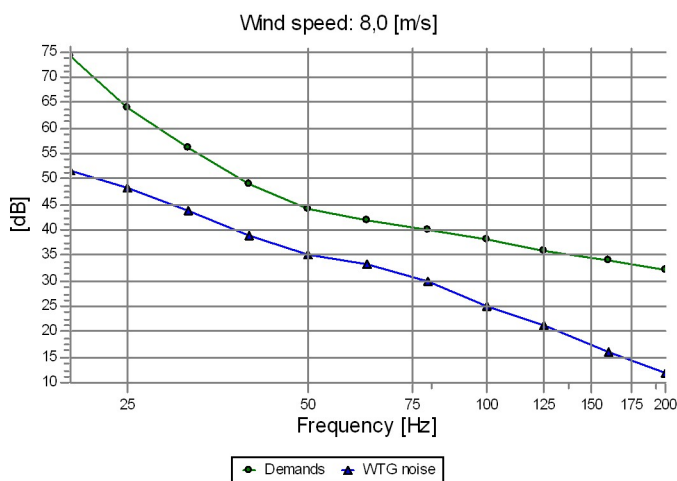
Calculation: Siltaneva VE1 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (41)



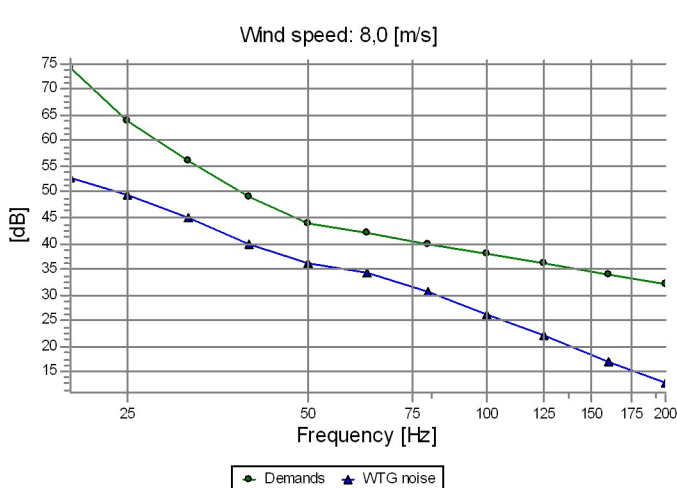
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,8	Yes
25,0	64,0	48,5	Yes
31,5	56,0	44,0	Yes
40,0	49,0	39,0	Yes
50,0	44,0	35,1	Yes
63,0	42,0	33,4	Yes
80,0	40,0	29,8	Yes
100,0	38,0	25,1	Yes
125,0	36,0	21,1	Yes
160,0	34,0	15,9	Yes
200,0	32,0	12,0	Yes

R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (35)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,8	Yes
25,0	64,0	48,4	Yes
31,5	56,0	43,9	Yes
40,0	49,0	38,9	Yes
50,0	44,0	35,0	Yes
63,0	42,0	33,3	Yes
80,0	40,0	29,7	Yes
100,0	38,0	25,0	Yes
125,0	36,0	21,1	Yes
160,0	34,0	15,8	Yes
200,0	32,0	11,9	Yes

R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (39)

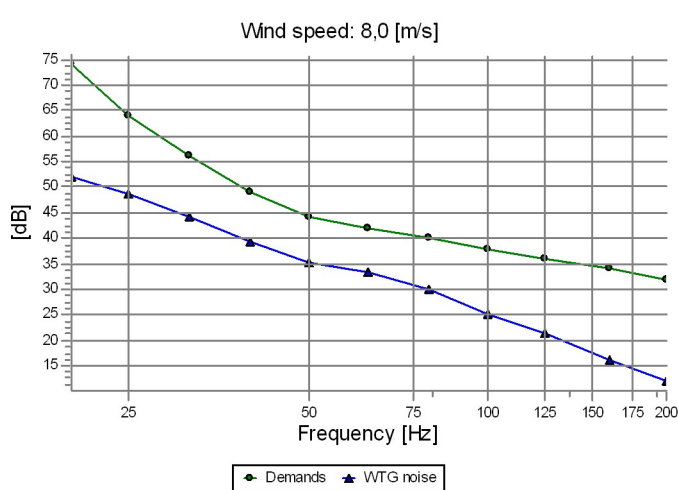


Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,7	Yes
25,0	64,0	49,4	Yes
31,5	56,0	44,9	Yes
40,0	49,0	39,9	Yes
50,0	44,0	36,0	Yes
63,0	42,0	34,3	Yes
80,0	40,0	30,7	Yes
100,0	38,0	26,0	Yes
125,0	36,0	22,1	Yes
160,0	34,0	16,8	Yes
200,0	32,0	13,0	Yes

DECIBEL - Detailed results, graphic

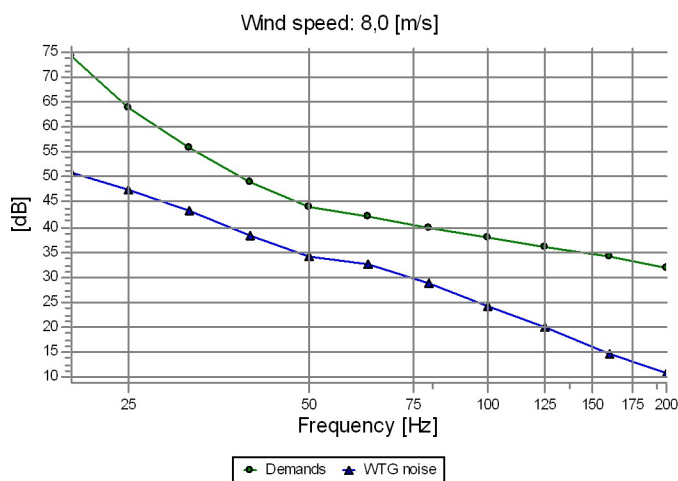
Calculation: Siltaneva VE1 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (40)



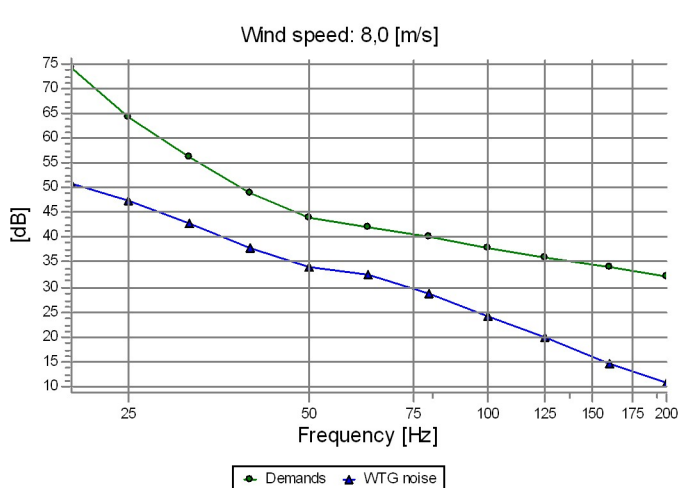
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,0	Yes
25,0	64,0	48,6	Yes
31,5	56,0	44,1	Yes
40,0	49,0	39,1	Yes
50,0	44,0	35,2	Yes
63,0	42,0	33,5	Yes
80,0	40,0	30,0	Yes
100,0	38,0	25,2	Yes
125,0	36,0	21,3	Yes
160,0	34,0	16,0	Yes
200,0	32,0	12,1	Yes

R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (43)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,0	Yes
25,0	64,0	47,6	Yes
31,5	56,0	43,1	Yes
40,0	49,0	38,1	Yes
50,0	44,0	34,2	Yes
63,0	42,0	32,4	Yes
80,0	40,0	28,9	Yes
100,0	38,0	24,1	Yes
125,0	36,0	20,2	Yes
160,0	34,0	14,8	Yes
200,0	32,0	11,0	Yes

R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (44)

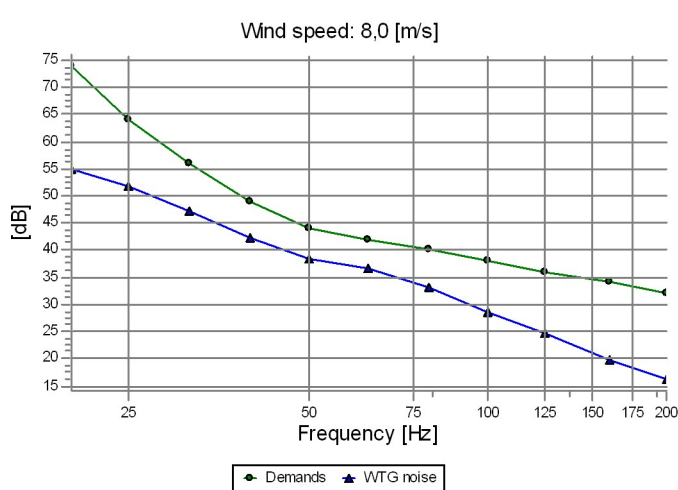


Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,9	Yes
25,0	64,0	47,5	Yes
31,5	56,0	43,0	Yes
40,0	49,0	38,0	Yes
50,0	44,0	34,1	Yes
63,0	42,0	32,4	Yes
80,0	40,0	28,8	Yes
100,0	38,0	24,0	Yes
125,0	36,0	20,1	Yes
160,0	34,0	14,7	Yes
200,0	32,0	10,9	Yes

DECIBEL - Detailed results, graphic

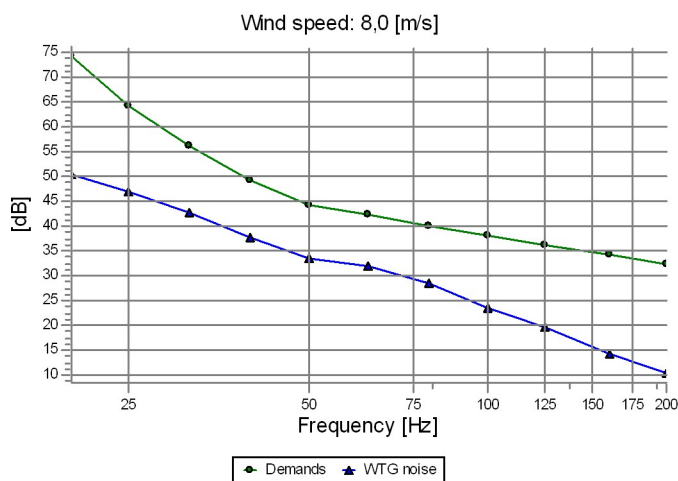
Calculation: Siltaneva VE1 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (42)



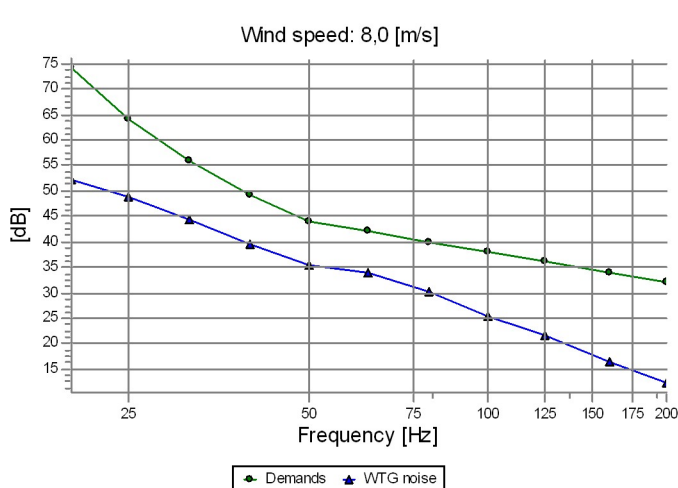
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	55,0	Yes
25,0	64,0	51,6	Yes
31,5	56,0	47,1	Yes
40,0	49,0	42,2	Yes
50,0	44,0	38,3	Yes
63,0	42,0	36,6	Yes
80,0	40,0	33,1	Yes
100,0	38,0	28,5	Yes
125,0	36,0	24,7	Yes
160,0	34,0	19,7	Yes
200,0	32,0	16,1	Yes

R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (34)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,3	Yes
25,0	64,0	47,0	Yes
31,5	56,0	42,4	Yes
40,0	49,0	37,5	Yes
50,0	44,0	33,5	Yes
63,0	42,0	31,8	Yes
80,0	40,0	28,2	Yes
100,0	38,0	23,5	Yes
125,0	36,0	19,5	Yes
160,0	34,0	14,2	Yes
200,0	32,0	10,3	Yes

R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (36)

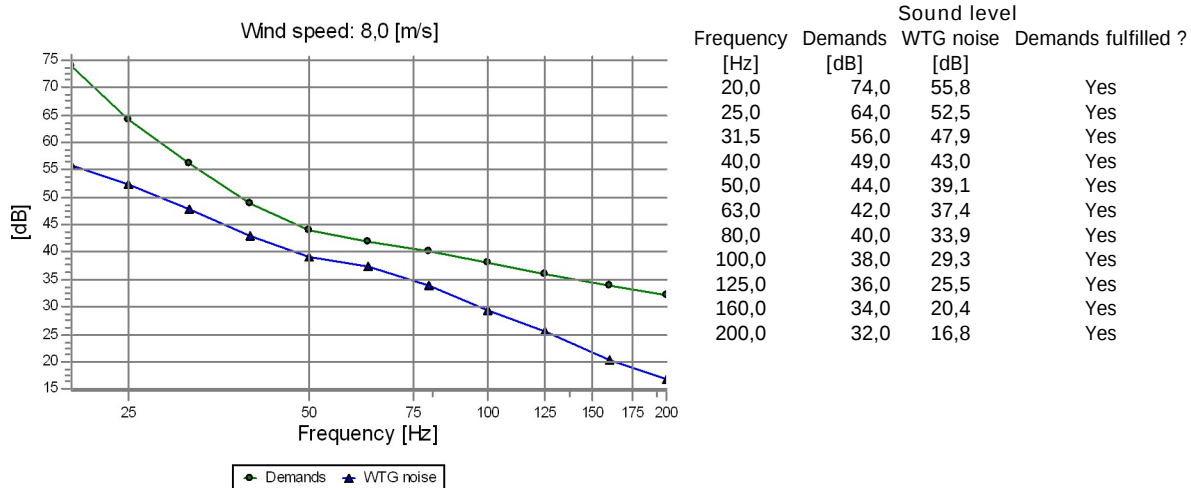


Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,2	Yes
25,0	64,0	48,9	Yes
31,5	56,0	44,4	Yes
40,0	49,0	39,4	Yes
50,0	44,0	35,4	Yes
63,0	42,0	33,7	Yes
80,0	40,0	30,2	Yes
100,0	38,0	25,5	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,3	Yes
200,0	32,0	12,5	Yes

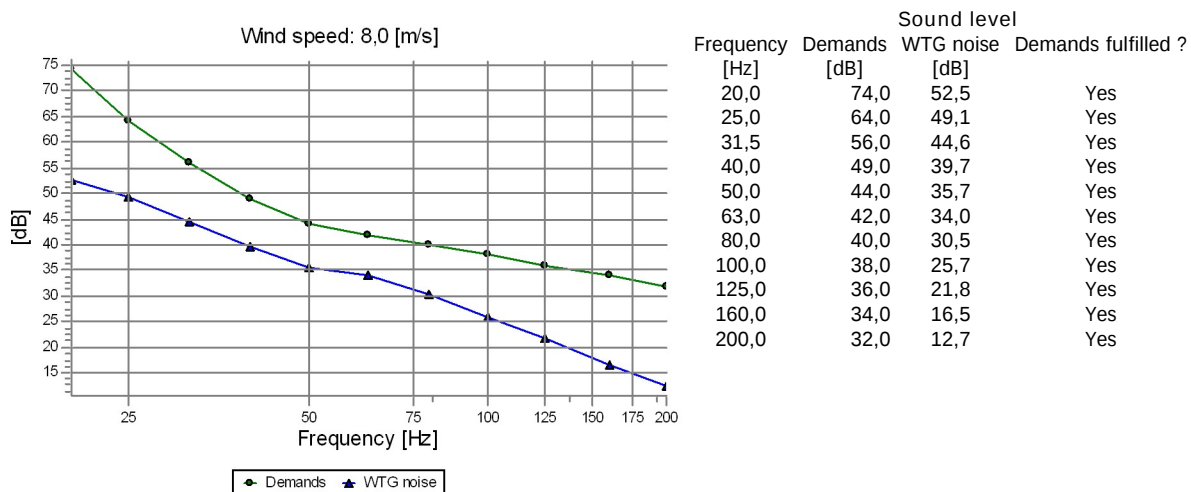
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

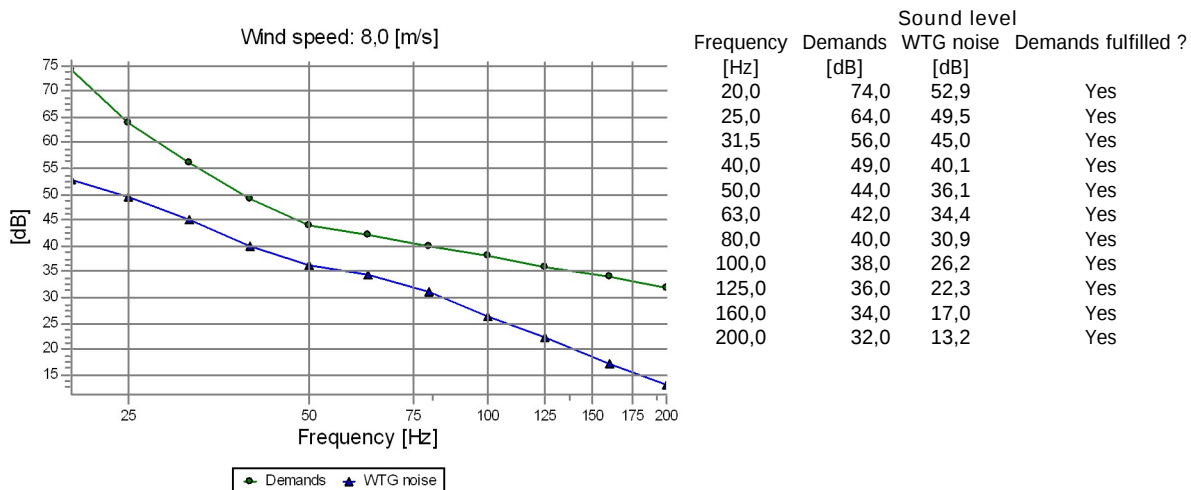
R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (38)



R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (37)

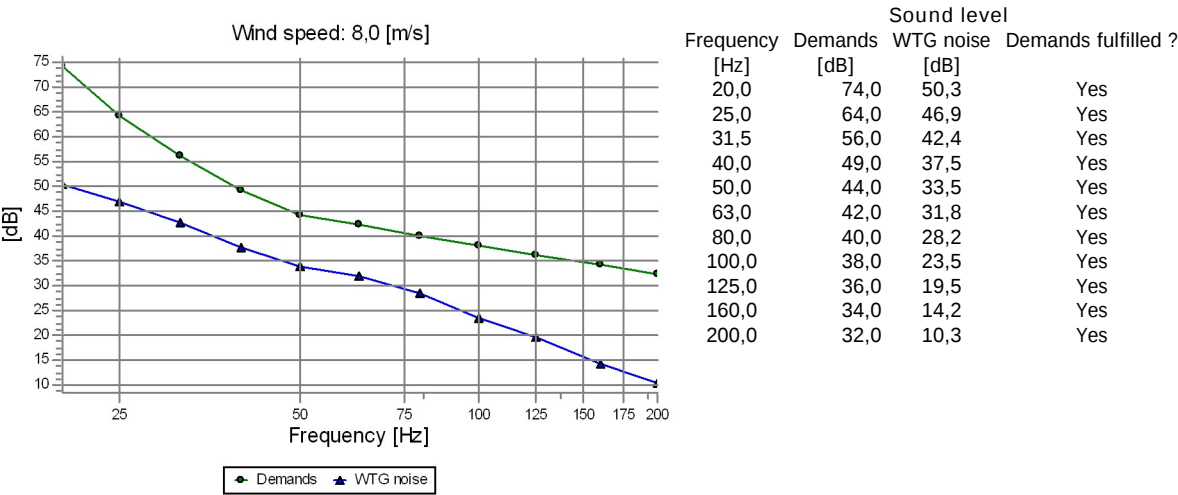


R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (45)



DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (46)



Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

4.12.2024 11.00/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 lowfreq inside

Noise calculation model:

Finland Low frequency

Wind speed (at 10 m height):

8,0 m/s

Spectral distribution:

From 20,0 Hz to 200,0 Hz

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty is subtracted from demand

Model: 5,0 dB(A)

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Low frequency calculation

dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge_2dB_uncertainty

Source Source/Date Creator Edited

10.9.2024 USER 4.12.2024 10.49

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98.

Lisäty 2 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LWA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	101,2	73,8	77,2	79,1	80,3	82,3	86,6	89,3	90,9	93,5	95,5	96,5

Noise sensitive area: R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 lowfreq inside

Noise sensitive area: R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 lowfreq inside

Noise sensitive area: R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

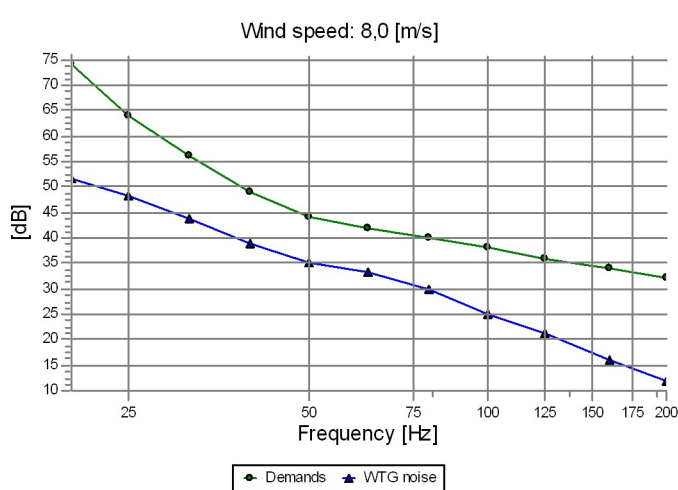
20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Detailed results, graphic

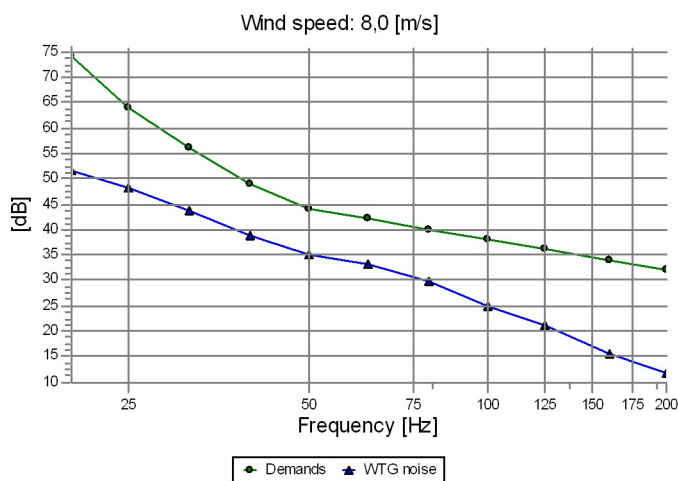
Calculation: Siltaneva VE2 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (41)



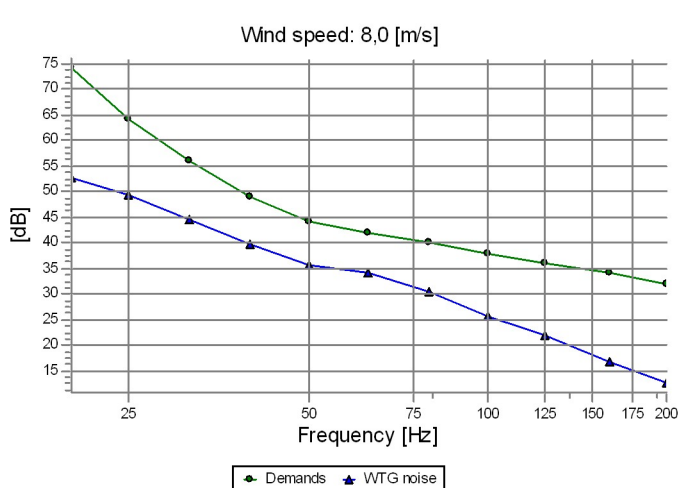
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,7	Yes
25,0	64,0	48,4	Yes
31,5	56,0	43,9	Yes
40,0	49,0	38,9	Yes
50,0	44,0	34,9	Yes
63,0	42,0	33,2	Yes
80,0	40,0	29,7	Yes
100,0	38,0	25,0	Yes
125,0	36,0	21,1	Yes
160,0	34,0	15,8	Yes
200,0	32,0	12,0	Yes

R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (35)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,6	Yes
25,0	64,0	48,3	Yes
31,5	56,0	43,8	Yes
40,0	49,0	38,8	Yes
50,0	44,0	34,9	Yes
63,0	42,0	33,2	Yes
80,0	40,0	29,6	Yes
100,0	38,0	24,9	Yes
125,0	36,0	21,0	Yes
160,0	34,0	15,7	Yes
200,0	32,0	11,9	Yes

R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (39)

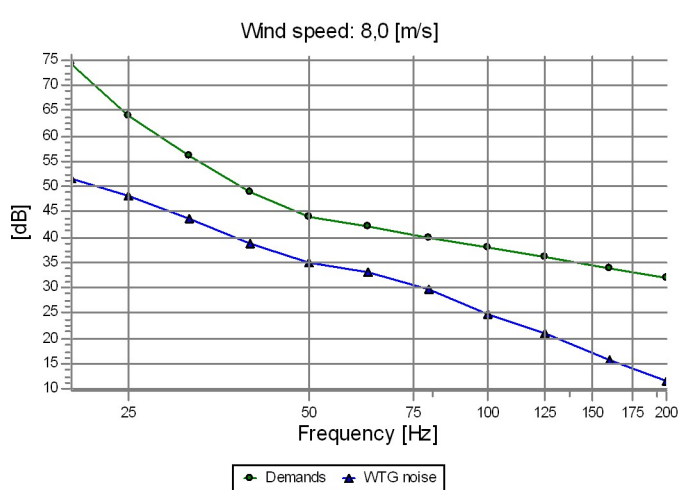


Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,5	Yes
25,0	64,0	49,2	Yes
31,5	56,0	44,7	Yes
40,0	49,0	39,7	Yes
50,0	44,0	35,8	Yes
63,0	42,0	34,1	Yes
80,0	40,0	30,5	Yes
100,0	38,0	25,8	Yes
125,0	36,0	21,9	Yes
160,0	34,0	16,7	Yes
200,0	32,0	12,9	Yes

DECIBEL - Detailed results, graphic

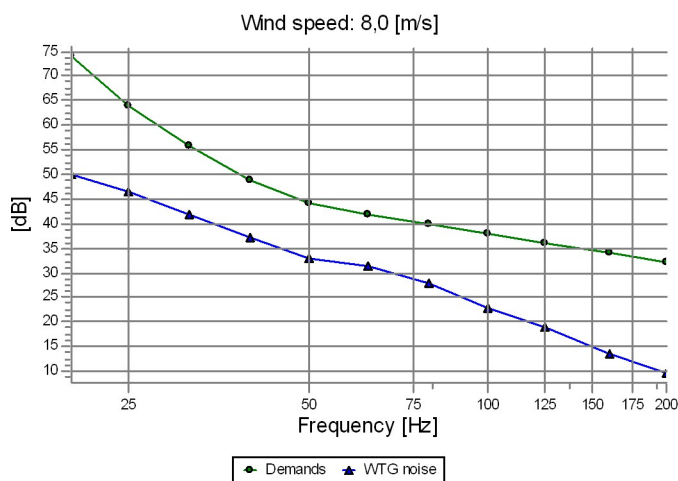
Calculation: Siltaneva VE2 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (40)



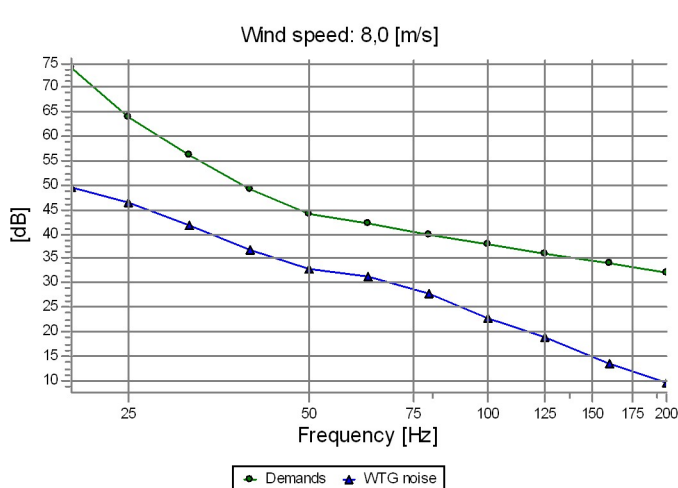
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,6	Yes
25,0	64,0	48,2	Yes
31,5	56,0	43,7	Yes
40,0	49,0	38,7	Yes
50,0	44,0	34,8	Yes
63,0	42,0	33,1	Yes
80,0	40,0	29,6	Yes
100,0	38,0	24,8	Yes
125,0	36,0	20,9	Yes
160,0	34,0	15,6	Yes
200,0	32,0	11,7	Yes

R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (43)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	49,9	Yes
25,0	64,0	46,5	Yes
31,5	56,0	42,0	Yes
40,0	49,0	37,0	Yes
50,0	44,0	33,0	Yes
63,0	42,0	31,3	Yes
80,0	40,0	27,8	Yes
100,0	38,0	23,0	Yes
125,0	36,0	19,0	Yes
160,0	34,0	13,6	Yes
200,0	32,0	9,7	Yes

R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (44)

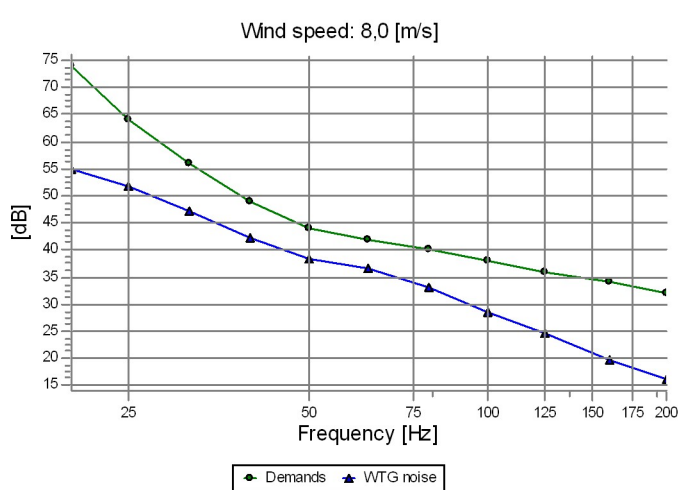


Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	49,7	Yes
25,0	64,0	46,3	Yes
31,5	56,0	41,8	Yes
40,0	49,0	36,8	Yes
50,0	44,0	32,9	Yes
63,0	42,0	31,1	Yes
80,0	40,0	27,6	Yes
100,0	38,0	22,8	Yes
125,0	36,0	18,8	Yes
160,0	34,0	13,4	Yes
200,0	32,0	9,5	Yes

DECIBEL - Detailed results, graphic

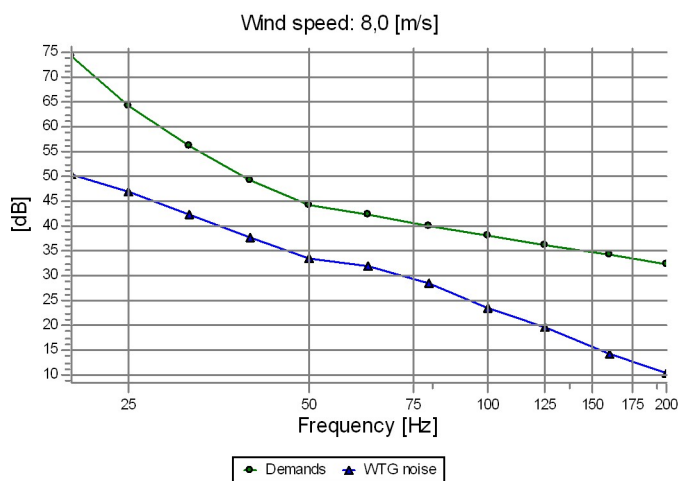
Calculation: Siltaneva VE2 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (42)



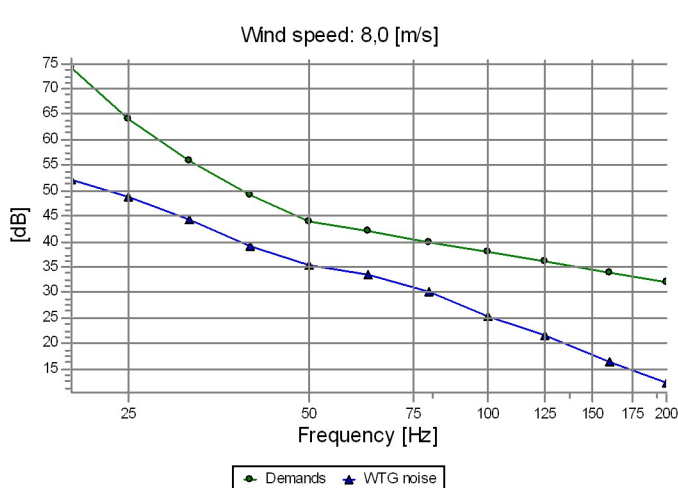
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	54,9	Yes
25,0	64,0	51,6	Yes
31,5	56,0	47,1	Yes
40,0	49,0	42,2	Yes
50,0	44,0	38,2	Yes
63,0	42,0	36,6	Yes
80,0	40,0	33,1	Yes
100,0	38,0	28,5	Yes
125,0	36,0	24,7	Yes
160,0	34,0	19,6	Yes
200,0	32,0	16,1	Yes

R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (34)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,2	Yes
25,0	64,0	46,9	Yes
31,5	56,0	42,3	Yes
40,0	49,0	37,4	Yes
50,0	44,0	33,4	Yes
63,0	42,0	31,7	Yes
80,0	40,0	28,2	Yes
100,0	38,0	23,4	Yes
125,0	36,0	19,4	Yes
160,0	34,0	14,1	Yes
200,0	32,0	10,3	Yes

R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (36)

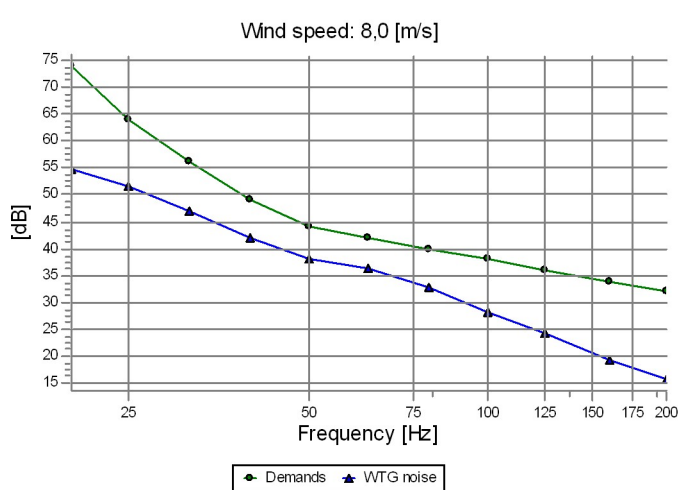


Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,1	Yes
25,0	64,0	48,7	Yes
31,5	56,0	44,2	Yes
40,0	49,0	39,3	Yes
50,0	44,0	35,3	Yes
63,0	42,0	33,6	Yes
80,0	40,0	30,1	Yes
100,0	38,0	25,4	Yes
125,0	36,0	21,4	Yes
160,0	34,0	16,2	Yes
200,0	32,0	12,4	Yes

DECIBEL - Detailed results, graphic

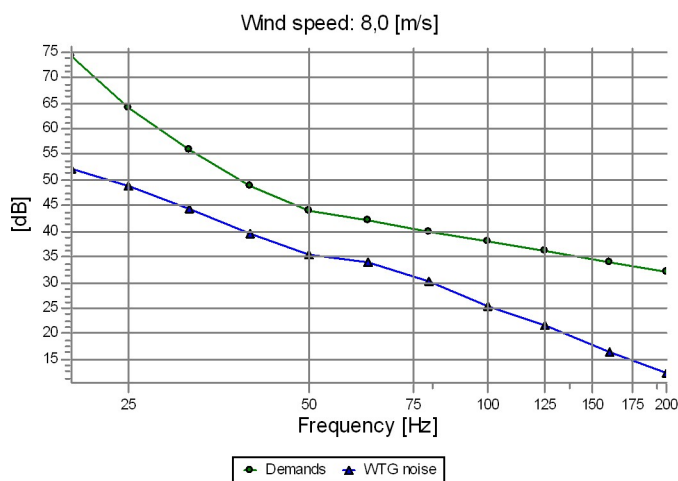
Calculation: Siltaneva VE2 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (38)



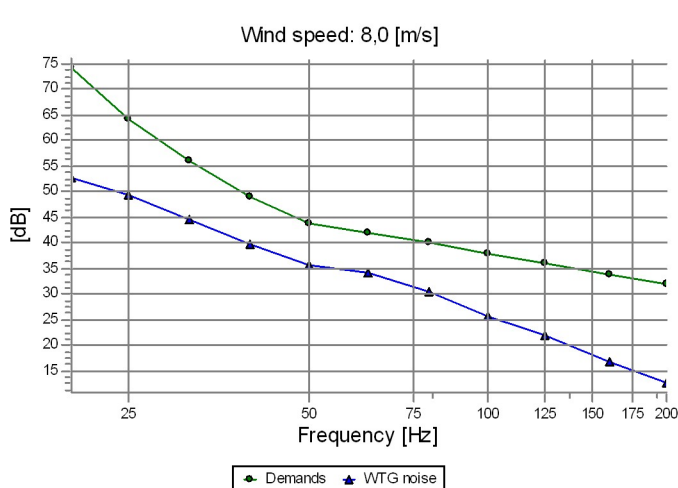
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	54,8	Yes
25,0	64,0	51,4	Yes
31,5	56,0	46,9	Yes
40,0	49,0	42,0	Yes
50,0	44,0	38,0	Yes
63,0	42,0	36,4	Yes
80,0	40,0	32,9	Yes
100,0	38,0	28,2	Yes
125,0	36,0	24,4	Yes
160,0	34,0	19,3	Yes
200,0	32,0	15,7	Yes

R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (37)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,2	Yes
25,0	64,0	48,9	Yes
31,5	56,0	44,3	Yes
40,0	49,0	39,4	Yes
50,0	44,0	35,4	Yes
63,0	42,0	33,7	Yes
80,0	40,0	30,2	Yes
100,0	38,0	25,5	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,3	Yes
200,0	32,0	12,5	Yes

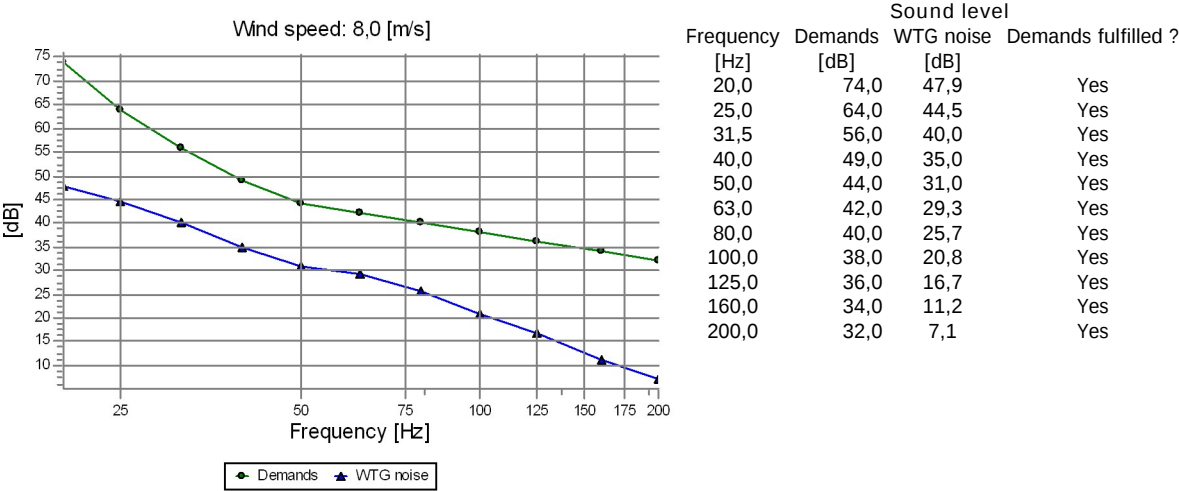
R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (45)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,6	Yes
25,0	64,0	49,2	Yes
31,5	56,0	44,7	Yes
40,0	49,0	39,8	Yes
50,0	44,0	35,8	Yes
63,0	42,0	34,1	Yes
80,0	40,0	30,6	Yes
100,0	38,0	25,9	Yes
125,0	36,0	22,0	Yes
160,0	34,0	16,7	Yes
200,0	32,0	12,9	Yes

DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (46)



DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 lowfreq inside

Noise calculation model:

Finland Low frequency

Wind speed (at 10 m height):

8,0 m/s

Spectral distribution:

From 20,0 Hz to 200,0 Hz

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty is subtracted from demand

Model: 5,0 dB(A)

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Low frequency calculation

dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge_2dB_uncertainty

Source Source/Date Creator Edited

10.9.2024 USER 4.12.2024 10.49

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98.

Lisäty 2 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LWA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	101,2	73,8	77,2	79,1	80,3	82,3	86,6	89,3	90,9	93,5	95,5	96,5

Noise sensitive area: R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 lowfreq inside

Noise sensitive area: R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 lowfreq inside

Noise sensitive area: R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

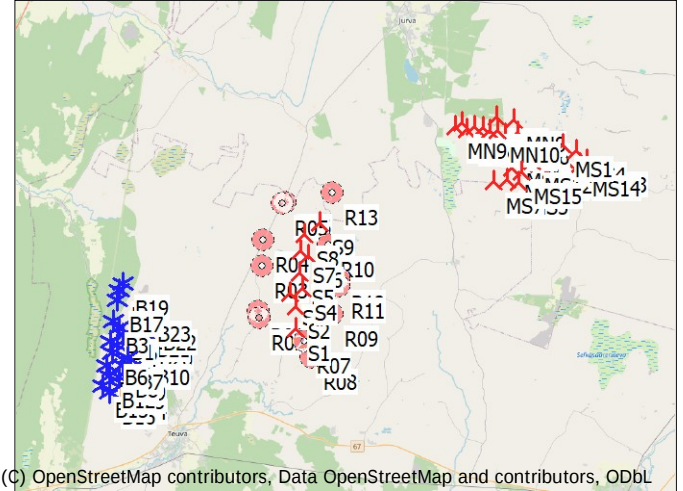
Liite 2. Yhteisvaikutusmallinnuksen mallinnustulosteita

DECIBEL - Main Result

Calculation: Siltaneva VE1 yhteisvaikutukset

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:400 000
New WTG Existing WTG Noise sensitive area

WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]
					Valid	Manufact.					Creator	Name			
B1	226 725,0	6 945 303,0	[m]	101,4 VESTAS V136-3.45 3450 136.0	Yes	VESTAS	V136-3.45 -3 450	3 450	136,0	142,0	USER	V136-3.45MW with serrated trailing edges	8,0	105,5	0,0
B10	227 926,3	6 943 863,3		79,0 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B11	225 954,9	6 943 445,9		87,6 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B12	226 033,9	6 942 847,9		90,4 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B13	226 533,7	6 942 744,9		94,0 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B14	226 603,9	6 942 182,0		87,3 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B15	225 634,7	6 942 352,9		89,0 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B16	225 948,0	6 942 007,7		89,0 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B17	226 768,8	6 946 822,1		98,8 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B18	226 855,6	6 947 312,0		95,9 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B19	227 154,4	6 947 619,0		97,8 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B2	226 892,0	6 944 971,0		99,8 VESTAS V136-3.45 3450 136.0	Yes	VESTAS	V136-3.45 -3 450	3 450	136,0	142,0	USER	V136-3.45MW with serrated trailing edges	8,0	105,5	0,0
B20	228 151,9	6 944 891,6		90,3 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B21	228 057,7	6 945 399,0		93,2 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B22	228 434,4	6 945 720,2		91,4 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B23	228 228,4	6 946 201,0		94,0 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B3	226 493,6	6 945 740,2		101,3 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B4	226 220,4	6 944 664,3		97,5 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B5	226 606,1	6 944 405,5		101,5 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B6	226 273,8	6 944 043,8		94,2 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B7	227 057,6	6 943 750,1		97,8 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B8	226 772,4	6 943 371,4		96,4 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
B9	227 182,7	6 943 163,3		88,6 VESTAS V150-5.6 5600 150.0	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0
MN1	247 181,0	6 954 201,0		134,1 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN10	247 601,0	6 954 158,0		136,8 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN11	245 742,0	6 954 740,0		127,6 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN12	246 837,0	6 954 366,0		129,9 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN3	245 997,0	6 954 359,0		127,4 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN4	246 443,0	6 954 432,0		129,3 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN5	248 000,0	6 953 874,0		142,2 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN6	248 693,0	6 954 026,0		147,8 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0
MN7	247 568,0	6 954 878,0		134,4 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN8	248 509,0	6 954 653,0		145,8 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MN9	245 364,0	6 954 519,0		125,7 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS1	250 957,0	6 953 080,0		165,4 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0
MS10	251 097,0	6 952 294,0		159,3 NORDEX N163/5.4 5700 163.0	Yes	NORDEX	N163/5.4-5 700	5 700	163,0	148,0	USER	Mode 3 with serrated trailing edges	8,0	106,0	1,0
MS12	249 314,0	6 952 382,0		164,2 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS13	252 209,0	6 952 277,0		161,7 NORDEX N163/5.27 5700 163.0	Yes	NORDEX	N163/5.27-5 700	5 700	163,0	148,0	USER	Mode 4 with serrated trailing edges	8,0	105,5	1,0
MS14	251 830,0	6 952 033,0		154,3 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS15	248 701,0	6 951 867,0		154,4 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS16	249 376,0	6 952 985,0		163,6 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0
MS17	248 369,0	6 952 717,0		142,4 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS18	248 204,0	6 952 152,0		142,9 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS2	250 725,0	6 952 444,0		162,8 NORDEX N163/5.27 5700 163.0	Yes	NORDEX	N163/5.27-5 700	5 700	163,0	148,0	USER	Mode 4 with serrated trailing edges	8,0	105,5	1,0
MS3	250 261,0	6 952 629,0		170,9 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0
MS4	251 667,0	6 952 756,0		167,3 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS5	248 532,0	6 951 289,0		154,3 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS6	247 905,0	6 951 503,0		139,2 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS7	247 220,0	6 951 478,0		134,3 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
MS9	249 686,0	6 952 245,0		168,5 NORDEX N163/5.5 5700 163.0	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0
S1	236 109,5	6 944 485,8		86,5 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S2	236 167,6	6 945 695,3		91,6 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S3	235 984,3	6 946 428,7		88,2 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S4	236 608,1	6 946 693,8		95,0 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S5	236 572,5	6 947 461,4		95,0 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S6	237 083,4	6 948 316,2		99,7 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S7	236 669,8	6 948 618,5		107,7 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S8	236 998,7	6 949 466,1		109,6 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0
S9	237 828,8	6 950 051,8		103,3 NORDEX N175/6.x 6800 200.0	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0

Calculation Results

DECIBEL - Main Result

Calculation: Siltaneva VE1 yhteisvaikutukset

Sound level

Noise sensitive area No. Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
			[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]		
R01 Noise sensitive point: Finnish normal frequency - User defined (8)	234 159,5	6 945 592,0	74,4	4,0	40,0	32,6	1,9	34,5	Yes	No
R02 Noise sensitive point: Finnish normal frequency - User defined (2)	234 220,8	6 945 240,7	75,0	4,0	40,0	32,6	1,9	34,4	Yes	No
R03 Noise sensitive point: Finnish normal frequency - User defined (6)	234 578,1	6 947 933,1	79,5	4,0	40,0	33,5	1,9	35,4	Yes	No
R04 Noise sensitive point: Finnish normal frequency - User defined (7)	234 809,6	6 949 346,1	85,1	4,0	40,0	32,5	1,9	34,4	Yes	No
R05 Noise sensitive point: Finnish normal frequency - User defined (10)	235 920,9	6 951 149,4	92,3	4,0	40,0	31,3	1,9	33,2	Yes	No
R06 Noise sensitive point: Finnish normal frequency - User defined (11)	236 051,8	6 951 259,1	93,0	4,0	40,0	31,2	1,9	33,2	Yes	No
R07 Noise sensitive point: Finnish normal frequency - User defined (9)	236 548,8	6 943 843,3	94,7	4,0	40,0	37,8	2,0	39,8	No	No
R08 Noise sensitive point: Finnish normal frequency - User defined (1)	236 817,0	6 942 982,3	98,2	4,0	40,0	30,9	1,9	32,8	Yes	No
R09 Noise sensitive point: Finnish normal frequency - User defined (3)	238 097,7	6 945 158,0	99,4	4,0	40,0	32,8	1,9	34,7	Yes	No
R10 Noise sensitive point: Finnish normal frequency - User defined (5)	238 178,7	6 948 810,4	110,0	4,0	40,0	37,9	2,0	39,9	No	No
R11 Noise sensitive point: Finnish normal frequency - User defined (4)	238 600,0	6 946 540,4	101,7	4,0	40,0	33,0	1,9	34,9	Yes	No
R12 Noise sensitive point: Finnish normal frequency - User defined (12)	238 604,9	6 947 020,5	103,3	4,0	40,0	33,6	2,0	35,5	Yes	No
R13 Noise sensitive point: Finnish normal frequency - User defined (13)	238 627,0	6 951 557,2	99,9	4,0	40,0	31,0	1,9	32,9	Yes	No

Distances (m)

WTG	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
B1	7434	7489	8275	9031	10888	11057	9923	10347	11364	11968	11929	11993	13434
B10	6463	6438	7791	8792	10807	10978	8615	8927	10245	11374	10995	11126	13168
B11	8473	8451	9712	10631	12585	12756	10592	10863	12252	13338	13007	13134	15033
B12	8569	8522	9934	10910	12899	13069	10553	10775	12272	13518	13086	13234	15298
B13	8133	8075	9564	10577	12589	12759	10066	10277	11803	13119	12638	12795	14951
B14	8282	8201	9823	10884	12920	13090	10074	10236	11863	13327	12752	12929	15233
B15	9112	9051	10532	11526	13523	13693	11006	11190	12764	14096	13613	13773	15909
B16	8952	8874	10459	11496	13517	13688	10749	10903	12541	13983	13428	13602	15859
B17	7486	7611	7881	8420	10115	10280	10215	10748	11441	11572	11824	11828	12758
B18	7497	7644	7741	8203	9835	9999	10286	10852	11437	11412	11760	11743	12503
B19	7286	7449	7424	7841	9442	9605	10116	10708	11207	11079	11487	11456	12119
B2	7288	7327	8230	9038	10931	11101	9714	10114	11198	11912	11803	11881	13445
B20	6043	6074	7103	8004	9967	10138	8455	8865	9941	10756	10568	10658	12406
B21	6100	6160	6989	7814	9733	9903	8625	9079	10034	10671	10595	10662	12222
B22	5722	5801	6524	7328	9240	9410	8322	8811	9671	10214	10190	10245	11736
B23	5957	6064	6576	7288	9139	9308	8641	9164	9916	10278	10368	10400	11687
B3	7661	7737	8369	9056	10859	11028	10224	10676	11609	12071	12122	12168	13444
B4	7986	8014	8966	9774	11658	11828	10352	10720	11877	12646	12510	12596	14181
B5	7639	7654	8710	9568	11490	11660	9950	10301	11506	12372	12172	12270	13976
B6	8029	8030	9162	10040	11971	12141	10268	10587	11866	12813	12566	12674	14446
B7	7330	7310	8598	9552	11536	11707	9483	9781	11120	12208	11865	11991	13945
B8	7707	7673	9033	10006	11998	12168	9779	10044	11456	12626	12234	12372	14394
B9	7381	7332	8793	9810	11828	11998	9383	9628	11086	12351	11896	12046	14181
MN1	15598	15744	14064	13279	11657	11502	14832	15261	12807	10485	11494	11177	8946
MN10	15926	16067	14423	13656	12052	11898	15106	15518	13078	10826	11783	11475	9336
MN11	14748	14920	13065	12181	10449	10288	14245	14750	12248	9603	10865	10505	7788
MN12	15405	15558	13833	13023	11371	11215	14705	15153	12685	10279	11353	11024	8670
MN3	14719	14882	13092	12249	10567	10409	14126	14607	12117	9580	10755	10408	7878
MN4	15122	15280	13517	12686	11014	10856	14480	14947	12466	9987	11117	10779	8321
MN5	16116	16248	14666	13935	12373	12221	15211	15598	13182	11041	11913	11620	9648
MN6	16790	16917	15362	14639	13082	12930	15836	16205	13806	11728	12556	12272	10356
MN7	16297	16450	14718	13895	12220	12062	15582	16021	13560	11171	12236	11910	9530
MN8	16957	17096	15455	14680	13056	12901	16109	16507	14080	11859	12796	12494	10348
MN9	14314	14489	12628	11744	10018	9858	13834	14346	11841	9170	10452	10087	7353
MS1	18377	18467	17155	16561	15148	15004	17101	17362	15092	13462	13970	13748	12414
MS10	18201	18277	17072	16539	15207	15069	16812	17035	14818	13370	13747	13549	12482
MS12	16593	16684	15381	14807	13439	13299	15346	15625	13331	11685	12194	11967	10710
MS13	19233	19300	18144	17631	16315	16177	17773	17967	15793	14441	14757	14573	13591
MS14	18793	18859	17719	17218	15921	15785	17324	17517	15345	14016	14314	14132	13201
MS15	15825	15912	14649	14107	12790	12654	14551	14826	12538	10949	11411	11190	10071
MS16	16904	17006	15624	15002	13569	13425	15739	16043	13718	11941	12546	12303	10835
MS17	15883	15989	14586	13961	12537	12393	14769	15095	12743	10905	11549	11296	9803
MS18	15489	15586	14253	13674	12314	12175	14302	14609	12281	10559	11115	10876	9588
MS2	17913	17994	16752	16201	14849	14710	16568	16808	14567	13052	13476	13268	12121
MS3	17558	17646	16358	15784	14405	14264	16273	16534	14264	12662	13145	12925	11674
MS4	18902	18981	17743	17185	15816	15675	17536	17764	15540	14043	14459	14255	13085

To be continued on next page...

DECIBEL - Main Result

Calculation: Siltaneva VE1 yhteisvaikutukset

...continued from previous page

WTG	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
MS5	15448	15525	14341	13848	12602	12470	14097	14350	12093	10638	11000	10798	9901
MS6	14951	15037	13786	13261	11980	11846	13687	13973	11672	10084	10537	10316	9271
MS7	14314	14407	13119	12582	11295	11162	13111	13421	11089	9419	9926	9692	8587
MS9	16879	16964	15699	15144	13798	13659	15582	15844	13573	12000	12458	12242	11072
S1	2240	2032	3769	5027	6661	6768	778	1660	2097	4790	3226	3554	7500
S2	2009	1998	2743	3892	5455	5560	1889	2787	2002	3705	2573	2772	6352
S3	2006	2125	2058	3142	4717	4827	2644	3543	2464	3236	2616	2684	5765
S4	2683	2792	2376	3202	4504	4595	2849	3714	2138	2633	1996	2022	5261
S5	3050	3232	2048	2579	3742	3830	3615	4482	2760	2096	2225	2078	4578
S6	3993	4198	2532	2494	3060	3116	4501	5336	3314	1201	2333	1997	3587
S7	3929	4169	2199	1996	2637	2710	4773	5633	3740	1520	2834	2508	3528
S8	4799	5053	2863	2191	1997	2026	5636	6481	4442	1349	3333	2924	2648
S9	5770	6009	3877	3098	2199	2147	6334	7136	4897	1289	3592	3127	1703

Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

18.12.2024 12.44/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutukset

Noise calculation model:

ISO 9613-2 Finland

Wind speed (at 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Järvi10_Siltaneva_Syke

Area type with hard ground: Jarvi10_Siltaneva

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

Uncertainty added to source noise level of the WTGs in the calculation

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge

Source Source/Date Creator Edited

10.9.2024 USER 10.9.2024 17.19

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	106,9	2,0	No	89,7	96,5	99,9	100,4	101,3	99,2	89,9	73,4

WTG: NORDEX N163/5.5 5700 163.0 !O!

Noise: Mode 2 with serrated trailing edges

Source Source/Date Creator Edited

27.11.2024 USER 28.11.2024 14.01

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	106,4	1,0	No	88,1	94,3	98,0	100,6	101,3	98,8	91,2	83,2

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutukset

WTG: NORDEX N163/5.15 5700 163.0 !O!

Noise: Mode 5 with serrated trailing edges

Source	Source/Date	Creator	Edited
	28.11.2024	USER	28.11.2024 14.20

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	105,0	1,0	No	86,7	92,9	96,6	99,2	99,9	97,4	89,8	81,8

WTG: NORDEX N163/5.27 5700 163.0 !O!

Noise: Mode 4 with serrated trailing edges

Source	Source/Date	Creator	Edited
	28.11.2024	USER	28.11.2024 14.12

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	105,5	1,0	No	87,2	93,4	97,1	99,7	100,4	97,9	90,3	82,3

WTG: NORDEX N163/5.4 5700 163.0 !O!

Noise: Mode 3 with serrated trailing edges

Source	Source/Date	Creator	Edited
	28.11.2024	USER	28.11.2024 14.07

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	106,0	1,0	No	87,7	93,9	97,6	100,2	101,0	98,4	90,8	82,8

WTG: VESTAS V136-3.45 3450 136.0 !O!

Noise: V136-3.45MW with serrated trailing edges

Source	Source/Date	Creator	Edited
	26.11.2024	USER	26.11.2024 16.05

Tiedot dokumentista "Pitkälänvuoren tuulivoimahanke, Petäjävesi. Melu- ja varjostusmallinnukset. FCG".

Kysessä dokumentissa tiedot on ovat dokumentista "DMS 0055-9919_V00, V136-mk3 -3.45 MW Third octave noise emission, Date 2015-11-23".

Napakorkeus 162 ja roottorinhalkaisija 136.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	142,0	8,0	105,5	No	90,9	97,0	96,4	99,1	100,0	97,3	91,3	74,4

WTG: VESTAS V150-5.6 5600 150.0 !O!

Noise: Level 0 - Measured - Mode 0 - 01-2019

Source	Source/Date	Creator	Edited
Vestas	23.1.2019	USER	23.7.2019 11.08

Blades with serrated trailing edge.

DMS no.: 0079-5099_01. Date 2019-01-23

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	155,0	8,0	104,9	No	86,2	93,7	98,3	100,0	98,9	94,8	87,9	78,0

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutukset

Noise sensitive area: R01 Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R02 Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R03 Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R04 Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R05 Noise sensitive point: Finnish normal frequency - User defined (10)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R06 Noise sensitive point: Finnish normal frequency - User defined (11)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R07 Noise sensitive point: Finnish normal frequency - User defined (9)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R08 Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutukset

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R09 Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R10 Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R11 Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R12 Noise sensitive point: Finnish normal frequency - User defined (12)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R13 Noise sensitive point: Finnish normal frequency - User defined (13)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

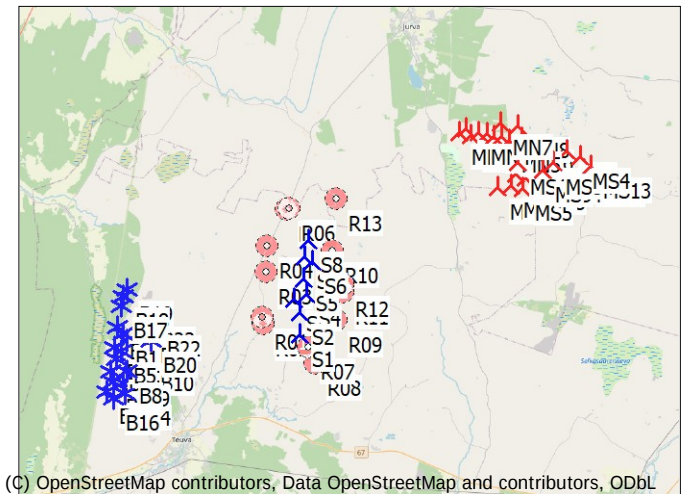
Siltaneva Teuva

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Calculated:
18.12.2024 15.53/4.0.552

Calculation is done according to Finnish guideline “ Ympäristöhallinnon ohjeita 2 | 2014 ” from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:400 000

 New WTG Existing WTG Noise sensitive area

	East				North				Z				Row data/Description				WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator		Creator	Name																
	[m]																									
B1	226 725,0	6 945 303,0	101,4	VESTAS V136-3.45	3450	136,0	...	Yes	VESTAS	V136-3.45	-3 450	3 450	136,0	142,0	USER	V136-3.45MW with serrated trailing edges	8,0	105,5	0,0							
B10	227 926,3	6 943 863,3	79,0	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B11	225 954,9	6 943 445,9	87,6	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B12	226 033,9	6 942 847,9	90,4	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B13	226 533,7	6 942 744,9	94,0	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B14	226 603,9	6 942 182,0	87,3	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B15	225 634,7	6 942 352,9	89,0	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B16	225 948,0	6 942 007,7	89,0	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B17	226 768,8	6 946 822,1	98,8	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B18	226 855,6	6 947 312,0	95,9	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B19	227 154,4	6 947 619,7	97,8	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B2	226 892,0	6 944 971,0	99,8	VESTAS V136-3.45	3450	136,0	...	Yes	VESTAS	V136-3.45	-3 450	3 450	136,0	142,0	USER	V136-3.45MW with serrated trailing edges	8,0	105,5	0,0							
B20	228 151,9	6 944 891,6	90,3	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B21	228 057,7	6 945 399,0	93,2	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B22	228 434,4	6 945 720,2	91,4	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B23	228 228,6	6 946 201,0	94,0	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B3	226 493,6	6 945 740,2	103,1	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B4	226 220,4	6 944 664,3	97,5	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B5	226 606,1	6 944 405,5	101,5	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B6	226 273,8	6 944 043,8	94,2	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B7	227 057,6	6 943 750,1	97,8	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B8	226 772,4	6 943 371,4	96,4	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
B9	227 182,7	6 943 163,3	88,6	VESTAS V150-5.6	5600	150,0	...	Yes	VESTAS	V150-5.6-5 600	5 600	150,0	155,0	USER	Level 0 - Measured - Mode 0 - 01-2019	8,0	104,9	0,0								
MN1	247 181,0	6 954 201,0	134,1	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN10	247 601,0	6 954 158,0	136,8	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN11	245 742,0	6 954 740,0	127,6	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN12	246 837,0	6 954 366,0	129,9	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN3	245 997,0	6 954 359,0	127,4	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN4	246 443,0	6 954 432,0	129,3	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN5	248 000,0	6 953 874,0	142,2	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN6	248 693,0	6 954 026,0	147,8	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.15-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0								
MN7	247 568,0	6 954 878,0	134,4	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN8	248 509,0	6 954 653,0	145,8	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN9	245 364,0	6 954 519,0	125,7	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MN1	250 957,0	6 953 080,0	165,4	NORDEX N163/5.15	5700	163,0	...	Yes	NORDEX	N163/5.15-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0								
MS10	251 097,0	6 952 294,0	159,3	NORDEX N163/5.4	5700	163,0	...	Yes	NORDEX	N163/5.4-5 700	5 700	163,0	148,0	USER	Mode 3 with serrated trailing edges	8,0	106,0	1,0								
MS12	249 314,0	6 952 382,0	164,2	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS13	252 209,0	6 952 277,0	161,7	NORDEX N163/5.27	5700	163,0	...	Yes	NORDEX	N163/5.27-5 700	5 700	163,0	148,0	USER	Mode 4 with serrated trailing edges	8,0	105,5	1,0								
MS14	251 830,0	6 952 033,0	154,3	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS15	248 701,0	6 951 867,0	154,4	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS16	249 376,0	6 952 985,0	163,6	NORDEX N163/5.15	5700	163,0	...	Yes	NORDEX	N163/5.15-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0								
MS17	248 369,0	6 952 717,0	142,4	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS18	248 204,0	6 952 152,0	142,9	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS2	250 725,0	6 952 444,0	162,8	NORDEX N163/5.27	5700	163,0	...	Yes	NORDEX	N163/5.27-5 700	5 700	163,0	148,0	USER	Mode 4 with serrated trailing edges	8,0	105,5	1,0								
MS3	250 261,0	6 952 629,0	170,9	NORDEX N163/5.15	5700	163,0	...	Yes	NORDEX	N163/5.15-5 700	5 700	163,0	148,0	USER	Mode 5 with serrated trailing edges	8,0	105,0	1,0								
MS4	251 667,0	6 952 756,0	167,3	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS5	248 532,0	6 951 289,0	154,3	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS6	247 905,0	6 951 503,0	139,2	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS7	247 220,0	6 951 478,0	134,3	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
MS9	249 686,0	6 952 245,0	168,5	NORDEX N163/5.5	5700	163,0	...	Yes	NORDEX	N163/5.5-5 700	5 700	163,0	148,0	USER	Mode 2 with serrated trailing edges	8,0	106,4	1,0								
S1	236 109,5	6 944 485,8	86,5	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S2	236 167,7	6 945 695,3	91,6	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S3	235 984,3	6 946 428,8	88,2	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S4	236 608,2	6 946 693,8	95,0	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S5	236 572,6	6 947 461,3	94,9	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S6	237 087,5	6 948 316,2	97,9	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S7	236 669,9	6 948 618,5	107,7	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								
S8	236 998,9	6 949 466,1	109,6	NORDEX N175/6.x	6800	200,0	...	Yes	NORDEX	N175/6.x-6 800	6 800	200,0	200,0	USER	Mode 0 - blades with serrated trailing edge	8,0	106,9	2,0								

DECIBEL - Main Result

Calculation: Siltaneva VE2 yhteisvaikutukset

Sound level

Noise sensitive area No. Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
			[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]		
R01 Noise sensitive point: Finnish normal frequency - User defined (8)	234 159,5	6 945 592,0	74,4	4,0	40,0	32,6	1,9	34,4	Yes	No
R02 Noise sensitive point: Finnish normal frequency - User defined (2)	234 220,8	6 945 240,7	75,0	4,0	40,0	32,5	1,9	34,4	Yes	No
R03 Noise sensitive point: Finnish normal frequency - User defined (6)	234 578,1	6 947 933,1	79,5	4,0	40,0	33,3	1,9	35,2	Yes	No
R04 Noise sensitive point: Finnish normal frequency - User defined (7)	234 809,6	6 949 346,1	85,1	4,0	40,0	32,2	1,9	34,1	Yes	No
R05 Noise sensitive point: Finnish normal frequency - User defined (10)	235 920,9	6 951 149,4	92,3	4,0	40,0	30,1	1,9	32,0	Yes	No
R06 Noise sensitive point: Finnish normal frequency - User defined (11)	236 051,8	6 951 259,1	93,0	4,0	40,0	29,9	1,9	31,8	Yes	No
R07 Noise sensitive point: Finnish normal frequency - User defined (9)	236 548,8	6 943 843,3	94,7	4,0	40,0	37,8	2,0	39,8	No	No
R08 Noise sensitive point: Finnish normal frequency - User defined (1)	236 817,0	6 942 982,3	98,2	4,0	40,0	30,9	1,9	32,8	Yes	No
R09 Noise sensitive point: Finnish normal frequency - User defined (3)	238 097,7	6 945 158,0	99,4	4,0	40,0	32,7	1,9	34,7	Yes	No
R10 Noise sensitive point: Finnish normal frequency - User defined (5)	238 178,7	6 948 810,4	110,0	4,0	40,0	36,8	2,0	38,8	No	No
R11 Noise sensitive point: Finnish normal frequency - User defined (4)	238 600,0	6 946 540,4	101,7	4,0	40,0	32,8	1,9	34,7	Yes	No
R12 Noise sensitive point: Finnish normal frequency - User defined (12)	238 604,9	6 947 020,5	103,3	4,0	40,0	33,3	2,0	35,3	Yes	No
R13 Noise sensitive point: Finnish normal frequency - User defined (13)	238 627,0	6 951 557,2	99,9	4,0	40,0	27,6	1,8	29,4	Yes	No

Distances (m)

WTG	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
B1	7434	7489	8275	9031	10888	11057	9923	10347	11364	11968	11929	11993	13434
B10	6463	6438	7791	8792	10807	10978	8615	8927	10245	11374	10995	11126	13168
B11	8473	8451	9712	10631	12585	12756	10592	10863	12252	13338	13007	13134	15033
B12	8569	8522	9934	10910	12899	13069	10553	10775	12272	13518	13086	13234	15298
B13	8133	8075	9564	10577	12589	12759	10066	10277	11803	13119	12638	12795	14951
B14	8282	8201	9823	10884	12920	13090	10074	10236	11863	13327	12752	12929	15233
B15	9112	9051	10532	11526	13523	13693	11006	11190	12764	14096	13613	13773	15909
B16	8952	8874	10459	11496	13517	13688	10749	10903	12541	13983	13428	13602	15859
B17	7486	7611	7881	8420	10115	10280	10215	10748	11441	11572	11824	11828	12758
B18	7497	7644	7741	8203	9835	9999	10286	10852	11437	11412	11760	11743	12503
B19	7286	7449	7424	7841	9442	9605	10116	10708	11207	11079	11487	11456	12119
B2	7288	7327	8230	9038	10931	11101	9714	10114	11198	11912	11803	11881	13445
B20	6043	6074	7103	8004	9967	10138	8455	8865	9941	10756	10568	10658	12406
B21	6100	6160	6989	7814	9733	9903	8625	9079	10034	10671	10595	10662	12222
B22	5722	5801	6524	7328	9240	9410	8322	8811	9671	10214	10190	10245	11736
B23	5957	6064	6576	7288	9139	9308	8641	9164	9916	10278	10368	10400	11687
B3	7661	7737	8369	9056	10859	11028	10224	10676	11609	12071	12122	12168	13444
B4	7986	8014	8966	9774	11658	11828	10352	10720	11877	12646	12510	12596	14181
B5	7639	7654	8710	9568	11490	11660	9950	10301	11506	12372	12172	12270	13976
B6	8029	8030	9162	10040	11971	12141	10268	10587	11866	12813	12566	12674	14446
B7	7330	7310	8598	9552	11536	11707	9483	9781	11120	12208	11865	11991	13945
B8	7707	7673	9033	10006	11998	12168	9779	10044	11456	12626	12234	12372	14394
B9	7381	7332	8793	9810	11828	11998	9383	9628	11086	12351	11896	12046	14181
MN1	15598	15744	14064	13279	11657	11502	14832	15261	12807	10485	11494	11177	8946
MN10	15926	16067	14423	13656	12052	11898	15106	15518	13078	10826	11783	11475	9336
MN11	14748	14920	13065	12181	10449	10288	14245	14750	12248	9603	10865	10505	7788
MN12	15405	15558	13833	13023	11371	11215	14705	15153	12685	10279	11353	11024	8670
MN3	14719	14882	13092	12249	10567	10409	14126	14607	12117	9580	10755	10408	7878
MN4	15122	15280	13517	12686	11014	10856	14480	14947	12466	9987	11117	10779	8321
MN5	16116	16248	14666	13935	12373	12221	15211	15598	13182	11041	11913	11620	9648
MN6	16790	16917	15362	14639	13082	12930	15836	16205	13806	11728	12556	12272	10356
MN7	16297	16450	14718	13895	12220	12062	15582	16021	13560	11171	12236	11910	9530
MN8	16957	17096	15455	14680	13056	12901	16109	16507	14080	11859	12796	12494	10348
MN9	14314	14489	12628	11744	10018	9858	13834	14346	11841	9170	10452	10087	7353
MS1	18377	18467	17155	16561	15148	15004	17101	17362	15092	13462	13970	13748	12414
MS10	18201	18277	17072	16539	15207	15069	16812	17035	14818	13370	13747	13549	12482
MS12	16593	16684	15381	14807	13439	13299	15346	15625	13331	11685	12194	11967	10710
MS13	19233	19300	18144	17631	16315	16177	17773	17967	15793	14441	14757	14573	13591
MS14	18793	18859	17719	17218	15921	15785	17324	17517	15345	14016	14314	14132	13201
MS15	15825	15912	14649	14107	12790	12654	14551	14826	12538	10949	11411	11190	10071
MS16	16904	17006	15624	15002	13569	13425	15739	16043	13718	11941	12546	12303	10835
MS17	15883	15989	14586	13961	12537	12393	14769	15095	12743	10905	11549	11296	9803
MS18	15489	15586	14253	13674	12314	12175	14302	14609	12281	10559	11115	10876	9588
MS2	17913	17994	16752	16201	14849	14710	16568	16808	14567	13052	13476	13268	12121
MS3	17558	17646	16358	15784	14405	14264	16273	16534	14264	12662	13145	12925	11674
MS4	18902	18981	17743	17185	15816	15675	17536	17764	15540	14043	14459	14255	13085

To be continued on next page...

DECIBEL - Main Result

Calculation: Siltaneva VE2 yhteisvaikutukset

...continued from previous page

WTG	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13
MS5	15448	15525	14341	13848	12602	12470	14097	14350	12093	10638	11000	10798	9901
MS6	14951	15037	13786	13261	11980	11846	13687	13973	11672	10084	10537	10316	9271
MS7	14314	14407	13119	12582	11295	11162	13111	13421	11089	9419	9926	9692	8587
MS9	16879	16964	15699	15144	13798	13659	15582	15844	13573	12000	12458	12242	11072
S1	2240	2032	3769	5027	6661	6768	778	1660	2097	4790	3226	3554	7500
S2	2009	1998	2743	3892	5455	5560	1889	2787	2002	3705	2573	2772	6352
S3	2006	2125	2058	3142	4717	4827	2644	3543	2464	3236	2616	2684	5765
S4	2683	2793	2377	3202	4505	4595	2849	3714	2138	2633	1996	2022	5261
S5	3050	3232	2048	2579	3742	3830	3615	4482	2760	2096	2225	2078	4578
S6	3993	4198	2532	2494	3060	3116	4501	5336	3314	1201	2333	1997	3587
S7	3929	4169	2199	1996	2637	2710	4773	5633	3740	1520	2834	2507	3528
S8	4799	5053	2863	2191	1997	2026	5636	6481	4442	1349	3332	2923	2648

Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

18.12.2024 15.53/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutukset

Noise calculation model:

ISO 9613-2 Finland

Wind speed (at 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Järvi10_Siltaneva_Syke

Area type with hard ground: Jarvi10_Siltaneva

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

Uncertainty added to source noise level of the WTGs in the calculation

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N163/5.5 5700 163.0 !O!

Noise: Mode 2 with serrated trailing edges

Source Source/Date Creator Edited

27.11.2024 USER 28.11.2024 14.01

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
						[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	106,4	1,0	No	88,1	94,3	98,0	100,6	101,3	98,8	91,2	83,2

WTG: NORDEX N163/5.15 5700 163.0 !O!

Noise: Mode 5 with serrated trailing edges

Source Source/Date Creator Edited

28.11.2024 USER 28.11.2024 14.20

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
						[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	105,0	1,0	No	86,7	92,9	96,6	99,2	99,9	97,4	89,8	81,8

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutukset

WTG: NORDEX N163/5.27 5700 163.0 !O!

Noise: Mode 4 with serrated trailing edges

Source	Source/Date	Creator	Edited
	28.11.2024	USER	28.11.2024 14.12

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	105,5	1,0	No	87,2	93,4	97,1	99,7	100,4	97,9	90,3	82,3

WTG: NORDEX N163/5.4 5700 163.0 !O!

Noise: Mode 3 with serrated trailing edges

Source	Source/Date	Creator	Edited
	28.11.2024	USER	28.11.2024 14.07

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	148,0	8,0	106,0	1,0	No	87,7	93,9	97,6	100,2	101,0	98,4	90,8	82,8

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge

Source	Source/Date	Creator	Edited
	10.9.2024	USER	10.9.2024 17.19

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	106,9	2,0	No	89,7	96,5	99,9	100,4	101,3	99,2	89,9	73,4

WTG: VESTAS V136-3.45 3450 136.0 !O!

Noise: V136-3.45MW with serrated trailing edges

Source	Source/Date	Creator	Edited
	26.11.2024	USER	26.11.2024 16.05

Tiedot dokumentista "Pitkälänvuoren tuulivoimahanke, Petäjävesi. Melu- ja varjostusmallinnukset. FCG".

Kysessä dokumentissa tiedot on ovat dokumentista "DMS 0055-9919_V00, V136-mk3 -3.45 MW Third octave noise emission, Date 2015-11-23".

Napakorkeus 162 ja roottorihalkaisija 136.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	142,0	8,0	105,5	No	90,9	97,0	96,4	99,1	100,0	97,3	91,3	74,4

WTG: VESTAS V150-5.6 5600 150.0 !O!

Noise: Level 0 - Measured - Mode 0 - 01-2019

Source	Source/Date	Creator	Edited
Vestas	23.1.2019	USER	23.7.2019 11.08

Blades with serrated trailing edge.

DMS no.: 0079-5099_01. Date 2019-01-23

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	155,0	8,0	104,9	No	86,2	93,7	98,3	100,0	98,9	94,8	87,9	78,0

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutukset

Noise sensitive area: R01 Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R02 Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R03 Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R04 Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R05 Noise sensitive point: Finnish normal frequency - User defined (10)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R06 Noise sensitive point: Finnish normal frequency - User defined (11)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R07 Noise sensitive point: Finnish normal frequency - User defined (9)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R08 Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutukset

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R09 Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R10 Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R11 Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R12 Noise sensitive point: Finnish normal frequency - User defined (12)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: R13 Noise sensitive point: Finnish normal frequency - User defined (13)

Predefined calculation standard:

Immission height(a.g.l.): 4,0 m

Uncertainty margin: 2,0 dB

No temporal binning

Noise demand: 40,0 dB(A)

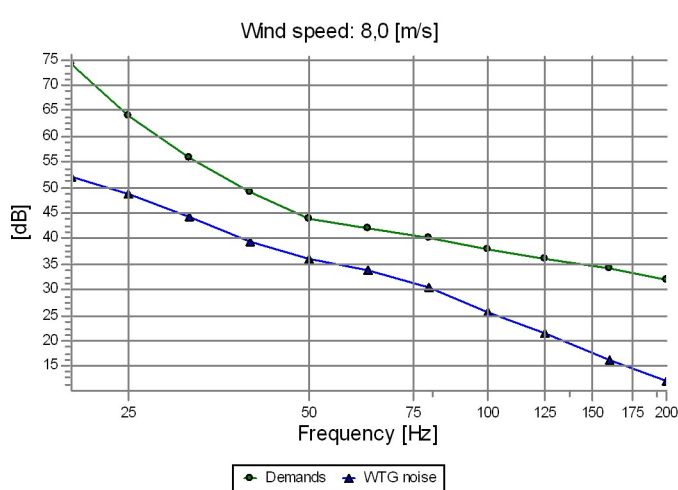
No distance demand

Pure tone penalty: 0 dB

DECIBEL - Detailed results, graphic

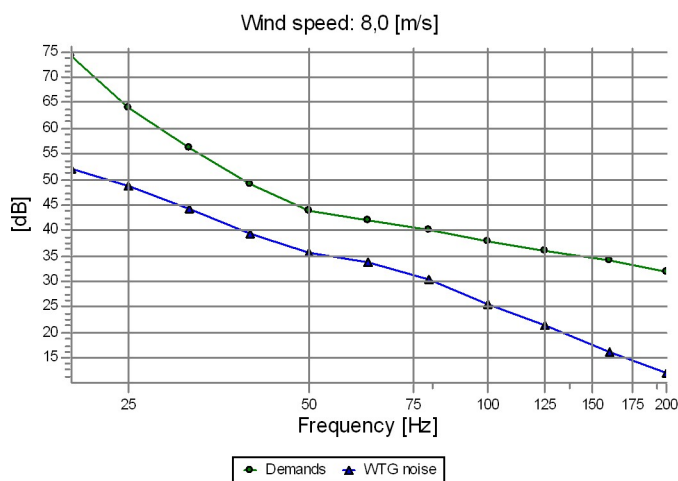
Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s

R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (41)



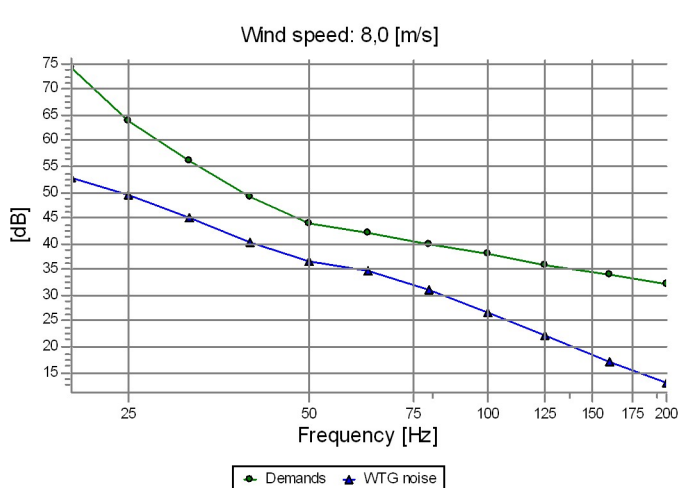
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,0	Yes
25,0	64,0	48,7	Yes
31,5	56,0	44,3	Yes
40,0	49,0	39,6	Yes
50,0	44,0	35,9	Yes
63,0	42,0	33,9	Yes
80,0	40,0	30,3	Yes
100,0	38,0	25,7	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,2	Yes
200,0	32,0	12,3	Yes

R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (35)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,9	Yes
25,0	64,0	48,6	Yes
31,5	56,0	44,2	Yes
40,0	49,0	39,5	Yes
50,0	44,0	35,8	Yes
63,0	42,0	33,8	Yes
80,0	40,0	30,3	Yes
100,0	38,0	25,6	Yes
125,0	36,0	21,5	Yes
160,0	34,0	16,1	Yes
200,0	32,0	12,2	Yes

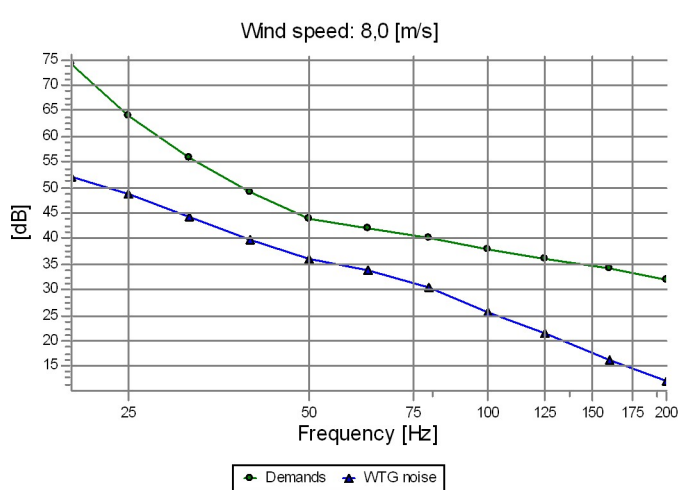
R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (39)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,8	Yes
25,0	64,0	49,5	Yes
31,5	56,0	45,1	Yes
40,0	49,0	40,3	Yes
50,0	44,0	36,6	Yes
63,0	42,0	34,7	Yes
80,0	40,0	31,1	Yes
100,0	38,0	26,5	Yes
125,0	36,0	22,4	Yes
160,0	34,0	17,0	Yes
200,0	32,0	13,2	Yes

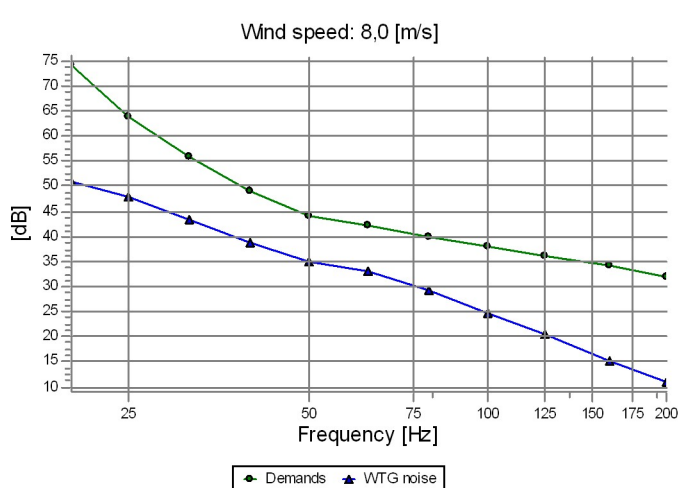
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (40)



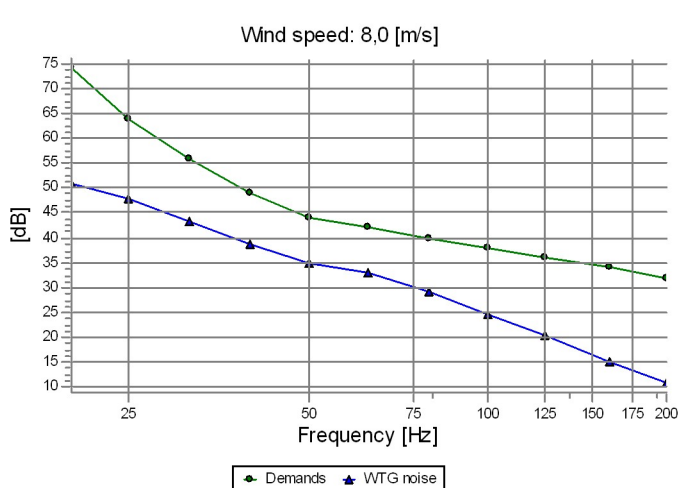
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,1	Yes
25,0	64,0	48,8	Yes
31,5	56,0	44,4	Yes
40,0	49,0	39,6	Yes
50,0	44,0	35,9	Yes
63,0	42,0	33,9	Yes
80,0	40,0	30,4	Yes
100,0	38,0	25,7	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,2	Yes
200,0	32,0	12,2	Yes

R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (43)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,1	Yes
25,0	64,0	47,8	Yes
31,5	56,0	43,4	Yes
40,0	49,0	38,6	Yes
50,0	44,0	35,0	Yes
63,0	42,0	32,9	Yes
80,0	40,0	29,3	Yes
100,0	38,0	24,8	Yes
125,0	36,0	20,5	Yes
160,0	34,0	15,0	Yes
200,0	32,0	11,1	Yes

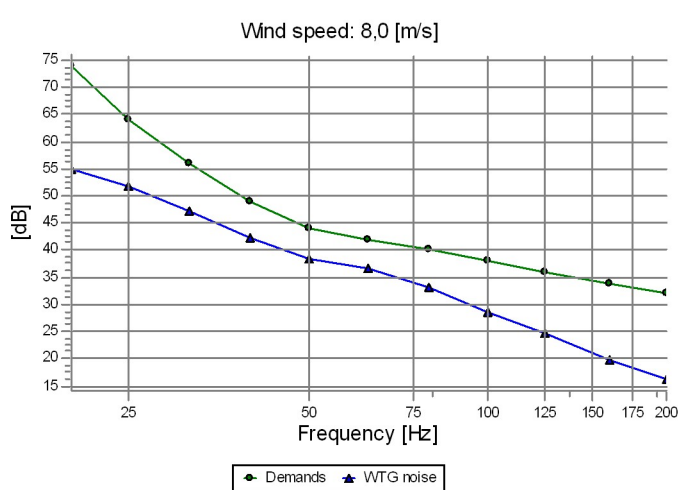
R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (44)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,0	Yes
25,0	64,0	47,7	Yes
31,5	56,0	43,3	Yes
40,0	49,0	38,5	Yes
50,0	44,0	34,9	Yes
63,0	42,0	32,9	Yes
80,0	40,0	29,3	Yes
100,0	38,0	24,7	Yes
125,0	36,0	20,4	Yes
160,0	34,0	14,9	Yes
200,0	32,0	11,0	Yes

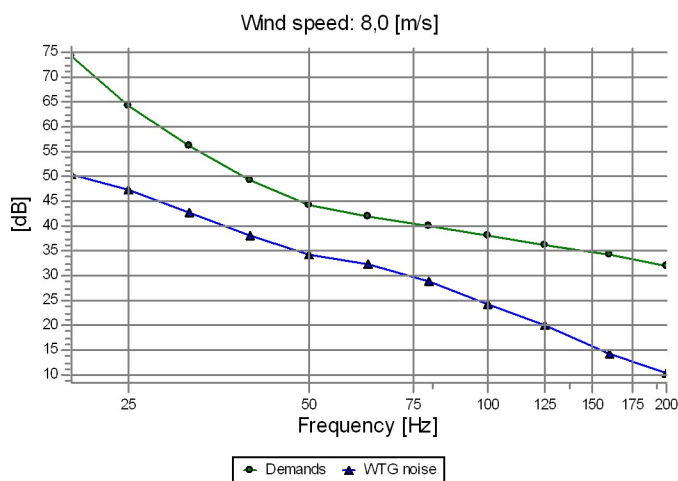
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (42)



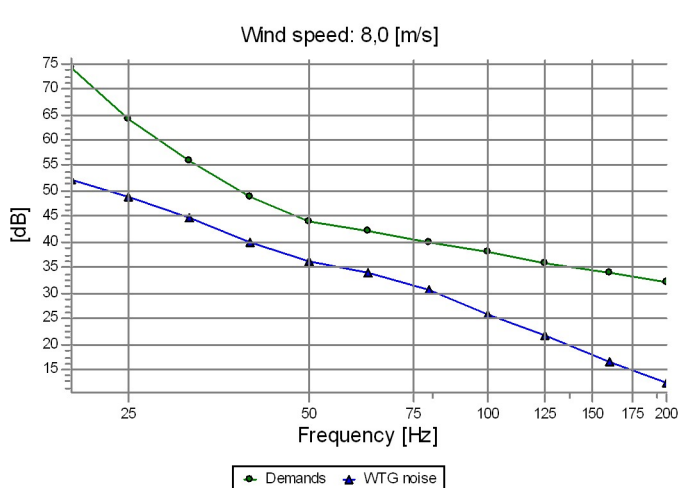
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	55,0	Yes
25,0	64,0	51,7	Yes
31,5	56,0	47,2	Yes
40,0	49,0	42,4	Yes
50,0	44,0	38,6	Yes
63,0	42,0	36,8	Yes
80,0	40,0	33,3	Yes
100,0	38,0	28,7	Yes
125,0	36,0	24,8	Yes
160,0	34,0	19,7	Yes
200,0	32,0	16,2	Yes

R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (34)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,4	Yes
25,0	64,0	47,1	Yes
31,5	56,0	42,7	Yes
40,0	49,0	38,0	Yes
50,0	44,0	34,3	Yes
63,0	42,0	32,3	Yes
80,0	40,0	28,7	Yes
100,0	38,0	24,0	Yes
125,0	36,0	19,8	Yes
160,0	34,0	14,4	Yes
200,0	32,0	10,5	Yes

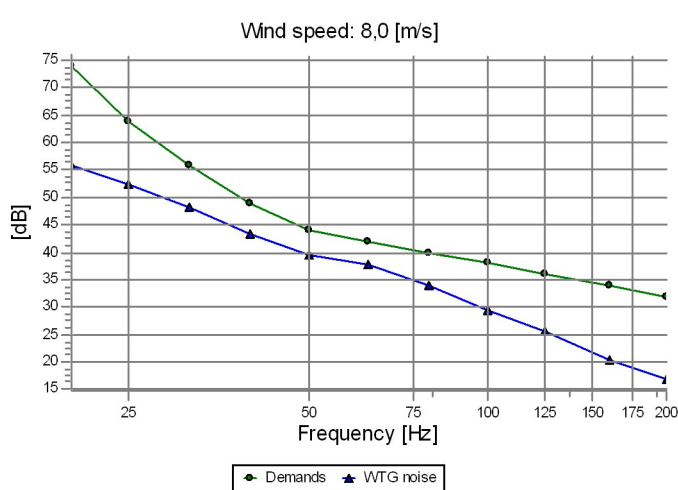
R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (36)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,3	Yes
25,0	64,0	49,0	Yes
31,5	56,0	44,6	Yes
40,0	49,0	39,8	Yes
50,0	44,0	36,0	Yes
63,0	42,0	34,1	Yes
80,0	40,0	30,5	Yes
100,0	38,0	25,9	Yes
125,0	36,0	21,8	Yes
160,0	34,0	16,4	Yes
200,0	32,0	12,5	Yes

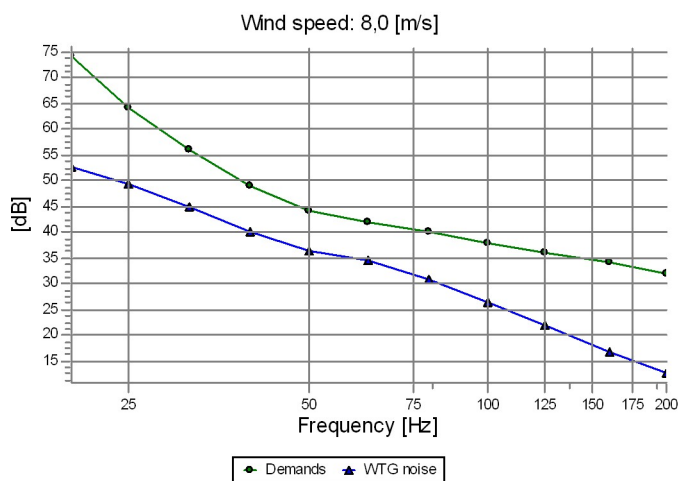
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (38)



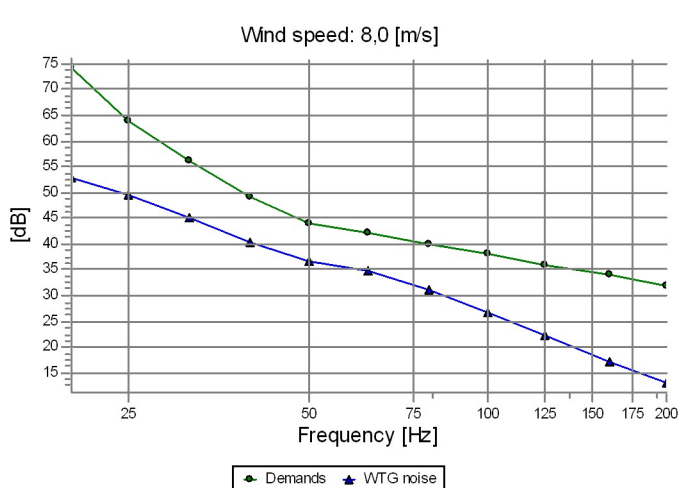
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	55,8	Yes
25,0	64,0	52,5	Yes
31,5	56,0	48,1	Yes
40,0	49,0	43,2	Yes
50,0	44,0	39,4	Yes
63,0	42,0	37,6	Yes
80,0	40,0	34,1	Yes
100,0	38,0	29,5	Yes
125,0	36,0	25,6	Yes
160,0	34,0	20,4	Yes
200,0	32,0	16,8	Yes

R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (37)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,6	Yes
25,0	64,0	49,2	Yes
31,5	56,0	44,8	Yes
40,0	49,0	40,0	Yes
50,0	44,0	36,3	Yes
63,0	42,0	34,4	Yes
80,0	40,0	30,8	Yes
100,0	38,0	26,2	Yes
125,0	36,0	22,0	Yes
160,0	34,0	16,6	Yes
200,0	32,0	12,8	Yes

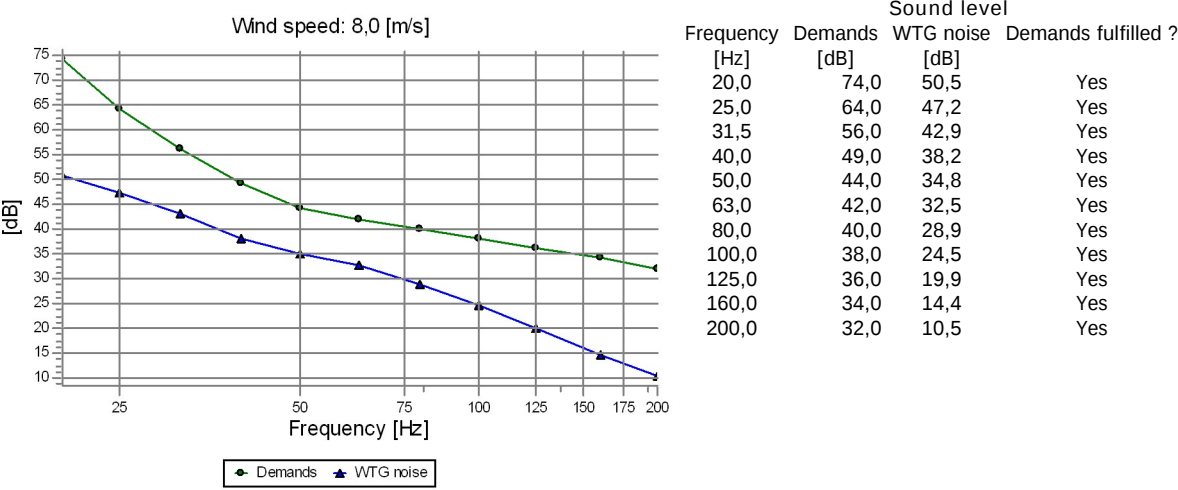
R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (45)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	53,0	Yes
25,0	64,0	49,7	Yes
31,5	56,0	45,2	Yes
40,0	49,0	40,4	Yes
50,0	44,0	36,7	Yes
63,0	42,0	34,8	Yes
80,0	40,0	31,2	Yes
100,0	38,0	26,6	Yes
125,0	36,0	22,5	Yes
160,0	34,0	17,1	Yes
200,0	32,0	13,3	Yes

DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (46)



DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside

Noise calculation model:

Finland Low frequency

Wind speed (at 10 m height):

8,0 m/s

Spectral distribution:

From 20,0 Hz to 200,0 Hz

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty is subtracted from demand

Model: 5,0 dB(A)

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Low frequency calculation

dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge_2dB_uncertainty

Source	Source/Date	Creator	Edited
	10.9.2024	USER	4.12.2024 10.49

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98.

Lisätty 2 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	101,2	73,8	77,2	79,1	80,3	82,3	86,6	89,3	90,9	93,5	95,5	96,5

WTG: NORDEX N163/5.5 5700 163.0 !O!

Noise: Mode 2 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	27.11.2024	USER	11.12.2024 15.04

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	97,7	64,1	68,0	73,5	77,1	82,2	83,5	86,3	91,0	89,5	90,8	92,1

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside

WTG: NORDEX N163/5.15 5700 163.0 !O!

Noise: Mode 5 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	28.11.2024	USER	11.12.2024 15.36

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudella 8 m/s

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	96,3	62,7	66,6	72,1	48,7	80,8	82,1	84,9	89,6	88,1	89,4	90,7

WTG: NORDEX N163/5.27 5700 163.0 !O!

Noise: Mode 4 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	28.11.2024	USER	11.12.2024 15.15

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1dB epävarmuus tuulennopeudelle 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	96,7	63,2	67,1	72,6	76,2	79,3	82,6	85,4	90,1	88,6	89,9	91,2

WTG: NORDEX N163/5.4 5700 163.0 !O!

Noise: Mode 3 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	28.11.2024	USER	11.12.2024 15.08

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudelle 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	97,3	63,7	67,6	73,1	76,7	81,8	83,1	85,9	90,6	89,1	90,4	91,7

WTG: VESTAS V136-3.45 3450 136.0 !O!

Noise: V136-3.45MW with serrated trailing edges

Source	Source/Date	Creator	Edited
	26.11.2024	USER	26.11.2024 16.05

Tiedot dokumentista "Pitkälänvuoren tuulivoimahanke, Petäjävesi. Melu- ja varjostusmallinnukset. FCG".

Kysessä dokumentissa tiedot on ovat dokumentista "DMS 0055-9919_V00, V136-mk3 -3.45 MW Third octave noise emission, Date 2015-11-23".

Napakorkeus 162 ja roottorinhalkaisija 136.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	142,0	8,0	98,7	64,0	71,8	77,1	80,2	83,1	86,1	88,0	89,2	94,4	91,5	90,1

Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

19.12.2024 10.17/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside

WTG: VESTAS V150-5.6 5600 150.0 !O!

Noise: Level 0 - Measured - Mode 0 - 01-2019

Source Source/Date Creator Edited
 Vestas 23.1.2019 USER 23.7.2019 11.08
 Blades with serrated trailing edge.
 DMS no.: 0079-5099_01. Date 2019-01-23

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	155,0	8,0	96,5	60,9	65,4	69,7	73,9	77,4	80,7	83,8	86,4	88,6	90,7	92,3

Noise sensitive area: R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside

Noise sensitive area: R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

19.12.2024 10.17/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE1 yhteisvaikutus lowfreq inside

Noise sensitive area: R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

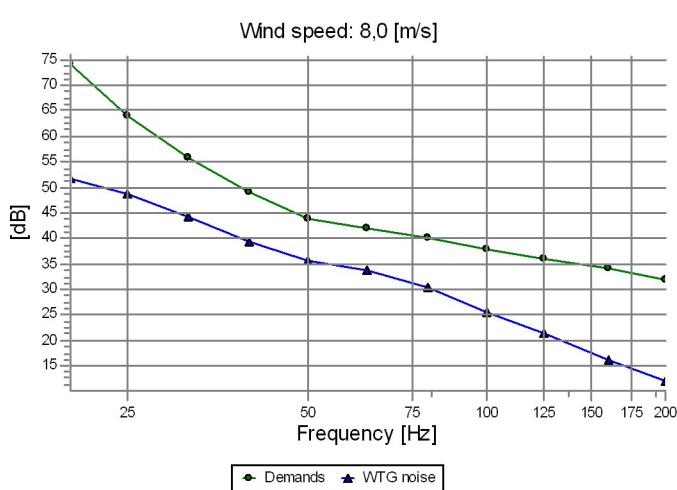
Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

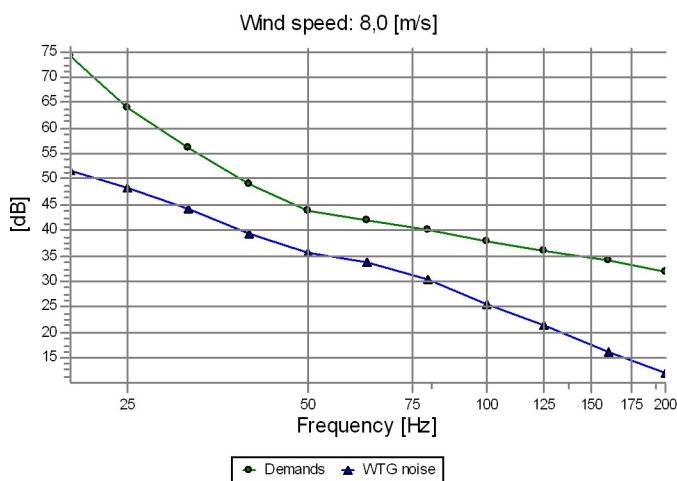
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (41)



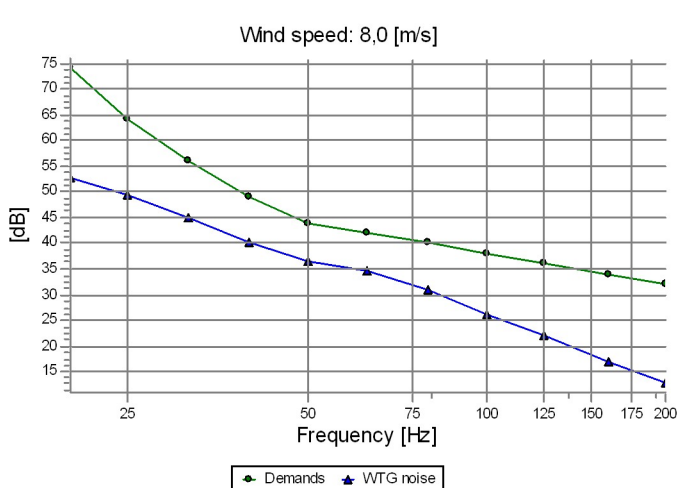
Frequency [Hz]	Sound level		Demands fulfilled ?
	Demands [dB]	WTG noise [dB]	
20,0	74,0	51,9	Yes
25,0	64,0	48,6	Yes
31,5	56,0	44,2	Yes
40,0	49,0	39,5	Yes
50,0	44,0	35,8	Yes
63,0	42,0	33,8	Yes
80,0	40,0	30,3	Yes
100,0	38,0	25,6	Yes
125,0	36,0	21,5	Yes
160,0	34,0	16,1	Yes
200,0	32,0	12,2	Yes

R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (35)



Frequency [Hz]	Sound level		Demands fulfilled ?
	Demands [dB]	WTG noise [dB]	
20,0	74,0	51,8	Yes
25,0	64,0	48,5	Yes
31,5	56,0	44,1	Yes
40,0	49,0	39,4	Yes
50,0	44,0	35,7	Yes
63,0	42,0	33,7	Yes
80,0	40,0	30,2	Yes
100,0	38,0	25,5	Yes
125,0	36,0	21,4	Yes
160,0	34,0	16,0	Yes
200,0	32,0	12,1	Yes

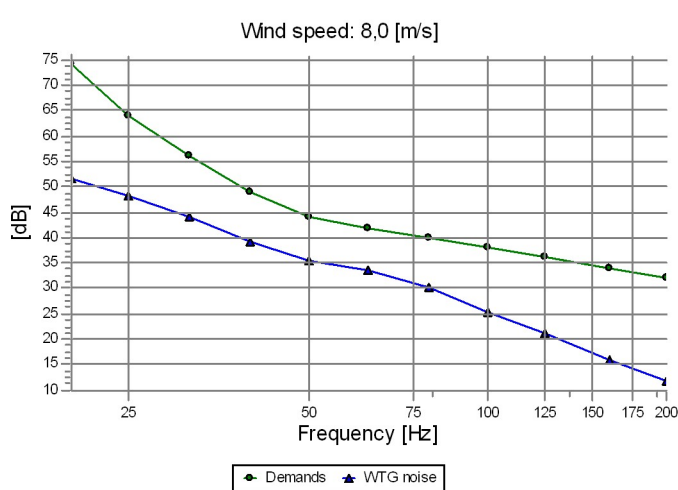
R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (39)



Frequency [Hz]	Sound level		Demands fulfilled ?
	Demands [dB]	WTG noise [dB]	
20,0	74,0	52,6	Yes
25,0	64,0	49,3	Yes
31,5	56,0	44,9	Yes
40,0	49,0	40,1	Yes
50,0	44,0	36,4	Yes
63,0	42,0	34,5	Yes
80,0	40,0	30,9	Yes
100,0	38,0	26,3	Yes
125,0	36,0	22,2	Yes
160,0	34,0	16,9	Yes
200,0	32,0	13,0	Yes

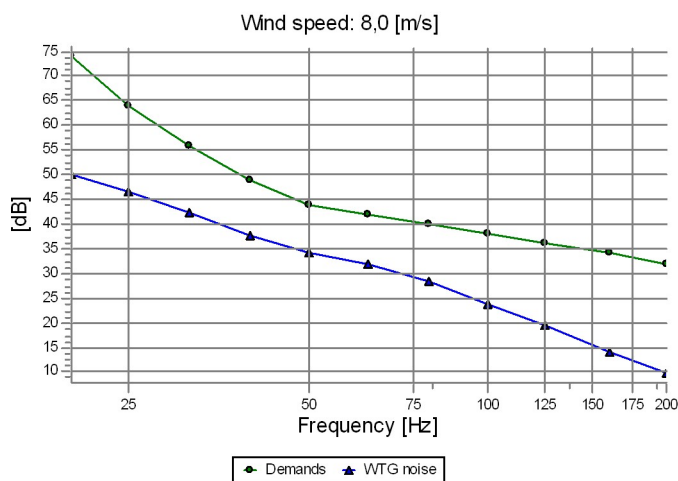
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (40)



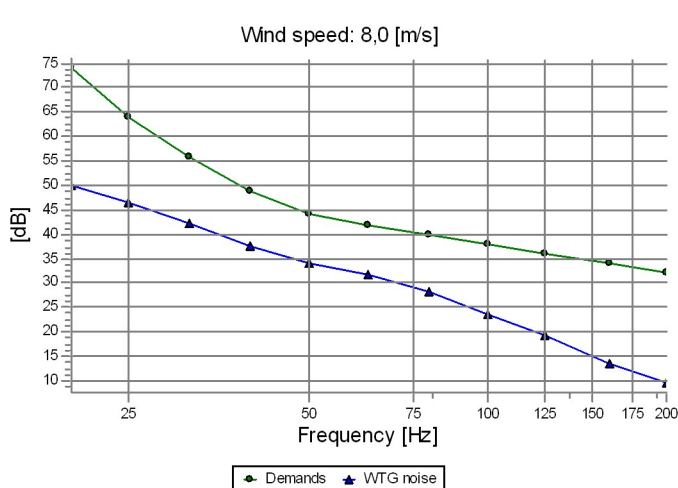
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	51,7	Yes
25,0	64,0	48,4	Yes
31,5	56,0	44,0	Yes
40,0	49,0	39,2	Yes
50,0	44,0	35,6	Yes
63,0	42,0	33,6	Yes
80,0	40,0	30,0	Yes
100,0	38,0	25,4	Yes
125,0	36,0	21,2	Yes
160,0	34,0	15,8	Yes
200,0	32,0	11,9	Yes

R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (43)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,0	Yes
25,0	64,0	46,7	Yes
31,5	56,0	42,4	Yes
40,0	49,0	37,7	Yes
50,0	44,0	34,1	Yes
63,0	42,0	31,9	Yes
80,0	40,0	28,4	Yes
100,0	38,0	23,8	Yes
125,0	36,0	19,4	Yes
160,0	34,0	13,9	Yes
200,0	32,0	9,9	Yes

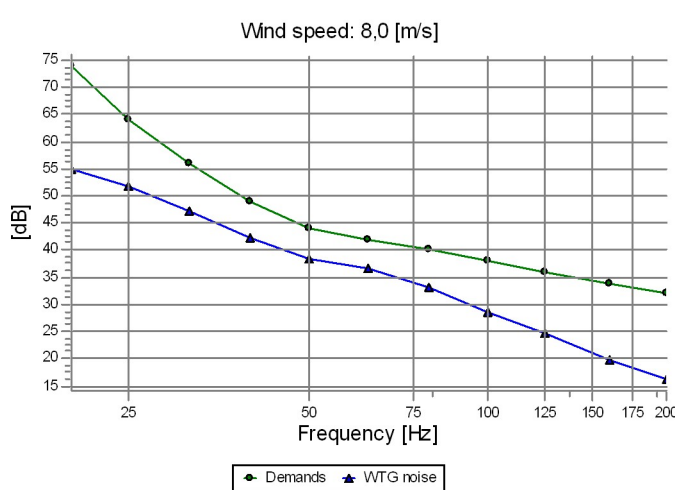
R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (44)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	49,9	Yes
25,0	64,0	46,5	Yes
31,5	56,0	42,2	Yes
40,0	49,0	37,5	Yes
50,0	44,0	34,0	Yes
63,0	42,0	31,8	Yes
80,0	40,0	28,2	Yes
100,0	38,0	23,6	Yes
125,0	36,0	19,2	Yes
160,0	34,0	13,7	Yes
200,0	32,0	9,7	Yes

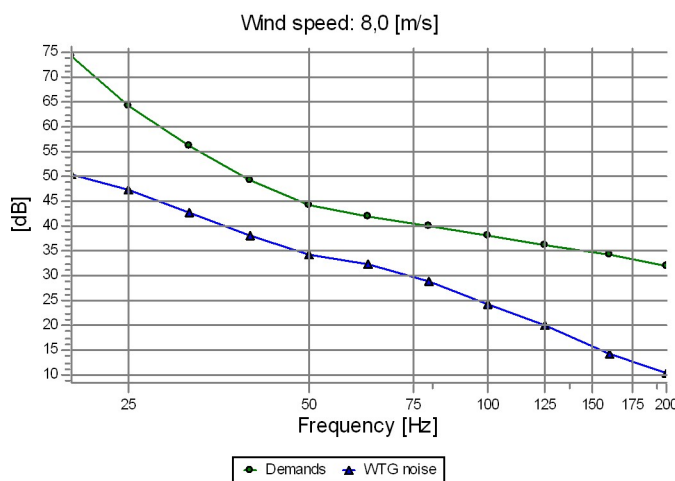
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (42)



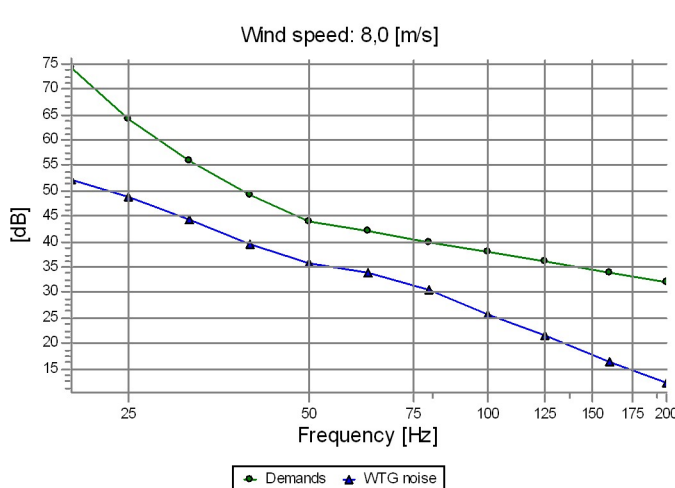
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	55,0	Yes
25,0	64,0	51,7	Yes
31,5	56,0	47,2	Yes
40,0	49,0	42,3	Yes
50,0	44,0	38,5	Yes
63,0	42,0	36,8	Yes
80,0	40,0	33,3	Yes
100,0	38,0	28,7	Yes
125,0	36,0	24,8	Yes
160,0	34,0	19,7	Yes
200,0	32,0	16,2	Yes

R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (34)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	50,3	Yes
25,0	64,0	47,0	Yes
31,5	56,0	42,7	Yes
40,0	49,0	37,9	Yes
50,0	44,0	34,2	Yes
63,0	42,0	32,2	Yes
80,0	40,0	28,6	Yes
100,0	38,0	24,0	Yes
125,0	36,0	19,8	Yes
160,0	34,0	14,3	Yes
200,0	32,0	10,4	Yes

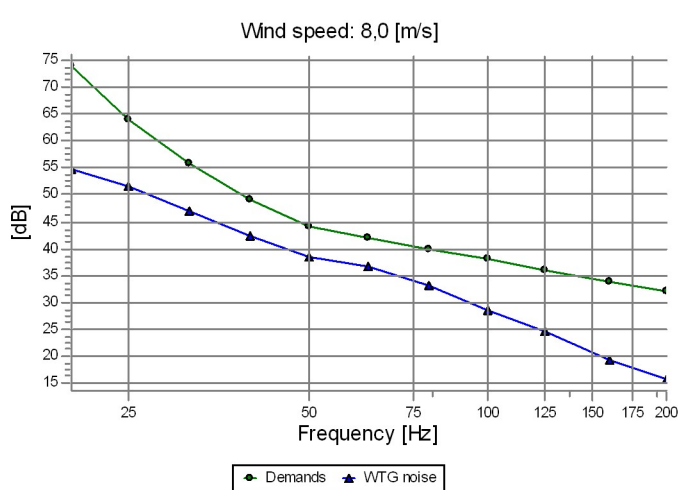
R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (36)



Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,2	Yes
25,0	64,0	48,8	Yes
31,5	56,0	44,4	Yes
40,0	49,0	39,6	Yes
50,0	44,0	35,9	Yes
63,0	42,0	34,0	Yes
80,0	40,0	30,4	Yes
100,0	38,0	25,8	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,3	Yes
200,0	32,0	12,4	Yes

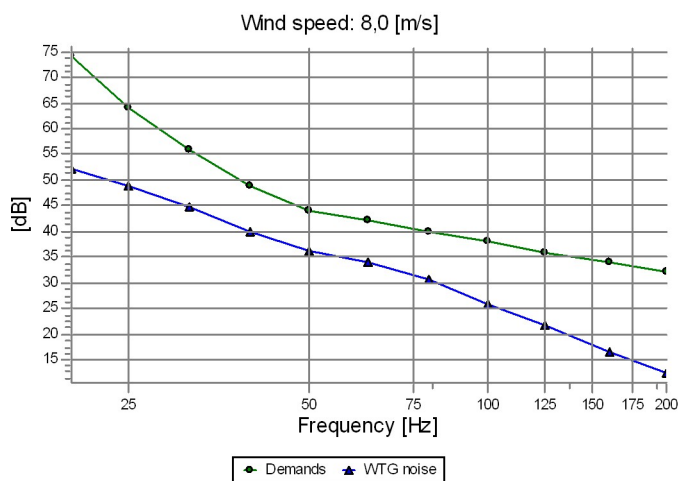
DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (38)



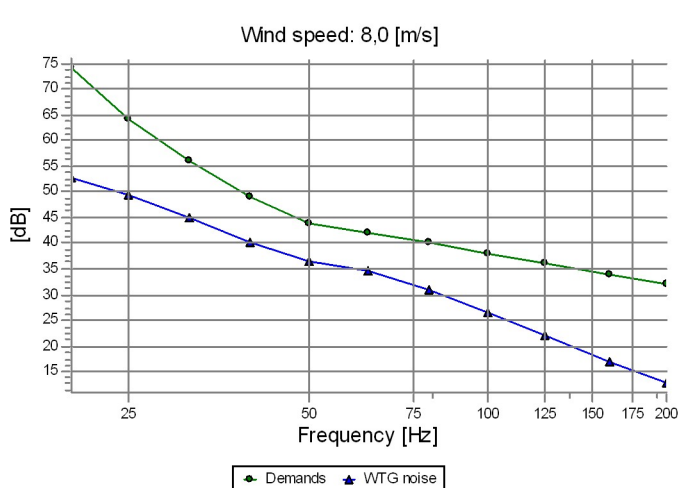
Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	54,8	Yes
25,0	64,0	51,5	Yes
31,5	56,0	47,1	Yes
40,0	49,0	42,2	Yes
50,0	44,0	38,5	Yes
63,0	42,0	36,6	Yes
80,0	40,0	33,1	Yes
100,0	38,0	28,5	Yes
125,0	36,0	24,5	Yes
160,0	34,0	19,4	Yes
200,0	32,0	15,7	Yes

R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (37)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,3	Yes
25,0	64,0	49,0	Yes
31,5	56,0	44,6	Yes
40,0	49,0	39,8	Yes
50,0	44,0	36,1	Yes
63,0	42,0	34,1	Yes
80,0	40,0	30,6	Yes
100,0	38,0	26,0	Yes
125,0	36,0	21,8	Yes
160,0	34,0	16,4	Yes
200,0	32,0	12,6	Yes

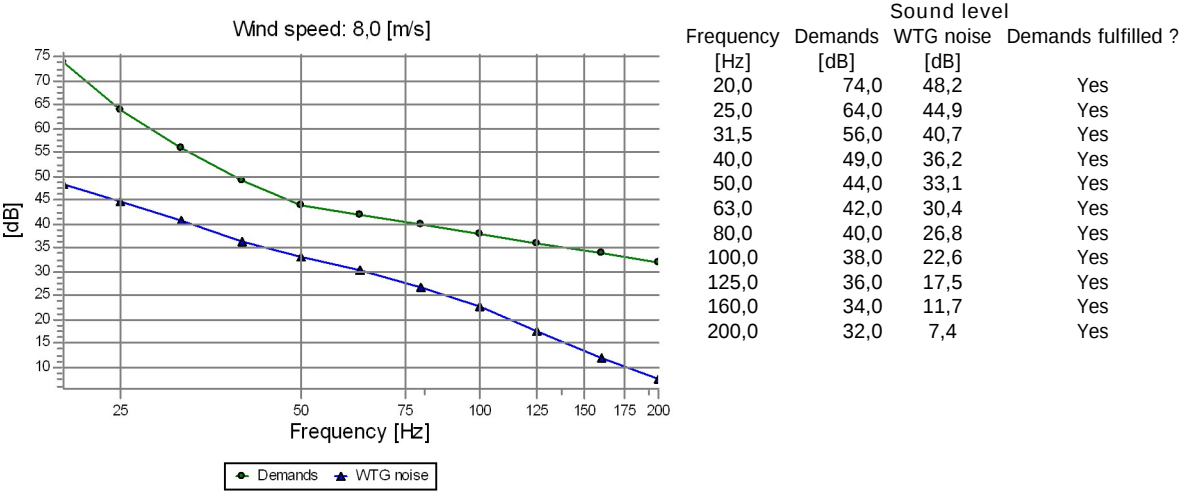
R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (45)



Sound level			
Frequency [Hz]	Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	52,7	Yes
25,0	64,0	49,3	Yes
31,5	56,0	44,9	Yes
40,0	49,0	40,1	Yes
50,0	44,0	36,4	Yes
63,0	42,0	34,5	Yes
80,0	40,0	30,9	Yes
100,0	38,0	26,3	Yes
125,0	36,0	22,2	Yes
160,0	34,0	16,8	Yes
200,0	32,0	13,0	Yes

DECIBEL - Detailed results, graphic

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside Noise calculation model: Finland Low frequency 8,0 m/s
R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (46)



DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside

Noise calculation model:

Finland Low frequency

Wind speed (at 10 m height):

8,0 m/s

Spectral distribution:

From 20,0 Hz to 200,0 Hz

Meteorological coefficient, C0:

Selected option: Fixed value: 0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty is subtracted from demand

Model: 5,0 dB(A)

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Low frequency calculation

dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N163/5.5 5700 163.0 !O!

Noise: Mode 2 with serrated trailing edges_1dB_uncertainty

Source Source/Date Creator Edited
27.11.2024 USER 11.12.2024 15.04

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	97,7	64,1	68,0	73,5	77,1	82,2	83,5	86,3	91,0	89,5	90,8	92,1

WTG: NORDEX N163/5.15 5700 163.0 !O!

Noise: Mode 5 with serrated trailing edges_1dB_uncertainty

Source Source/Date Creator Edited
28.11.2024 USER 11.12.2024 15.36

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudella 8 m/s

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	96,3	62,7	66,6	72,1	48,7	80,8	82,1	84,9	89,6	88,1	89,4	90,7

Project:

Siltaneva Teuva

Licensed user:

Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

19.12.2024 10.18/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside

WTG: NORDEX N163/5.27 5700 163.0 !O!

Noise: Mode 4 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	28.11.2024	USER	11.12.2024 15.15

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1dB epävarmuus tuulennopeudelle 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	96,7	63,2	67,1	72,6	76,2	79,3	82,6	85,4	90,1	88,6	89,9	91,2

WTG: NORDEX N163/5.4 5700 163.0 !O!

Noise: Mode 3 with serrated trailing edges_1dB_uncertainty

Source	Source/Date	Creator	Edited
	28.11.2024	USER	11.12.2024 15.08

Tiedot dokumentista "Meluselvitys Matkussaaren Tuulivoimapuisto. EthaWind"

Selvityksessä viitataan dokumenttiin "Third octave sound power levels Nordex N163/5.X. F008_276_A17_EN"

Np 148 m ja roottorinhalkaisija 163 m.

Lisätty 1 dB epävarmuus tuulennopeudelle 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	148,0	8,0	97,3	63,7	67,6	73,1	76,7	81,8	83,1	85,9	90,6	89,1	90,4	91,7

WTG: NORDEX N175/6.x 6800 200.0 !O!

Noise: Mode 0 - blades with serrated trailing edge_2dB_uncertainty

Source	Source/Date	Creator	Edited
	10.9.2024	USER	4.12.2024 10.49

Perustuu meludokumenttiin: Third octave sound power levels, Nordex N175/6.X, Rev.01, 2022-05-08, F008_278_A17_EN, s.53/98.

Lisätty 2 dB epävarmuus tuulennopeudella 8 m/s.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	101,2	73,8	77,2	79,1	80,3	82,3	86,6	89,3	90,9	93,5	95,5	96,5

WTG: VESTAS V136-3.45 3450 136.0 !O!

Noise: V136-3.45MW with serrated trailing edges

Source	Source/Date	Creator	Edited
	26.11.2024	USER	26.11.2024 16.05

Tiedot dokumentista "Pitkälänvuoren tuulivoimahanke, Petäjävesi. Melu- ja varjostusmallinnukset. FCG".

Kysessä dokumentissa tiedot on ovat dokumentista "DMS 0055-9919_V00, V136-mk3 -3.45 MW Third octave noise emission, Date 2015-11-23".

Napakorkeus 162 ja roottorinhalkaisija 136.

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	142,0	8,0	98,7	64,0	71,8	77,1	80,2	83,1	86,1	88,0	89,2	94,4	91,5	90,1

Project:

Siltaneva Teuva

Licensed user:

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FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

19.12.2024 10.18/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside

WTG: VESTAS V150-5.6 5600 150.0 !O!

Noise: Level 0 - Measured - Mode 0 - 01-2019

Source Source/Date Creator Edited
 Vestas 23.1.2019 USER 23.7.2019 11.08
 Blades with serrated trailing edge.
 DMS no.: 0079-5099_01. Date 2019-01-23

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	155,0	8,0	96,5	60,9	65,4	69,7	73,9	77,4	80,7	83,8	86,4	88,6	90,7	92,3

Noise sensitive area: R01 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R02 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R03 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R04 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

Noise sensitive area: R05 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz 25,0 Hz 31,5 Hz 40,0 Hz 50,0 Hz 63,0 Hz 80,0 Hz 100,0 Hz 125,0 Hz 160,0 Hz 200,0 Hz
 74,0 dB 64,0 dB 56,0 dB 49,0 dB 44,0 dB 42,0 dB 40,0 dB 38,0 dB 36,0 dB 34,0 dB 32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside

Noise sensitive area: R06 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R07 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R08 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R09 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R10 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R11 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Project:

Siltaneva Teuva

Licensed user:

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Ilmalanportti 2
FI-00240 Helsinki

Lassi / lassi.pirttinen@sweco.fi

Calculated:

19.12.2024 10.18/4.0.552

DECIBEL - Assumptions for noise calculation

Calculation: Siltaneva VE2 yhteisvaikutus lowfreq inside

Noise sensitive area: R12 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: R13 Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: 0,0 dB

No temporal binning

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand