# Haarasuonkankaan tuulivoimahanke, Vaala

Melu- ja varjostusmallinnusraportti

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# Sisällysluettelo

**1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET ..... 1**

**2 LÄHTÖTIEDOT JA MENETELMÄT ..... 1**

2.1 Melu ..... 1

2.1.1 Melumallinnus ISO 9613-2 ..... 1

2.1.2 Matalataajuinen melu ..... 5

2.2 Varjostusmallinnus ..... 6

2.3 Raja- ja ohjearvot ..... 7

2.3.1 Melu ..... 7

2.3.2 Varjostus ..... 7

**3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET ..... 9**

3.1 Melu ..... 9

3.1.1 VE1: Melun laskentatulokset (ISO 9613-2) ..... 9

3.1.2 VE2: Melun laskentatulokset (ISO 9613-2) ..... 11

3.1.3 Matalataajuiset melutasot ..... 12

3.2 Varjostus ..... 15

3.2.1 Hankevaihtoehto VE1, “Real Case, No forest” ..... 15

3.2.2 Hankevaihtoehto VE2, “Real Case, No Forest” ..... 17

**4 MELUN JA VARJOSTUKSEN YHTEISMALLINNUSTEN TULOKSET ..... 19**

4.1 Melu ..... 19

4.1.1 VE1: Yhteismelun laskentatulokset (ISO 9613-2) ..... 19

4.1.2 VE2: Yhteismelun laskentatulokset (ISO 9613-2) ..... 21

4.1.3 Matalataajuiset melutasot ..... 22

4.2 Varjostus ..... 25

4.2.1 VE 1: Varjostuksen yhteisvaikutus, ”Real Case, No Forest” ..... 25

4.2.2 VE 2: Varjostuksen yhteisvaikutus ”Real Case, No Forest” ..... 27

# Haarasuonkankaan tuulivoimahanke, Vaala

## 1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Pohjan Voima Oy suunnittelee Haarasuonkankaan tuulivoimapuistoa Vaalan kunnan alueelle. Tuulivoimahankkeen aiheuttamia melu- ja varjostusvaikutuksia on arvioitu laatimalla mallinnukset tuulivoimaloiden aiheuttamista äänenpainetasoista ja varjostuksista. Mallinnusten tavoitteena on osoittaa, kuinka laajalle alueelle kyseiset vaikutukset ulottuvat ja arvioida vaikutukset lähiseudun ympärivuotiselle ja vapaa-ajan asutukselle.

Tuulivoimaloiden aiheuttamia meluvaikutuksia on arvioitu WindPRO-ohjelmalla YVA-vaiheen kahden hankevaihtoehdon voimaloiden sijoitussuunnitelmien mukaisesti. Melu- ja varjostusmallinnukset on laatinut Miikka Saranpää FCG Finnish Consulting Group Oy:stä. Laaduntarkastuksen on tehnyt Liisa Karhu (FCG).

## 2 LÄHTÖTIEDOT JA MENETELMÄT

### 2.1 Melu

#### 2.1.1 Melumallinnus ISO 9613-2

Tuulivoimaloiden aiheuttamat äänenpainetasot on mallinnettu WindPRO-laskentaohjelman Decibel-moduulilla ISO 9613-2 standardin mukaisesti. Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen 2/2014 mukaisesti tuulen nopeutena käytettiin 10 m korkeudella mitattuna 8 m/s, ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisena kosteutena 70 % ja maanpinnan kovuutena arvoa 0,4. Laskenta on tehty 4,0 m maan pinnan tasosta (Taulukko 6).

Hankevaihtoehdoissa 1 voimalamäärä on 39 kpl. Hankevaihtoehdossa 2 voimalamäärä on pienempi, koostuen yhteensä 29 tuulivoimalaitoksesta. Tuulivoimaloiden äänenpainetasot on mallinnettu molemmissa hankevaihtoehdoissa käyttäen V172-7,2 MW voimalaitosta (Taulukko 1). Hankevaihtoehdoissa 1 ja 2 voimalaitosten napakorkeutena on käytetty 214 metriä, jolloin voimalaitosten kokonaiskorkeudeksi muodostuu 300 metriä. V172-7,2 MW voimalaitoksen valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso on 110,1 dB(A).

Yhteismelun mallinnuksissa on huomioitu Haarasuonkankaan suunniteltujen tuulivoimaloiden lisäksi Turkkiselän tuulivoimahankkeen suunnitellut tuulivoimalat sekä Takiankankaan tuulivoimahankkeen suunnitellut tuulivoimalat. Turkkiselän tuulivoimalat on mallinnettu napakorkeuksiltaan 190 m korkeilla Nordex N149-4,5 MW voimaloilla, joiden roottorin halkaisija on 180 metriä (Taulukko 2). Takiankankaan tuulivoimalat on mallinnettu V172-7,2 MW voimaloilla ja napakorkeudella 225 m (Taulukko 3).

Melumallinnusten laskentatuloksia on havainnollistettu ns. keskiäänitasokarttojen avulla. Keskiäänitasokartoissa on melun keskiäänitaso- eli ekvivalenttiäänitasokäyrät (LAeq) 5 dB välein.

*Taulukko 1. Haarasuonkankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot voimalaitoksella V172-7,2 MW sekä melun erityispiirteet.*

| MALLINNUSOHJELMANTIEDOT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mallinnusohjelma ja versio:<br>WindPRO version 3.5.584 | | | | Mallinnusmenetelmä: ISO 9613-2 | | | |
| **TUULIVOIMALOIDEN TIEDOT** | | | | | | | |
| Tuulivoimalan valmistaja: Vestas | | | | Tyyppi: V172 – 7,2 MW | | Sarjanumero/t:- | |
| Nimellisteho: 7,2 MW | | Napakorkeus: 214 m | | Roottorinhalkaisija: 172 m | | Tornin tyyppi:<br>teräs/hybridi | |
| Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun | | | | | | | |
| Lapakulman säätö | | Pyörimisnopeus | | Muu, mikä: PO7200-0S (No STE) | | | |
| Kyllä | dB | Kyllä | dB | Noise mode säätö: | | Kyllä | |
| ~~Ei~~ | | ~~Ei~~ | | Noise mode, lähtömelutaso | | 110,1 dB(A) | |
| **AKUSTISET TIEDOT/LASKENNA LÄHTÖTIEDOT** | | | | | | | |
| Third octave noise emission V172-7.2MW 50/60 Hz Document no 0128-4336_00 | | | | | | | |

| Oktaaveittain [Hz], dB(A) | | 1/3-oktaaveittain [Hz], dB(A) | | | | | |
|---|---|---|---|---|---|---|---|
| | | *12,5* | *48,6* | *125,0* | *95,2* | *1250,0* | *97,8* |
| *62,5* | *91,5* | *16,0* | *54,7* | *160,0* | *97,2* | *1600,0* | *96,3* |
| *125* | *100,2* | *20* | *60,4* | *200,0* | *98,6* | *2000,0* | *94,3* |
| *250* | *104,1* | *25* | *66,1* | *250,0* | *99,5* | *2500,0* | *92* |
| *500* | *105* | *31,5* | *71,5* | *315,0* | *99,9* | *3150,0* | *89,3* |
| *1000* | *103,7* | *40* | *76,7* | *400,0* | *100,2* | *4000,0* | *86,2* |
| *2000* | *99,3* | *50,0* | *81,5* | *500,0* | *100,2* | *5000,0* | *82,8* |
| *4000* | *91,6* | *63,0* | *85,8* | *630,0* | *100,2* | *6300,0* | *79* |
| *8000* | *80,8* | *80,0* | *89,5* | *800,0* | *99,8* | *8000,0* | *74,7* |
| ***110,1 dB(A)*** | | *100,0* | *92,6* | *1000,0* | *99* | *10000* | *70,1* |

| Melun erityispiirteiden mittaus ja havainnot: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kapeakaistaisuus / Tonaalisuus | | Impulssimaisuus | | Merkityksellinen sykintä (amplitudimodulaatio) | | Muu, Mikä: | |
| ~~kyllä~~ | Ei | ~~kyllä~~ | Ei | ~~kyllä~~ | Ei | ~~kyllä~~ | Ei |

*Taulukko 2. Turkkiselkä tuulivoimapuiston mallinnusohjelma ja tuulivoimaloiden äänitehotasot voimalaitoksella N117-2,4 MW sekä melun erityispiirteet.*

| MALLINNUSOHJELMAN TIEDOT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mallinnusohjelma ja versio:<br><br>WindPRO version 3.5.584 | | | | Mallinnusmenetelmä:<br>ISO 9613-2 | | | |
| **TUULIVOIMALOIDEN TIEDOT** | | | | | | | |
| Tuulivoimalan valmistaja: Nordex | | | | Tyyppi: N149 4.5 | | Sarjanumero/t:- | |
| Nimellisteho: 4,5 MW | | Napakorkeus: 190 m | | Roottorin halkaisija: 180 m | | Tornin tyyppi: teräs | |
| Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun | | | | | | | |
| Lapakulman säätö | | Pyörimisnopeus | | Muu, mikä | | | |
| Kyllä | - dB | Kyllä | - dB | Noise mode säätö: | | Standard Mode | |
| ~~Ei~~ | | ~~Ei~~ | | Noise mode, lähtömelutaso | | 106 dB(A) | |

| AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Melupäästötiedot perustuvat valmistajan dokumenttiin ” DMS no: F008_271_A17_EN, N149/4.0-4.5 Third octave sound power levels, Date 2017-08-29”. Sekä (Pöyry Finland Oy, Tuulialfa_Vaala_meluselvitys_OYK_22-10-2019.docx) | | | | | | | |
| Oktaaveittain [Hz],dB(A) | | 1/3-oktaaveittain [Hz], unweighted - dB(LIN) | | | | | |
| *31,5* | - | *12,5* | - | *125* | *104,4* | *1250* | *95,4* |
| *63* | *88* | *16* | - | *160* | *102,8* | *1600* | *94* |
| *125* | *94* | *20* | *113,2* | *200* | *101,7* | *2000* | *92,6* |
| *250* | *99* | *25* | *111,6* | *250* | *100,4* | *2500* | *90,6* |
| *500* | *100* | *31,5* | *111,4* | *315* | *101,6* | *3150* | *87,9* |
| *1000* | *101* | *40* | *110,4* | *400* | *99,4* | *4000* | *84,1* |
| *2000* | *98* | *50* | *111,2* | *500* | *98,1* | *5000* | *79,8* |
| *4000* | *91* | *63* | *108,4* | *630* | *98,7* | *6300* | *80,2* |
| *8000* | *83* | *80* | *107,4* | *800* | *96,7* | *8000* | *79,3* |
| ***106 dB(A)*** | | *100* | *108,8* | *1000* | *96,7* | *10000* | *76,5* |

| Melun erityispiirteiden mittaus ja havainnot: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kapeakaistaisuus / Tonaalisuus | | Impulssimaisuus | | Merkityksellinen sykintä (amplitudimodulaatio) | | Muu, Mikä: | |
| ~~kyllä~~ | ei | ~~kyllä~~ | ei | ~~kyllä~~ | ei | ~~kyllä~~ | ei |

*Taulukko 3. Takiankankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot voimalaitoksella V172-7,2 MW sekä melun erityispiirteet.*

| MALLINNUSOHJELMANTIEDOT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mallinnusohjelma ja versio:<br>WindPRO version 3.5.584 | | | | Mallinnusmenetelmä: ISO 9613-2 | | | |
| **TUULIVOIMALOIDEN TIEDOT** | | | | | | | |
| Tuulivoimalan valmistaja: Vestas | | | | Tyyppi: V172 – 7,2 MW | | Sarjanumero/t:- | |
| Nimellisteho: 7,2 MW | | Napakorkeus: 225 m | | Roottorinhalkaisija: 250 m | | Tornin tyyppi:<br>teräs/hybridi | |
| Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun | | | | | | | |
| Lapakulman säätö | | Pyörimisnopeus | | Muu, mikä: PO7200-0S (No STE) | | | |
| Kyllä | dB | Kyllä | dB | Noise mode säätö: | | Kyllä | |
| ~~Ei~~ | | ~~Ei~~ | | Noise mode, lähtömelutaso | | 106,9 + 2 dB(A) | |
| **AKUSTISET TIEDOT/LASKENNA LÄHTÖTIEDOT** | | | | | | | |
| Asiakirja nro: 0128-4336_00, 30.6.2022 (Original instruction T05 0128-4336 VER 00)<br><br>Lähtömelutasoon on lisätty epävarmuusarvoksi 2 dB(A), koska voimalaitosmallin roottorin halkaisijaa on muutettu. | | | | | | | |
| Oktaaveittain [Hz], dB(A) | | 1/3-oktaaveittain [Hz], dB(A) | | | | | |
| | | *12,5* | *53* | *125,0* | *95,2* | *1250,0* | *94,4* |
| *62,5* | *92,4* | *16,0* | *58,6* | *160,0* | *96,8* | *1600,0* | *92,4* |
| *125* | *100* | *20* | *63,7* | *200,0* | *98* | *2000,0* | *90,1* |
| *250* | *103,3* | *25* | *68,9* | *250,0* | *98,6* | *2500,0* | *90,1* |
| *500* | *103,5* | *31,5* | *73,8* | *315,0* | *98,8* | *3150,0* | *87,5* |
| *1000* | *101,9* | *40* | *79,6* | *400,0* | *98,9* | *4000,0* | *84,5* |
| *2000* | *97,4* | *50,0* | *83* | *500,0* | *98,7* | *5000,0* | *99,1* |
| *4000* | *89,9* | *63,0* | *86,8* | *630,0* | *98,1* | *6300,0* | *97,4* |
| *8000* | *79,2* | *80,0* | *90,2* | *800,0* | *98,1* | *8000,0* | *73,3* |
| ***108,9 dB(A)*** | | *100,0* | *92,9* | *1000,0* | *97,2* | *10000* | *68,9* |
| Melun erityispiirteiden mittaus ja havainnot: | | | | | | | |
| Kapeakaistaisuus / Tonaalisuus | | Impulssimaisuus | | Merkityksellinen sykintä (amplitudimodulaatio) | | Muu, Mikä: | |
| ~~kyllä~~ | Ei | ~~kyllä~~ | Ei | ~~kyllä~~ | Ei | ~~kyllä~~ | Ei |

*Taulukko 4. Käytetyt mallinnusparametrit ISO 9613-2 laskelmissa*

| AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT | | | |
|---|---|---|---|
| Laskenta korkeus | | Laskentaruudun koko [m·m] | |
| ISO 9613-2: 4,0 m | | 25x25 m | |
| Suhteellinen kosteus | | Lämpötila | |
| 70 % | Muu, mikä ja miksi: | ISO 9613-2: 15 C° | |
| Maastomallin lähde ja tarkkuus | | | |
| Maastomallin lähde: MML maastotietokanta | | Vaakaresoluutio:1,0 | Pystyresoluutio:0,5 |
| **Maan- ja vedenpinnan absorption ja heijastuksen huomioiminen, käytetyt kertoimet** | | | |
| ISO 9613-2 | 0,4 / vesialueilla 0 | | HUOM |
| Ilmakehän stabiilius laskennassa/meteorologinen korjaus | | | |
| Neutraali, (0): Neutraali | | Muu, mikä ja miksi: | |
| Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus | | | |
| Tuulen suunta: 0-360° | | Tuulen nopeus: 10 metrin korkeudella mitattuna 8 m/s | |
| Voimalan äänen suuntaavuus ja vaimentuminen | | | |
| Vapaa avaruus: kyllä | | Muu, mikä, miksi: | |

### 2.1.2 Matalataajuinen melu

Matalataajuinen melu laskettiin Ympäristöministeriön ohjeen 2/2014 mukaisin menetelmin käyttäen voimalavalmistajilta saatuja arvioita niiden äänitehotasoista.

Ohje 2/2014 antaa menetelmän matalataajuisen melun laskentaan rakennusten ulkopuolelle. Sosiaali- ja terveysministeriön Asumisterveysasetus 2015 antaa matalataajuiselle melulle toimenpiderajat asuinhuoneissa. Rakennusten sisälle kantautuva äänitaso arvioitiin Turun AMK:n (Keränen, Hakala ja Hongisto, 2019) julkistamien Anojanssi projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

Anojanssi projektissa mitattiin ilmaääneneristävyys standardin ISO 16283-3:2016 mukaan. Projektissa valittiin 13 pientaloa ja 26 julkisivurakennetta niin, että edustettuina oli kevyitä, raskaita, uusia ja vanhoja julkisivurakenteita. Tuloksista johdettiin 84 % persentiili, joka kertoo arvon, joka ylittyi 84 % mitatuista suomalaisista pientaloista.

*Taulukko 5. Suomalaisen pientalon julkisivun äänitasoeron alalikiarvo Anojanssi projektin tulosten mukaisesti.*

| f [Hz] | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DLσ [dB] | 7.6 | 8.3 | 9.2 | 10.3 | 11.5 | 13.0 | 14.8 | 16.8 | 18.8 | 21.1 | 22.8 |

Matalataajuisen melun laskelmassa huomioitiin maanpinnan muodon vaikutus ohjeen 4/2014 mukaisesti. Tulokset on esitetty taajuuskohtaisena taulukkona hankealuetta ympäröiville asuin- ja lomarakennuksille.

## 2.2 Varjostusmallinnus

Tuulivoimaloiden varjostusvaikutukset on mallinnettu molemmissa hankevaihtoehdoissa käyttäen roottorinhalkaisijaltaan 200 metristä voimalaitosta, jonka napakorkeus on 200 metriä. Kokonaiskorkeudeltaan voimalat ovat tällöin 300 metriä korkea.

*Taulukko 6. Haarasuonkankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden koko varjostusmallinnuksissa.*

| MALLINNUSOHJELMAN TIEDOT | | | |
|---|---|---|---|
| Mallinnusohjelma ja versio:<br><br>WindPRO versiot 3.5.584 | | Mallinnusmenetelmä:<br>ISO 9613-2 | |
| **TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)** | | | |
| Tuulivoimalan valmistaja: Generic | | Tyyppi: Generic RD200xHH200 | Sarjanumero/t:- |
| Nimellisteho: - | Napakorkeus: 200 m | Roottorin halkaisija: 200 m | Tornin tyyppi: teräs/hybridi |

Varjostuksen yhteismallinnuksissa on huomioitu Haarasuonkankaan suunniteltujen tuulivoimaloiden lisäksi suunnitellut Turkkiselän ja Takiankankaan tuulivoimalat. Turkkiselän tuulivoimalat on mallinnettu napakorkeuksiltaan 190 m korkeilla voimaloilla, joiden roottorin halkaisija on 180 metriä. Takiankankaan tuulivoimalat on mallinnettu napakorkeudella 225 metriä ja roottorin halkaisijalla 250 metriä.

Varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Laskennassa varjot huomioidaan, kun aurinko on yli 3 astetta horisontin yläpuolella. Varjoksi lasketaan tilanne, jossa siipi peittää vähintään 20 % auringosta.

Auringon keskimääräiset paistetunnit perustuvat Luulajan sääaseman mitattuihin säätietoihin 1969 - 1993. Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Varjostusmallin laskennassa on huomioitu hankealueen korkeustiedot, tuulivoimaloiden sijainnit, tuulivoimalan napakorkeudet ja roottorin halkaisija sekä hankealueen aikavyöhyke. Mallinnuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, pilvisyys kuukausittain eli kuinka paljon aurinko paistaa ollessaan horisontin yläpuolella sekä tuulivoimalaitosten arvioitu vuotuinen käyntiaika.

Varjostuksen tarkastelukorkeutena lähialueen asuin- tai lomarakennusten pihapiirissä käytettiin 1,0 metriä ja laskenta-alueen kokoa 5,0 x 5,0 metriä. Laskentaikkunoiden suunnat asennettiin voimaloita kohti ns. ”greenhouse mode”. Mallinnus tehtiin niin sanotulle todelliselle tilanteelle (Real Case), jossa puuston suojaavaa vaikutusta ei huomioitu (Real Case, No Forest).

Varjostusmallinnusten tuloksia on havainnollistettu karttojen avulla. Kartoilla esitetään varjostusvaikutuksen (1, 8 ja 20 tuntia vuodessa) laajuus. Sen lisäksi mallinnuksessa on erikseen laskettu vaikutus tuulivoimahankealueen ympäristössä oleviin herkkiin kohteisiin.

## 2.3 Raja- ja ohjearvot

### 2.3.1 Melu

Valtioneuvoston asetuksessa (1107/2015) tuulivoimaloille on määritelty suunnitteluarvot päivä- ja yöajan keskiäänitasojen maksimiarvolle. Jos tuulivoimalan melu sisältää tonaalisia, kapeakaistaisia tai impulssimaisia komponentteja, tai se on selvästi amplitudimoduloitunutta, mallinnustuloksiin tulee ohjeen mukaan lisätä viisi desibeliä ennen ohjearvoon vertaamista. Koska ohjearvo sisältää jo tyypillisen tuulivoimamelun piirteet, edellä mainitut äänenpiirteiden tulee olla tuulivoimalalle epätyypillisen voimakkaita, jotta mallinnustuloksissa täytyy huomioida viiden desibelin lisä äänenvoimakkuuteen.

*Taulukko 7. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason toimenpiderajat (Valtioneuvoston asetus 27.8.2015).*

| Vaikutuskohde | Päivä (7-22) | Yö (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 |

Sosiaali- ja terveysministeriön asetuksessa (545/2015) on annettu matalataajuiselle melulle toimenpiderajoja. Toimenpiderajat koskevat asuinhuoneita ja ne on annettu taajuuspainottamattomina yhden tunnin keskiäänitasoina tersseittäin. Toimenpiderajat koskevat yöaikaa ja päivällä sallitaan 5 dB suuremmat arvot.

*Taulukko 8. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.*

| Terssikaista Hz | 20 | 25 | 31,5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Keskiäänitaso LZeq,1h, dB | 74 | 64 | 56 | 49 | 44 | 42 | 40 | 38 | 36 | 34 | 32 |
| Edellisestä laskettu keski-äänitaso A-painotettuna LAeq,1h, dB | 24 | 19 | 17 | 14 | 14 | 16 | 18 | 19 | 20 | 21 | 21 |

Lisäksi yöaikainen mahdollisesti unihäiriötä aiheuttava melu, joka erottuu selvästi taustamelusta, ei saa ylittää 25 dB yhden tunnin keskiäänitasona LAeq,1h mitattuna niissä tiloissa, jotka on tarkoitettu nukkumiseen.

### 2.3.2 Varjostus

Suomessa ei ole viranomaisten antamia yleisiä määräyksiä tuulivoimaloiden muodostaman varjostuksen enimmäiskestoista eikä varjonmuodostuksen arviointiperusteista. Ympäristöministeriön tuulivoimarakentamisen suunnitteluohjeistuksessa esitetään käytettäväksi muiden maiden suosituksia välkkeen rajoittamisesta (Ympäristöministeriö 2012).

Useissa maissa on annettu raja-arvoja tai suosituksia hyväksyttävän välkevaikutuksen määrästä. Esimerkiksi Ruotsissa suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä.

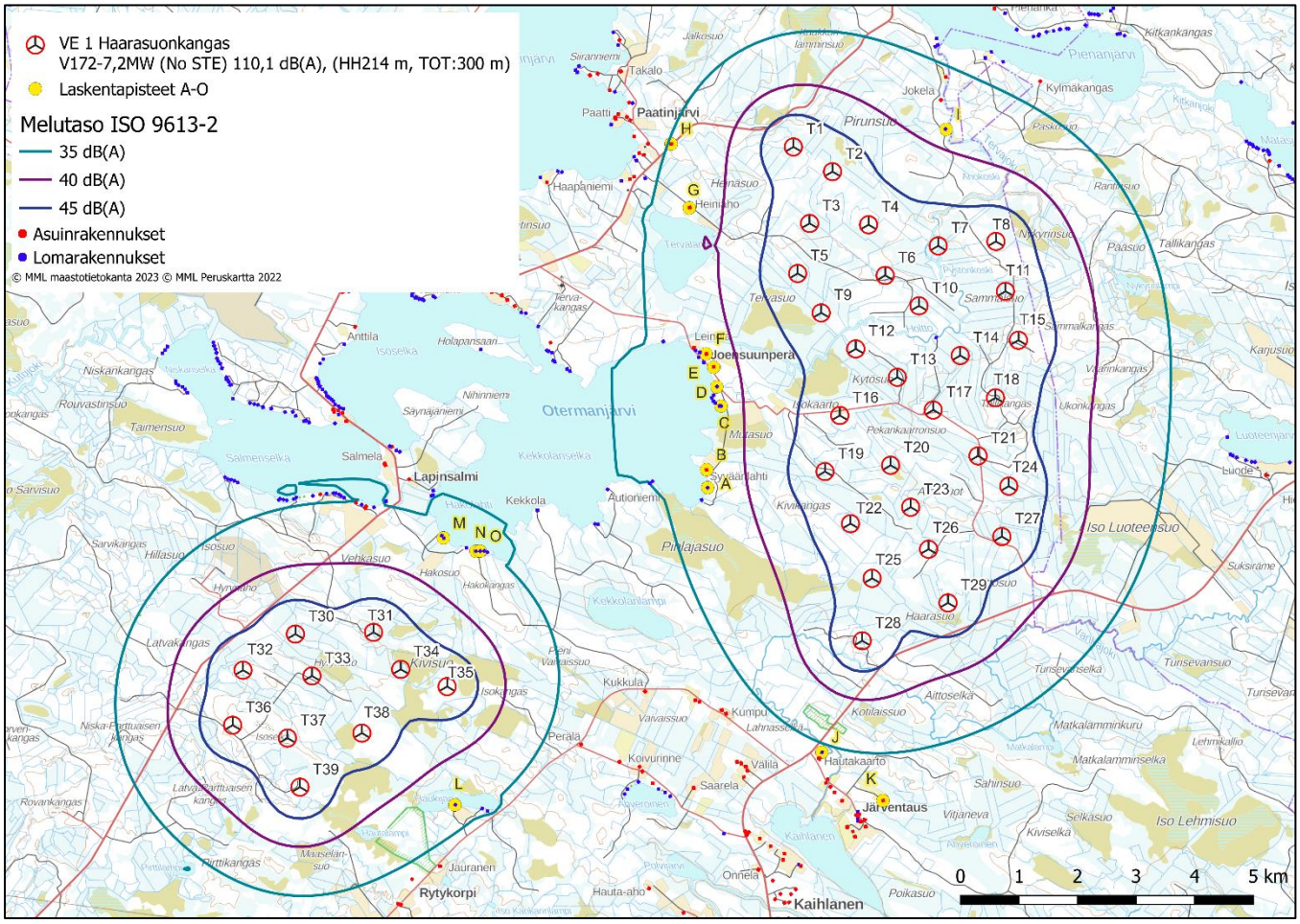
Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa (”Real Case”) esiintyy vähintään kahdeksan tuntia vuodessa.

# 3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

## 3.1 Melu

### 3.1.1 VE1: Melun laskentatulokset (ISO 9613-2)

Hankevaihtoehdon 1 (VE1) melumallinnuksen tulosten mukaan melutaso 40 dB(A) ei ylity lähimmillä asuin- ja lomarakennuksilla. Katso tarkemmat laskentatulokset liitteestä 1.



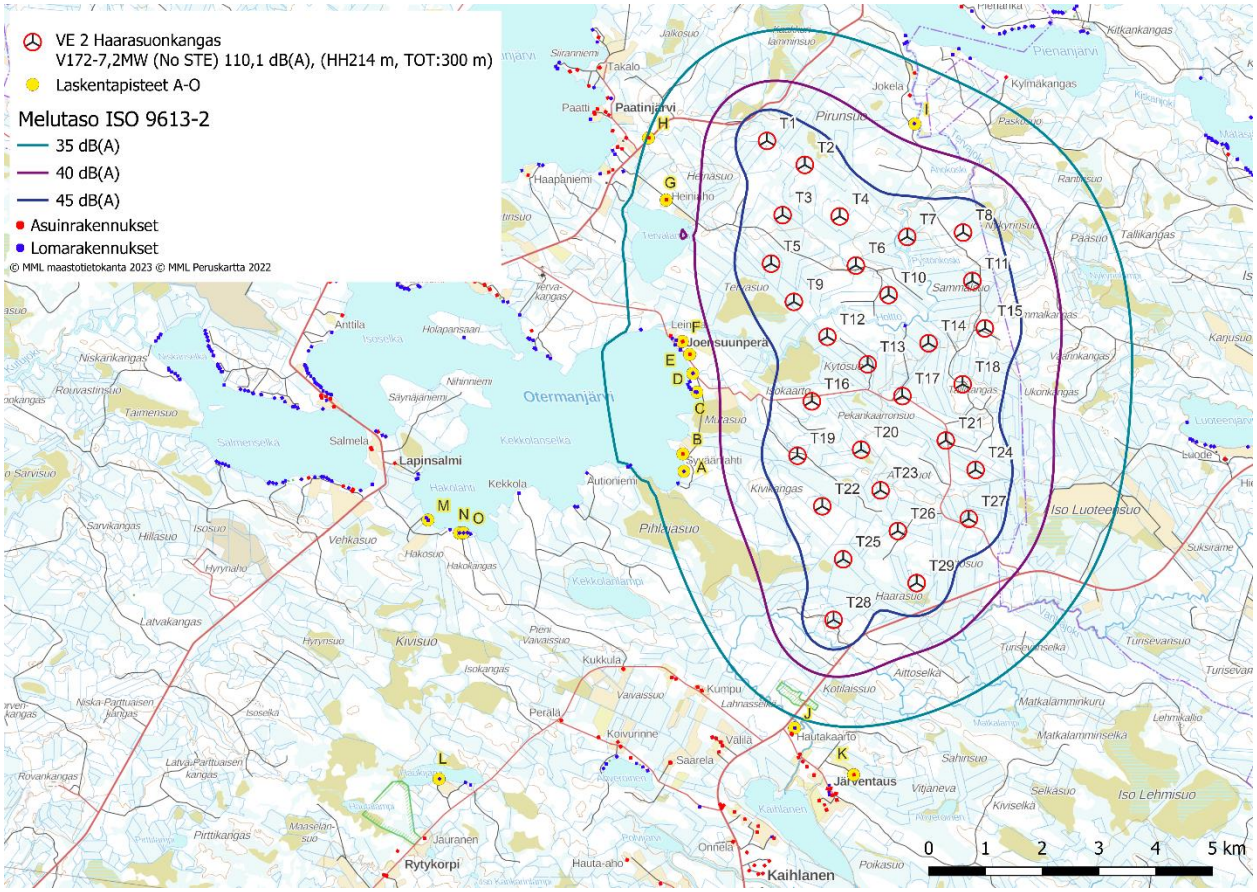

*Kuva 1. Melumallinnuksen tulos hankevaihtoehdossa 1*

*Taulukko 9. Laskennalliset melutasot Haarasuonkankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 1*

| Laskentapiste | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskenta-korkeus (m) | Melutaso dB(A) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4 | 37,2 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4 | 37,3 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4 | 38,6 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4 | 38,4 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 4 | 38,4 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4 | 38,1 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4 | 37,4 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4 | 35,2 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 4 | 38,6 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4 | 34,4 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4 | 32,2 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 4 | 37,7 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4 | 36 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4 | 35,5 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4 | 35,4 |

### 3.1.2 VE2: Melun laskentatulokset (ISO 9613-2)

Hankevaihtoehdon 2 (VE2) melumallinnuksen mukaan melutaso 40 dB(A) ei ylity lähimmillä asuin- ja lomarakennuksilla. Katso tarkemmat laskentatulokset liitteestä 2.




*Kuva 2. Melumallinnuksen tulos hankevaihtoehdossa 2*

*Taulukko 10. Laskennalliset melutasot Haarasuonkankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 2*

| Laskentapiste | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskenta-korkeus (m) | Melutaso dB(A) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4 | 37 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4 | 37,1 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4 | 38,4 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4 | 38,3 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 4 | 38,3 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4 | 38 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4 | 37,3 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4 | 35,1 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 4 | 38,6 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4 | 34,2 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4 | 31,9 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 4 | 25 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4 | 27,6 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4 | 27,5 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4 | 27,7 |

### 3.1.3 Matalataajuiset melutasot

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin.

Haarasuonkankaan tuulivoimahankkeen aiheuttama matalataajuinen melu ei kummassakaan hankevaihtoehdossa ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteiden sisätiloissa.

Hankevaihtoehdon 1 tulokset laskentapisteittäin on esitetty taulukossa 11 ja hankevaihtoehdon 2 taulukossa 12. Taulukoissa näkyy jokaisen laskentapisteen terssikaistakohtaiset arvot.

Tarkemmat matalataajuisen yhteismelun rakennuskohtaiset laskentatulokset ja kuvaajat on esitetty liitteissä 3 ja 4.

*Taulukko 11. Matalataajuisen melun laskentatulokset VE1*

| Pienitaajuisen melun laskenta menetelmä: ISO 9613-2, Anojanssi (Keränen, Hakala ja Hongisto, 2019) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terssin painottamaton äänitaso Leq dB - altistuvien laskentapisteiden (rakennusten) sisätilossa | | | | | | | | | | | |
| Terssikaista [Hz] | 20 | 25 | 31,5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
| Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat LZeq,1h, dB | 74,0 | 64,0 | 56,0 | 49,0 | 44,0 | 42,0 | 40,0 | 38,0 | 36,0 | 34,0 | 32,0 |
| Laskentapiste A | 41,1 | 40 | 39 | 38 | 36,8 | 35,1 | 32,5 | 29,1 | 25 | 19,5 | 15,8 |
| Laskentapiste B | 41,2 | 40,1 | 39,1 | 38,1 | 36,9 | 35,2 | 32,6 | 29,2 | 25,1 | 19,6 | 15,9 |
| Laskentapiste C | 42 | 40,9 | 39,9 | 38,9 | 37,7 | 36 | 33,4 | 30,1 | 26 | 20,6 | 17 |
| Laskentapiste D | 41,9 | 40,8 | 39,8 | 38,8 | 37,6 | 35,9 | 33,3 | 30 | 25,9 | 20,5 | 16,9 |
| Laskentapiste E | 41,9 | 40,8 | 39,7 | 38,8 | 37,6 | 35,9 | 33,3 | 30 | 25,9 | 20,5 | 16,8 |
| Laskentapiste F | 41,6 | 40,6 | 39,5 | 38,6 | 37,4 | 35,6 | 33,1 | 29,7 | 25,7 | 20,2 | 16,6 |
| Laskentapiste G | 40,8 | 39,7 | 38,7 | 37,7 | 36,5 | 34,8 | 32,2 | 28,9 | 24,8 | 19,3 | 15,7 |
| Laskentapiste H | 39,3 | 38,3 | 37,2 | 36,2 | 35 | 33,2 | 30,6 | 27,2 | 23,1 | 17,5 | 13,7 |
| Laskentapiste I | 41,7 | 40,6 | 39,5 | 38,6 | 37,4 | 35,7 | 33,1 | 29,8 | 25,8 | 20,4 | 16,9 |
| Laskentapiste J | 38,9 | 37,8 | 36,7 | 35,7 | 34,5 | 32,7 | 30,1 | 26,7 | 22,5 | 16,8 | 13 |
| Laskentapiste K | 37,6 | 36,5 | 35,4 | 34,4 | 33,2 | 31,4 | 28,7 | 25,2 | 20,9 | 15 | 11 |
| Laskentapiste L | 39,7 | 38,7 | 37,6 | 36,6 | 35,5 | 33,7 | 31,1 | 27,8 | 23,7 | 18,3 | 14,7 |
| Laskentapiste M | 39,6 | 38,5 | 37,4 | 36,4 | 35,2 | 33,5 | 30,9 | 27,5 | 23,4 | 17,8 | 14,1 |
| Laskentapiste N | 39,4 | 38,4 | 37,3 | 36,3 | 35,1 | 33,3 | 30,7 | 27,3 | 23,2 | 17,6 | 13,9 |
| Laskentapiste O | 39,4 | 38,3 | 37,2 | 36,2 | 35,1 | 33,3 | 30,6 | 27,2 | 23,1 | 17,5 | 13,7 |

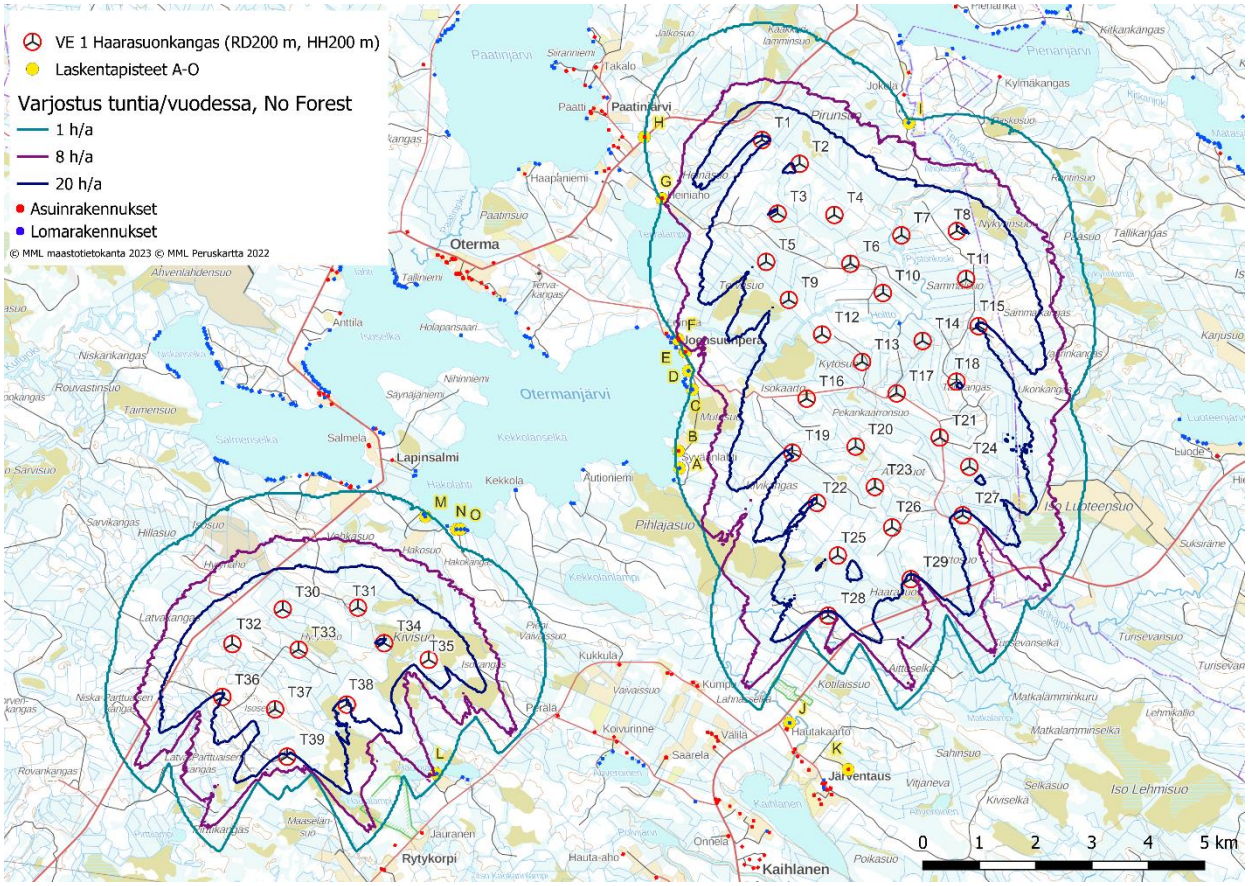
*Taulukko 12. Matalataajuisen melun laskentatulokset VE2*

| Pienitaajuisen melun laskenta menetelmä: ISO 9613-2, Anojanssi (Keränen, Hakala ja Hongisto, 2019) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terssin painottamaton äänitaso Leq dB - altistuvien laskentapisteiden (rakennusten) sisätilossa | | | | | | | | | | | |
| Terssikaista [Hz] | 20 | 25 | 31,5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
| Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat LZeq,1h, dB | 74,0 | 64,0 | 56,0 | 49,0 | 44,0 | 42,0 | 40,0 | 38,0 | 36,0 | 34,0 | 32,0 |
| Laskentapiste A | 40,7 | 39,6 | 38,6 | 37,6 | 36,4 | 34,7 | 32,1 | 28,8 | 24,7 | 19,2 | 15,6 |
| Laskentapiste B | 40,8 | 39,7 | 38,7 | 37,7 | 36,5 | 34,8 | 32,2 | 28,9 | 24,8 | 19,4 | 15,7 |
| Laskentapiste C | 41,7 | 40,6 | 39,6 | 38,6 | 37,5 | 35,7 | 33,2 | 29,9 | 25,9 | 20,4 | 16,9 |
| Laskentapiste D | 41,6 | 40,6 | 39,5 | 38,6 | 37,4 | 35,7 | 33,1 | 29,8 | 25,8 | 20,3 | 16,7 |
| Laskentapiste E | 41,6 | 40,5 | 39,5 | 38,5 | 37,4 | 35,6 | 33,1 | 29,8 | 25,8 | 20,3 | 16,7 |
| Laskentapiste F | 41,4 | 40,3 | 39,3 | 38,3 | 37,1 | 35,4 | 32,8 | 29,5 | 25,5 | 20,1 | 16,5 |
| Laskentapiste G | 40,6 | 39,5 | 38,5 | 37,5 | 36,4 | 34,6 | 32 | 28,7 | 24,7 | 19,3 | 15,7 |
| Laskentapiste H | 39,1 | 38 | 37 | 36 | 34,8 | 33 | 30,4 | 27 | 22,9 | 17,4 | 13,6 |
| Laskentapiste I | 41,6 | 40,5 | 39,5 | 38,5 | 37,3 | 35,6 | 33,1 | 29,8 | 25,8 | 20,4 | 16,9 |
| Laskentapiste J | 38,4 | 37,3 | 36,2 | 35,2 | 34 | 32,2 | 29,6 | 26,2 | 22,1 | 16,5 | 12,7 |
| Laskentapiste K | 37,1 | 36 | 34,9 | 33,9 | 32,7 | 30,9 | 28,2 | 24,7 | 20,5 | 14,7 | 10,7 |
| Laskentapiste L | 32,2 | 31 | 29,9 | 28,8 | 27,5 | 25,5 | 22,6 | 18,7 | 13,8 | 7,1 | 1,9 |
| Laskentapiste M | 34 | 32,9 | 31,8 | 30,7 | 29,4 | 27,5 | 24,7 | 21 | 16,3 | 9,9 | 5,1 |
| Laskentapiste N | 34,5 | 33,4 | 32,3 | 31,2 | 30 | 28 | 25,3 | 21,6 | 16,9 | 10,7 | 5,9 |
| Laskentapiste O | 34,6 | 33,4 | 32,4 | 31,3 | 30 | 28,1 | 25,3 | 21,6 | 17 | 10,8 | 6,1 |

## 3.2 Varjostus

### 3.2.1 Hankevaihtoehto VE1, “Real Case, No forest”

Hankevaihtoehdossa 1 varjostusvaikutusalueelle (8 h/a) ei sijoitu asuin- tai lomarakennuksia. Mallinnustulosten mukaan varjostusta ilmenee enimmillään 7 h 32 min vuodessa hankealueen länsipuolella sijaitsevan lomarakennuksen (laskentapiste L) alueella. Tarkemmat laskentatulokset on esitetty liitteessä 5.



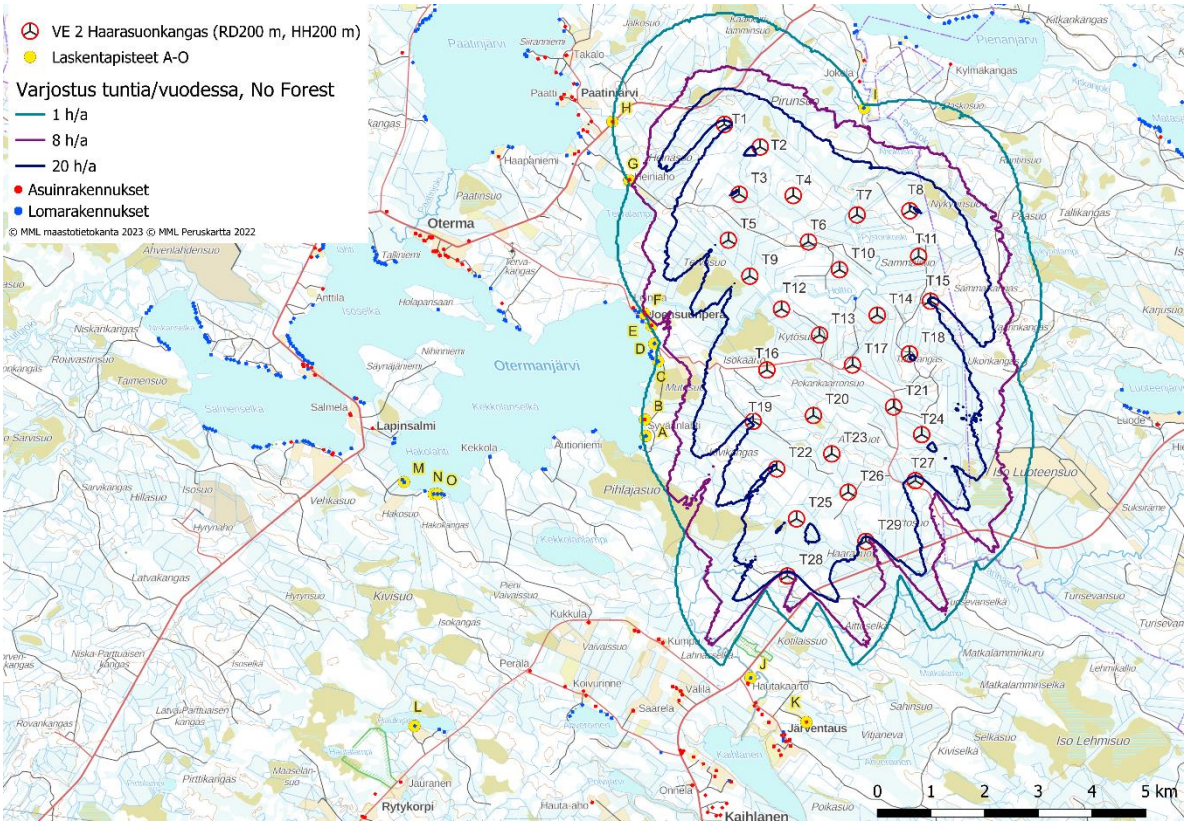

*Kuva 3. Varjostusmallinnuksen tulos hankevaihtoehdossa 1 (puuston suojaavaa vaikutusta ei ole huomioitu)*

*Taulukko 13. Varjostusmallinnuksen tulos VE1, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real case, No Forest".*

| Rakennus | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskentaikkuna (m) | Varjostus (h/a) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 x 5,0 | 2:19 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 x 5,0 | 1:59 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 x 5,0 | 1:52 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 5,0 x 5,0 | 3:13 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 x 5,0 | 5:39 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 x 5,0 | 0:00 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 5,0 x 5,0 | 3:16 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 x 5,0 | 0:00 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 5,0 x 5,0 | 7:32 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 x 5,0 | 1:51 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 x 5,0 | 0:00 |

### 3.2.2 Hankevaihtoehto VE2, “Real Case, No Forest”

Hankevaihtoehdossa 2 varjostusvaikutusalueelle (8 h/a) ei sijoitu asuin- tai lomarakennuksia. Mallinnustulosten mukaan varjostusta ilmenee enimmillään 5 h 39 min vuodessa, hankealueen länsipuolella sijaitsevan asuinrakennuksen (laskentapiste G) alueella. Tarkemmat laskentatulokset on esitetty liitteessä 6.




*Kuva 4. Varjostusmallinnuksen tulos hankevaihtoehdossa 2 (puuston suojaavaa vaikutusta ei ole huomioitu)*

*Taulukko 14. Varjostusmallinnuksen tulos VE2, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real case, No forest".*

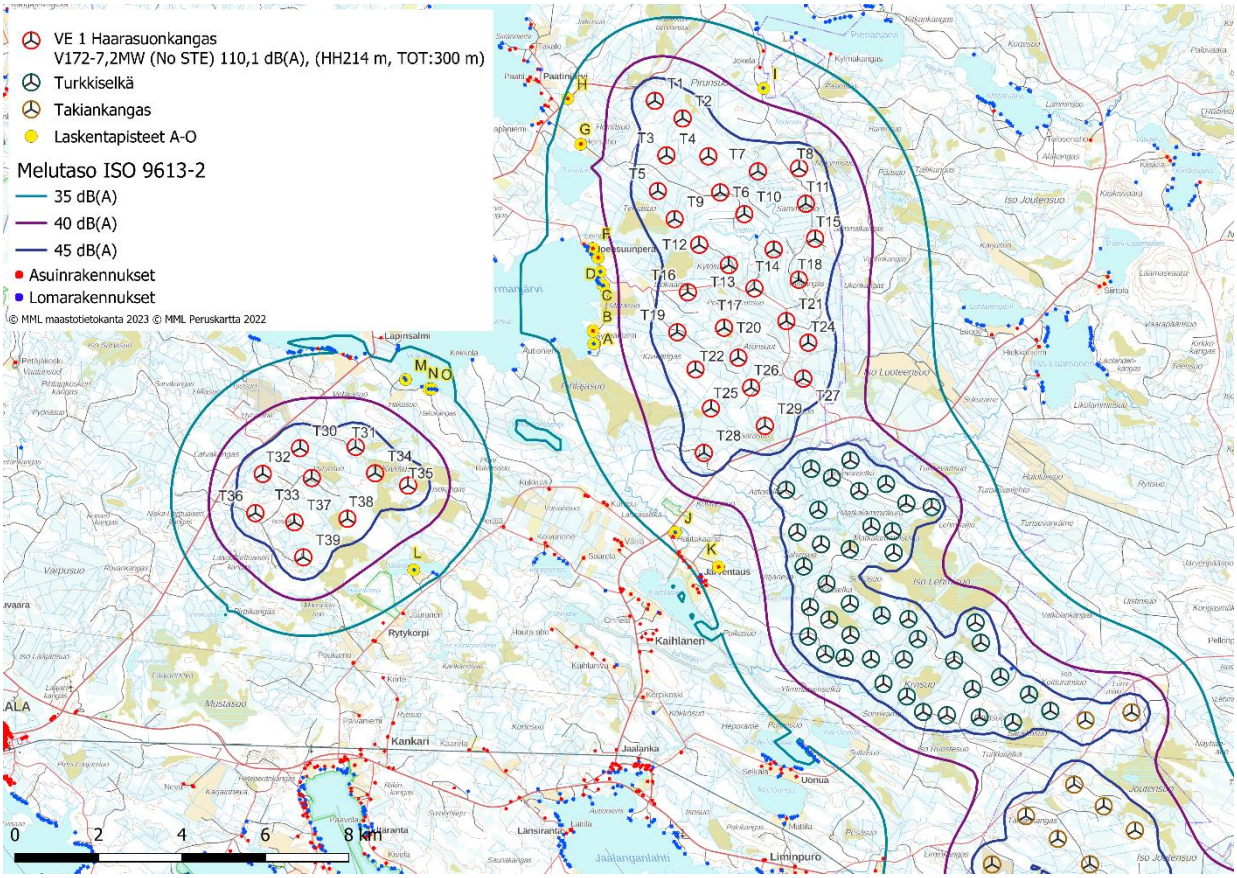
| Rakennus | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskentaikkuna (m) | Varjostus (h/a) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 x 5,0 | 2:19 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 x 5,0 | 1:59 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 x 5,0 | 1:52 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 5,0 x 5,0 | 3:13 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 x 5,0 | 5:39 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 x 5,0 | 0:00 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 5,0 x 5,0 | 3:16 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 x 5,0 | 0:00 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 5,0 x 5,0 | 0:00 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 x 5,0 | 0:00 |

# 4 MELUN JA VARJOSTUKSEN YHTEISMALLINNUSTEN TULOKSET

## 4.1 Melu

### 4.1.1 VE1: Yhteismelun laskentatulokset (ISO 9613-2)

Hankevaihtoehdon 1 (VE1) yhteismelun mallinnuksen mukaan melutaso 40 dB(A) ei ylity Haarasuonkankaan tuulivoimapuiston lähimmillä asuin- ja lomarakennuksilla. Katso tarkemmat laskentatulokset liitteestä 7.



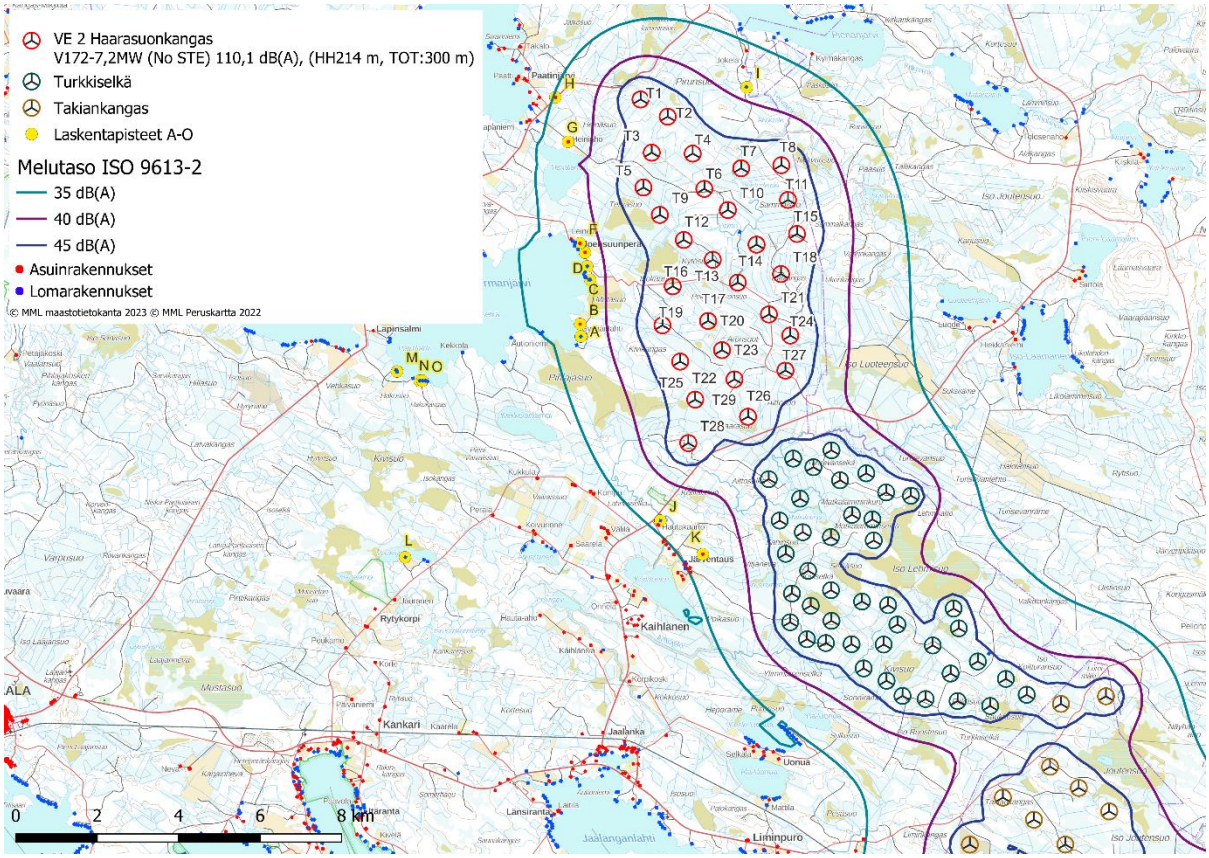

*Kuva 5. Melun yhteisvaikutuksen mallinnuksen tulos hankevaihtoehdossa VE1.*

*Taulukko 15. Laskennalliset yhteismelun tasot Haarasuonkankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 1*

| Laskentapiste | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskenta-korkeus (m) | Melutaso dB(A) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4 | 37,4 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4 | 37,5 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4 | 38,7 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4 | 38,5 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 4 | 38,5 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4 | 38,2 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4 | 37,4 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4 | 35,3 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 4 | 38,7 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4 | 36 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4 | 36,5 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 4 | 37,8 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4 | 36,1 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4 | 35,6 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4 | 35,5 |

### 4.1.2 VE2: Yhteismelun laskentatulokset (ISO 9613-2)

Hankevaihtoehdon 2 (VE2) yhteismelun mallinnuksen mukaan melutaso 40 dB(A) ei ylity Haarasuonkankaan tuulivoimapuiston lähimmillä asuin- ja lomarakennuksilla. Katso tarkemmat laskentatulokset liitteestä 8.




*Kuva 6. Melumallinnuksen tulos vaihtoehdossa VE 2.*

*Taulukko 16. Laskennalliset yhteismelun tasot Haarasuonkankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 2*

| Laskentapiste | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskenta-korkeus (m) | Melutaso dB(A) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4 | 37,2 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4 | 37,3 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4 | 38,5 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4 | 38,4 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 4 | 38,4 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4 | 38,1 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4 | 37,4 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4 | 35,2 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 4 | 38,7 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4 | 35,8 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4 | 36,4 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 4 | 26,6 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4 | 28,3 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4 | 28,3 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4 | 28,5 |

### 4.1.3 Matalataajuiset melutasot

Haarasuonkankaan, Turkkiselän ja Takiankankaan tuulivoimahankkeiden aiheuttama matalataajuinen yhteismelu ei Haarasuonkankaan kummassakaan hankevaihtoehdossa ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteiden sisätiloissa.

Haarasuonkankaan hankevaihtoehdon 1 tulokset laskentapisteittäin on esitetty taulukossa 17 ja hankevaihtoehdon 2 tulokset taulukossa 18. Taulukoissa näkyy jokaisen laskentapisteen terssikaistakohtaiset arvot. Tarkemmat matalataajuisen yhteismelun laskentatulokset ja kuvaajat on esitetty liitteessä 9 ja 10.

*Taulukko 17. Matalataajuisen yhteismelun laskentatulokset VE1*

| Pienitaajuisen melun laskenta menetelmä: ISO 9613-2, Anojanssi (Keränen, Hakala ja Hongisto, 2019) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terssin painottamaton äänitaso Leq dB - altistuvien laskentapisteiden (rakennusten) sisätilossa | | | | | | | | | | | |
| Terssikaista [Hz] | 20 | 25 | 31,5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
| Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat LZeq,1h, dB | 74,0 | 64,0 | 56,0 | 49,0 | 44,0 | 42,0 | 40,0 | 38,0 | 36,0 | 34,0 | 32,0 |
| Laskentapiste A | 43 | 41,4 | 40,4 | 39 | 37,8 | 35,7 | 32,9 | 29,6 | 25,2 | 19,6 | 15,9 |
| Laskentapiste B | 43 | 41,4 | 40,4 | 39 | 37,9 | 35,7 | 33 | 29,7 | 25,3 | 19,7 | 16 |
| Laskentapiste C | 43,4 | 41,9 | 40,8 | 39,6 | 38,4 | 36,4 | 33,7 | 30,4 | 26,2 | 20,7 | 17 |
| Laskentapiste D | 43,2 | 41,8 | 40,7 | 39,5 | 38,3 | 36,3 | 33,6 | 30,3 | 26,1 | 20,6 | 16,9 |
| Laskentapiste E | 43,2 | 41,7 | 40,7 | 39,4 | 38,3 | 36,2 | 33,6 | 30,3 | 26 | 20,5 | 16,9 |
| Laskentapiste F | 43 | 41,5 | 40,4 | 39,2 | 38 | 36 | 33,3 | 30 | 25,8 | 20,3 | 16,6 |
| Laskentapiste G | 42 | 40,5 | 39,5 | 38,3 | 37,1 | 35,1 | 32,4 | 29,1 | 24,9 | 19,4 | 15,7 |
| Laskentapiste H | 40,7 | 39,2 | 38,1 | 36,9 | 35,7 | 33,6 | 30,9 | 27,5 | 23,2 | 17,5 | 13,7 |
| Laskentapiste I | 42,7 | 41,3 | 40,2 | 39,1 | 37,9 | 36 | 33,3 | 30 | 25,9 | 20,5 | 16,9 |
| Laskentapiste J | 44,7 | 42,4 | 41,4 | 39,5 | 38,4 | 35,2 | 32,2 | 29,3 | 23,8 | 17,9 | 14 |
| Laskentapiste K | 46,2 | 43,7 | 42,7 | 40,5 | 39,5 | 35,8 | 32,6 | 30,1 | 23,7 | 17,7 | 13,7 |
| Laskentapiste L | 41,5 | 40 | 38,9 | 37,6 | 36,4 | 34,2 | 31,5 | 28,2 | 23,9 | 18,4 | 14,8 |
| Laskentapiste M | 41,1 | 39,6 | 38,5 | 37,2 | 36 | 33,9 | 31,2 | 27,8 | 23,5 | 17,9 | 14,2 |
| Laskentapiste N | 41,1 | 39,6 | 38,5 | 37,2 | 36 | 33,8 | 31,1 | 27,7 | 23,3 | 17,7 | 13,9 |
| Laskentapiste O | 41,1 | 39,5 | 38,5 | 37,1 | 35,9 | 33,8 | 31 | 27,7 | 23,3 | 17,6 | 13,8 |

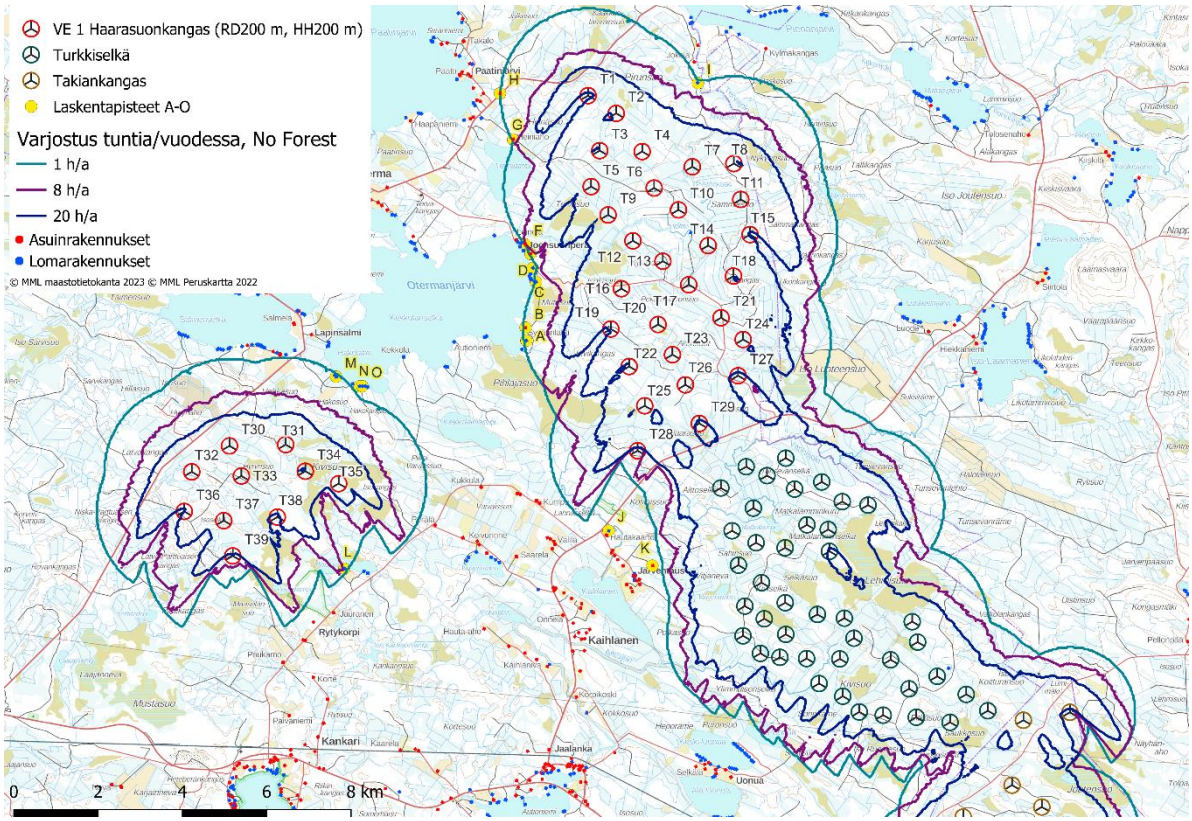
*Taulukko 18. Matalataajuisen yhteismelun laskentatulokset VE2*

| Pienitaajuisen melun laskenta menetelmä: ISO 9613-2, Anojanssi (Keränen, Hakala ja Hongisto, 2019) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Terssin painottamaton äänitaso Leq dB - altistuvien laskentapisteiden (rakennusten) sisätilossa | | | | | | | | | | | |
| Terssikaista [Hz] | 20 | 25 | 31,5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 |
| Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat LZeq,1h, dB | 74,0 | 64,0 | 56,0 | 49,0 | 44,0 | 42,0 | 40,0 | 38,0 | 36,0 | 34,0 | 32,0 |
| Laskentapiste A | 42,8 | 41,1 | 40,1 | 38,7 | 37,5 | 35,3 | 32,6 | 29,3 | 24,9 | 19,4 | 15,7 |
| Laskentapiste B | 42,7 | 41,1 | 40,1 | 38,7 | 37,6 | 35,4 | 32,7 | 29,4 | 25 | 19,5 | 15,8 |
| Laskentapiste C | 43,2 | 41,7 | 40,6 | 39,4 | 38,2 | 36,2 | 33,5 | 30,2 | 26 | 20,5 | 16,9 |
| Laskentapiste D | 43,1 | 41,6 | 40,5 | 39,3 | 38,1 | 36,1 | 33,4 | 30,1 | 25,9 | 20,4 | 16,8 |
| Laskentapiste E | 43 | 41,5 | 40,5 | 39,2 | 38,1 | 36 | 33,4 | 30,1 | 25,9 | 20,4 | 16,8 |
| Laskentapiste F | 42,8 | 41,3 | 40,2 | 39 | 37,8 | 35,8 | 33,1 | 29,9 | 25,6 | 20,1 | 16,5 |
| Laskentapiste G | 41,8 | 40,4 | 39,3 | 38,1 | 36,9 | 34,9 | 32,3 | 29 | 24,8 | 19,3 | 15,7 |
| Laskentapiste H | 40,5 | 39 | 37,9 | 36,7 | 35,5 | 33,4 | 30,7 | 27,3 | 23 | 17,4 | 13,7 |
| Laskentapiste I | 42,6 | 41,2 | 40,2 | 39 | 37,8 | 35,9 | 33,3 | 30 | 25,8 | 20,4 | 16,9 |
| Laskentapiste J | 44,5 | 42,2 | 41,2 | 39,2 | 38,2 | 34,9 | 31,9 | 29,1 | 23,5 | 17,7 | 13,8 |
| Laskentapiste K | 46,1 | 43,6 | 42,6 | 40,4 | 39,4 | 35,6 | 32,5 | 30 | 23,5 | 17,5 | 13,6 |
| Laskentapiste L | 38,1 | 35,8 | 34,7 | 32,7 | 31,4 | 28,2 | 24,9 | 21,3 | 15,2 | 8,2 | 2,8 |
| Laskentapiste M | 38 | 36 | 34,8 | 33,1 | 31,9 | 29 | 25,9 | 22,3 | 16,9 | 10,3 | 5,4 |
| Laskentapiste N | 38,5 | 36,4 | 35,3 | 33,6 | 32,3 | 29,5 | 26,5 | 22,9 | 17,5 | 11,1 | 6,2 |
| Laskentapiste O | 38,5 | 36,5 | 35,4 | 33,7 | 32,4 | 29,6 | 26,6 | 23 | 17,6 | 11,2 | 6,4 |

## 4.2 Varjostus

### 4.2.1 VE 1: Varjostuksen yhteisvaikutus, ”Real Case, No Forest”

Hankevaihtoehdossa 1 yhteisvaikutusmallinnuksen varjostusvaikutusalueelle (8 h/a) ei sijoitu asuin- tai lomarakennuksia. Mallinnustulosten mukaan varjostusta ilmenee enimmillään 7 h 40 min vuodessa hankealueen eteläpuolella sijaitsevan lomarakennuksen (laskentapiste L) alueella. Tarkemmat laskentatulokset on esitetty liitteessä 11.



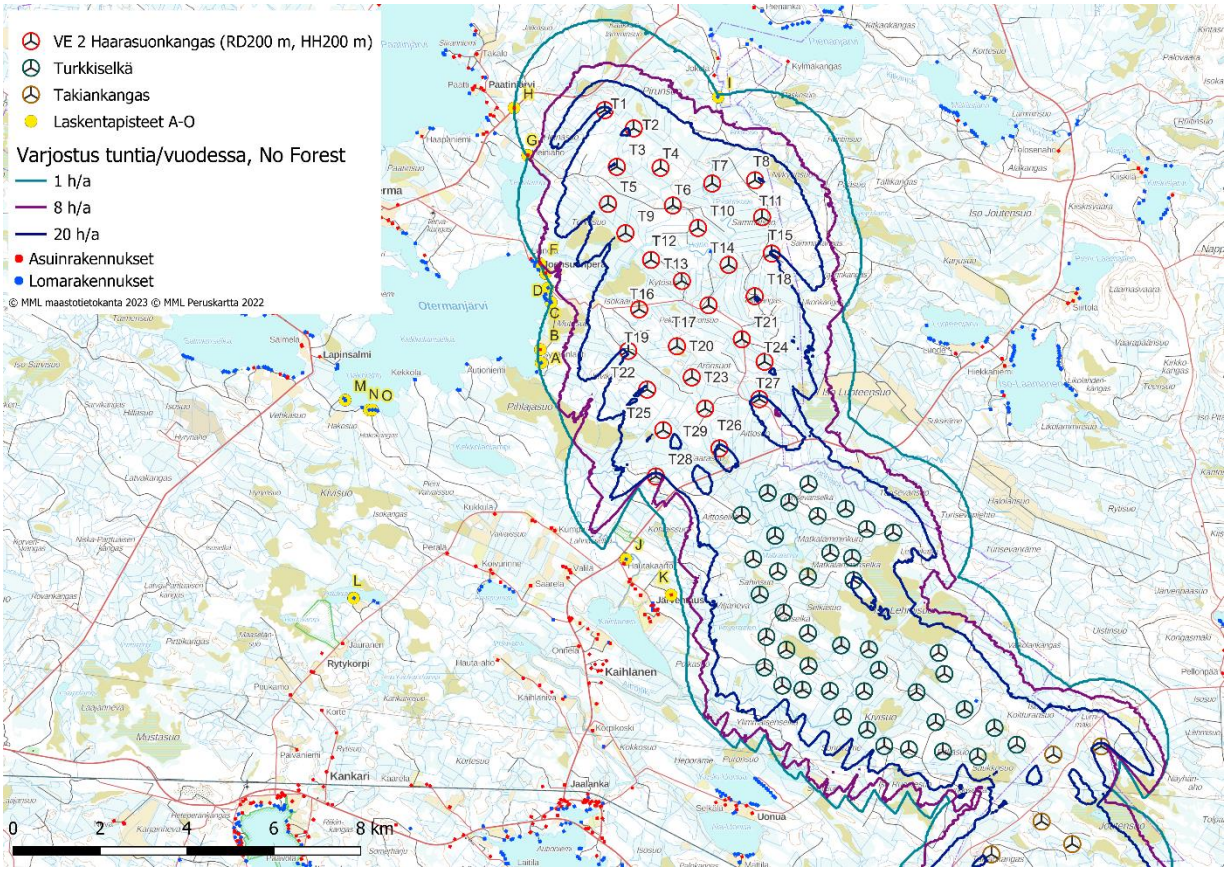

*Kuva 7. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 1 (puuston suojaavaa vaikutusta ei ole huomioitu)*

*Taulukko 19. Varjostuksen yhteismallinnuksen tulos VE1, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, No Forest".*

| Rakennus | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskentaikkuna (m) | Varjostus (h/a) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 x 5,0 | 2:21 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 x 5,0 | 2:01 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 x 5,0 | 1:53 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 5,0 x 5,0 | 3:16 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 x 5,0 | 5:44 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 x 5,0 | 0:00 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 5,0 x 5,0 | 3:19 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 x 5,0 | 0:00 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 5,0 x 5,0 | 7:40 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 x 5,0 | 1:53 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 x 5,0 | 0:00 |

### 4.2.2 VE 2: Varjostuksen yhteisvaikutus ”Real Case, No Forest”

Hankevaihtoehdossa 2 yhteisvaikutusmallinnuksen varjostusvaikutusalueelle (8 h/a) ei sijoitu asuin- tai lomarakennuksia. Mallinnustulosten mukaan varjostusta ilmenee enimmillään 5 h 45 min vuodessa hankealueen eteläpuolella sijaitsevan asuinrakennuksen (laskentapiste G) alueella. Tarkemmat laskentatulokset on esitetty liitteessä 12.




*Kuva 8. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 2 (puuston suojaavaa vaikutusta ei ole huomioitu)*

*Taulukko 20. Varjostuksen yhteismallinnuksen tulos VE2, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, No Forest".*

| Rakennus | ETRS89-TM35 Itä | ETRS89-TM35 Pohjoinen | Z (m) | Laskentaikkuna (m) | Varjostus (h/a) |
|---|---|---|---|---|---|
| Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 x 5,0 | 2:21 |
| Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 x 5,0 | 2:01 |
| Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 x 5,0 | 1:54 |
| Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145 | 5,0 x 5,0 | 3:17 |
| Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 x 5,0 | 5:45 |
| Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 x 5,0 | 0:00 |
| Lomarakennus I | 510 890 | 7 175 161 | 155 | 5,0 x 5,0 | 3:19 |
| Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 x 5,0 | 0:00 |
| Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 x 5,0 | 0:00 |
| Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140 | 5,0 x 5,0 | 0:00 |
| Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 x 5,0 | 0:00 |
| Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 x 5,0 | 0:00 |

**FCG Finnish Consulting Group Oy**

Miikka Saranpää, ins. AMK
Laatija

Liisa Karhu, FM
Tarkastaja

## Liite 1. Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 - Hankevaihtoehto 1

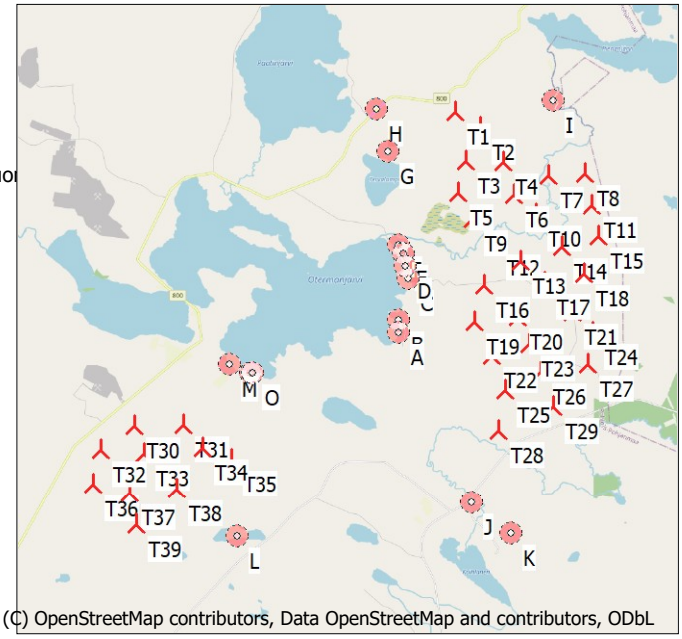
Licensed user:
**FCG Finnish Consulting Group Oy**
Osmontie 34, PO Box 950
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+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE1_V172x39xHH214_2023058

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuo
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:200 000
New WTG
Noise sensitive area

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | Wind speed | LwA,ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T30 | 499 777 | 7 166 541 | 137,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T31 | 501 112 | 7 166 571 | 140,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T32 | 498 884 | 7 165 924 | 140,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T33 | 500 060 | 7 165 826 | 146,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T34 | 501 577 | 7 165 939 | 141,7 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T35 | 502 368 | 7 165 645 | 147,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T36 | 498 706 | 7 164 985 | 147,2 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T37 | 499 643 | 7 164 765 | 154,4 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T38 | 500 913 | 7 164 850 | 150,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T39 | 499 856 | 7 163 927 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |

## Calculation Results

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# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058

## Sound level

| Noise sensitive area | | | | | | Demands | Sound level | |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z [m] | Immission height [m] | Noise [dB(A)] | From WTGs [dB(A)] | Distance to noise demand [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 40,0 | 37,2 | 673 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 40,0 | 37,3 | 657 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 40,0 | 38,6 | 384 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 40,0 | 38,4 | 426 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 40,0 | 38,4 | 411 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 40,0 | 38,1 | 475 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 40,0 | 37,4 | 559 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 40,0 | 35,2 | 978 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 40,0 | 38,6 | 330 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 40,0 | 34,4 | 1 029 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 40,0 | 32,2 | 1 734 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 40,0 | 37,7 | 720 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 40,0 | 36,0 | 827 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 40,0 | 35,5 | 953 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 40,0 | 35,4 | 998 |

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T30 | 7471 | 7562 | 8247 | 8343 | 8473 | 8491 | 9912 | 10547 | 14064 | 9214 | 10427 | 3990 | 3016 | 3392 | 3457 |
| T31 | 6218 | 6329 | 7083 | 7206 | 7365 | 7407 | 9035 | 9767 | 13015 | 7925 | 9160 | 3257 | 2008 | 2230 | 2287 |
| T32 | 8524 | 8625 | 9327 | 9426 | 9559 | 9577 | 10974 | 11585 | 15148 | 9983 | 11150 | 4286 | 4102 | 4465 | 4529 |
| T33 | 7483 | 7604 | 8370 | 8495 | 8652 | 8692 | 10268 | 10962 | 14297 | 8804 | 9978 | 3287 | 3257 | 3517 | 3575 |
| T34 | 6090 | 6237 | 7081 | 7239 | 7429 | 7498 | 9295 | 10091 | 13106 | 7329 | 8532 | 2492 | 2361 | 2390 | 2431 |
| T35 | 5598 | 5775 | 6697 | 6886 | 7105 | 7201 | 9163 | 10026 | 12774 | 6497 | 7692 | 2024 | 2541 | 2363 | 2381 |
| T36 | 9070 | 9195 | 9964 | 10087 | 10240 | 10276 | 11785 | 12434 | 15875 | 10073 | 11178 | 4031 | 4817 | 5107 | 5166 |
| T37 | 8353 | 8499 | 9327 | 9472 | 9649 | 9704 | 11362 | 12078 | 15316 | 9129 | 10222 | 3077 | 4335 | 4532 | 4584 |
| T38 | 7241 | 7409 | 8296 | 8468 | 8669 | 8747 | 10571 | 11364 | 14348 | 7862 | 8970 | 2006 | 3614 | 3666 | 3706 |
| T39 | 8639 | 8809 | 9699 | 9869 | 10067 | 10142 | 11920 | 12682 | 15746 | 8932 | 9956 | 2662 | 4913 | 5026 | 5070 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

| | |
|---|---|
| LWA,ref: | Sound pressure level at WTG |
| K: | Pure tone |
| Dc: | Directivity correction |
| Adiv: | the attenuation due to geometrical divergence |
| Aatm: | the attenuation due to atmospheric absorption |
| Agr: | the attenuation due to ground effect |
| Abar: | the attenuation due to a barrier |
| Amisc: | the attenuation due to miscellaneous other effects |
| Cmet: | Meteorological correction |

## Calculation Results

### Noise sensitive area: A Lomarakennus A (Syvälahti)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6 000 | 6 004 | **15,94** | 110,1 | 0,00 | 86,57 | - | - | 0,00 | 0,00 | - |
| T10 | 4 760 | 4 765 | **19,09** | 110,1 | 0,00 | 84,56 | - | - | 0,00 | 0,00 | - |
| T11 | 6 091 | 6 094 | **15,72** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T12 | 3 465 | 3 471 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T13 | 3 747 | 3 753 | **22,28** | 110,1 | 0,00 | 82,49 | - | - | 0,00 | 0,00 | - |
| T14 | 4 867 | 4 872 | **18,79** | 110,1 | 0,00 | 84,75 | - | - | 0,00 | 0,00 | - |
| T15 | 5 872 | 5 876 | **16,22** | 110,1 | 0,00 | 86,38 | - | - | 0,00 | 0,00 | - |
| T16 | 2 570 | 2 579 | **27,10** | 110,1 | 0,00 | 79,23 | - | - | 0,00 | 0,00 | - |
| T17 | 4 073 | 4 079 | **21,18** | 110,1 | 0,00 | 83,21 | - | - | 0,00 | 0,00 | - |
| T18 | 5 148 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T19 | 2 022 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 802 | 5 806 | **16,39** | 110,1 | 0,00 | 86,28 | - | - | 0,00 | 0,00 | - |
| T20 | 3 148 | 3 155 | **24,55** | 110,1 | 0,00 | 80,98 | - | - | 0,00 | 0,00 | - |
| T21 | 4 649 | 4 654 | **19,41** | 110,1 | 0,00 | 84,36 | - | - | 0,00 | 0,00 | - |
| T22 | 2 516 | 2 525 | **27,37** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T23 | 3 482 | 3 489 | **23,24** | 110,1 | 0,00 | 81,85 | - | - | 0,00 | 0,00 | - |
| T24 | 5 142 | 5 147 | **18,04** | 110,1 | 0,00 | 85,23 | - | - | 0,00 | 0,00 | - |
| T25 | 3 207 | 3 214 | **24,31** | 110,1 | 0,00 | 81,14 | - | - | 0,00 | 0,00 | - |
| T26 | 3 916 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 5 092 | 5 096 | **18,18** | 110,1 | 0,00 | 85,14 | - | - | 0,00 | 0,00 | - |
| T28 | 3 716 | 3 722 | **22,40** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T29 | 4 551 | 4 556 | **19,70** | 110,1 | 0,00 | 84,17 | - | - | 0,00 | 0,00 | - |
| T3 | 4 836 | 4 841 | **18,88** | 110,1 | 0,00 | 84,70 | - | - | 0,00 | 0,00 | - |
| T30 | 7 471 | 7 474 | **14,30** | 110,1 | 0,00 | 88,47 | - | - | 0,00 | 0,00 | - |
| T31 | 6 218 | 6 221 | **16,54** | 110,1 | 0,00 | 86,88 | - | - | 0,00 | 0,00 | - |
| T32 | 8 524 | 8 527 | **12,64** | 110,1 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| T33 | 7 483 | 7 486 | **14,22** | 110,1 | 0,00 | 88,49 | - | - | 0,00 | 0,00 | - |
| T34 | 6 090 | 6 094 | **16,75** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T35 | 5 598 | 5 602 | **17,68** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T36 | 9 070 | 9 072 | **11,80** | 110,1 | 0,00 | 90,15 | - | - | 0,00 | 0,00 | - |
| T37 | 8 353 | 8 356 | **12,79** | 110,1 | 0,00 | 89,44 | - | - | 0,00 | 0,00 | - |
| T38 | 7 241 | 7 245 | **14,37** | 110,1 | 0,00 | 88,20 | - | - | 0,00 | 0,00 | - |
| T39 | 8 639 | 8 641 | **12,15** | 110,1 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| T4 | 5 263 | 5 268 | **17,73** | 110,1 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |
| T5 | 3 967 | 3 973 | **21,53** | 110,1 | 0,00 | 82,98 | - | - | 0,00 | 0,00 | - |
| T6 | 4 724 | 4 729 | **19,19** | 110,1 | 0,00 | 84,50 | - | - | 0,00 | 0,00 | - |
| T7 | 5 704 | 5 708 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T8 | 6 472 | 6 476 | **14,87** | 110,1 | 0,00 | 87,23 | - | - | 0,00 | 0,00 | - |
| T9 | 3 559 | 3 565 | **22,96** | 110,1 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,24** | | | | | | | | |

- Data undefined due to calculation with octave data

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9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 5 708 | 5 712 | **16,64** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T10 | 4 581 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T11 | 5 943 | 5 947 | **16,06** | 110,1 | 0,00 | 86,49 | - | - | 0,00 | 0,00 | - |
| T12 | 3 277 | 3 284 | **24,03** | 110,1 | 0,00 | 81,33 | - | - | 0,00 | 0,00 | - |
| T13 | 3 619 | 3 625 | **22,74** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T14 | 4 750 | 4 755 | **19,12** | 110,1 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |
| T15 | 5 764 | 5 769 | **16,48** | 110,1 | 0,00 | 86,22 | - | - | 0,00 | 0,00 | - |
| T16 | 2 455 | 2 465 | **27,67** | 110,1 | 0,00 | 78,84 | - | - | 0,00 | 0,00 | - |
| T17 | 4 001 | 4 007 | **21,42** | 110,1 | 0,00 | 83,06 | - | - | 0,00 | 0,00 | - |
| T18 | 5 082 | 5 088 | **18,20** | 110,1 | 0,00 | 85,13 | - | - | 0,00 | 0,00 | - |
| T19 | 2 021 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 525 | 5 530 | **17,06** | 110,1 | 0,00 | 85,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 143 | 3 151 | **24,56** | 110,1 | 0,00 | 80,97 | - | - | 0,00 | 0,00 | - |
| T21 | 4 641 | 4 646 | **19,43** | 110,1 | 0,00 | 84,34 | - | - | 0,00 | 0,00 | - |
| T22 | 2 624 | 2 633 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T23 | 3 542 | 3 549 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T24 | 5 168 | 5 172 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T25 | 3 380 | 3 387 | **23,63** | 110,1 | 0,00 | 81,60 | - | - | 0,00 | 0,00 | - |
| T26 | 4 026 | 4 032 | **21,34** | 110,1 | 0,00 | 83,11 | - | - | 0,00 | 0,00 | - |
| T27 | 5 168 | 5 173 | **17,97** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T28 | 3 949 | 3 955 | **21,59** | 110,1 | 0,00 | 82,94 | - | - | 0,00 | 0,00 | - |
| T29 | 4 707 | 4 712 | **19,24** | 110,1 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| T3 | 4 558 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T30 | 7 562 | 7 565 | **13,56** | 110,1 | 0,00 | 88,58 | - | - | 0,00 | 0,00 | - |
| T31 | 6 329 | 6 333 | **15,61** | 110,1 | 0,00 | 87,03 | - | - | 0,00 | 0,00 | - |
| T32 | 8 625 | 8 627 | **11,91** | 110,1 | 0,00 | 89,72 | - | - | 0,00 | 0,00 | - |
| T33 | 7 604 | 7 607 | **13,28** | 110,1 | 0,00 | 88,62 | - | - | 0,00 | 0,00 | - |
| T34 | 6 237 | 6 240 | **15,86** | 110,1 | 0,00 | 86,90 | - | - | 0,00 | 0,00 | - |
| T35 | 5 775 | 5 779 | **16,94** | 110,1 | 0,00 | 86,24 | - | - | 0,00 | 0,00 | - |
| T36 | 9 195 | 9 197 | **10,89** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T37 | 8 499 | 8 502 | **12,02** | 110,1 | 0,00 | 89,59 | - | - | 0,00 | 0,00 | - |
| T38 | 7 409 | 7 412 | **13,75** | 110,1 | 0,00 | 88,40 | - | - | 0,00 | 0,00 | - |
| T39 | 8 809 | 8 812 | **11,59** | 110,1 | 0,00 | 89,90 | - | - | 0,00 | 0,00 | - |
| T4 | 5 014 | 5 019 | **18,39** | 110,1 | 0,00 | 85,01 | - | - | 0,00 | 0,00 | - |
| T5 | 3 694 | 3 700 | **22,47** | 110,1 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| T6 | 4 506 | 4 511 | **19,83** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T7 | 5 500 | 5 504 | **17,12** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T8 | 6 292 | 6 296 | **15,27** | 110,1 | 0,00 | 86,98 | - | - | 0,00 | 0,00 | - |
| T9 | 3 317 | 3 323 | **23,88** | 110,1 | 0,00 | 81,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,31** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: C Lomarakennus C (Mutalahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 4 594 | 4 600 | **19,57** | 110,1 | 0,00 | 84,25 | - | - | 0,00 | 0,00 | - |
| T10 | 3 787 | 3 794 | **22,14** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T11 | 5 236 | 5 240 | **17,80** | 110,1 | 0,00 | 85,39 | - | - | 0,00 | 0,00 | - |
| T12 | 2 497 | 2 506 | **27,46** | 110,1 | 0,00 | 78,98 | - | - | 0,00 | 0,00 | - |
| T13 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T14 | 4 173 | 4 179 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T15 | 5 198 | 5 203 | **17,89** | 110,1 | 0,00 | 85,33 | - | - | 0,00 | 0,00 | - |
| T16 | 2 032 | 2 044 | **29,96** | 110,1 | 0,00 | 77,21 | - | - | 0,00 | 0,00 | - |
| T17 | 3 622 | 3 629 | **22,73** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T18 | 4 686 | 4 692 | **19,30** | 110,1 | 0,00 | 84,43 | - | - | 0,00 | 0,00 | - |
| T19 | 2 097 | 2 108 | **29,58** | 110,1 | 0,00 | 77,48 | - | - | 0,00 | 0,00 | - |
| T2 | 4 431 | 4 437 | **20,05** | 110,1 | 0,00 | 83,94 | - | - | 0,00 | 0,00 | - |
| T20 | 3 066 | 3 074 | **24,88** | 110,1 | 0,00 | 80,75 | - | - | 0,00 | 0,00 | - |
| T21 | 4 469 | 4 475 | **19,94** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T22 | 2 986 | 2 994 | **25,22** | 110,1 | 0,00 | 80,52 | - | - | 0,00 | 0,00 | - |
| T23 | 3 668 | 3 675 | **22,56** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 5 099 | 5 104 | **18,16** | 110,1 | 0,00 | 85,16 | - | - | 0,00 | 0,00 | - |
| T25 | 3 912 | 3 917 | **21,88** | 110,1 | 0,00 | 82,86 | - | - | 0,00 | 0,00 | - |
| T26 | 4 304 | 4 310 | **20,45** | 110,1 | 0,00 | 83,69 | - | - | 0,00 | 0,00 | - |
| T27 | 5 286 | 5 290 | **17,67** | 110,1 | 0,00 | 85,47 | - | - | 0,00 | 0,00 | - |
| T28 | 4 677 | 4 682 | **19,80** | 110,1 | 0,00 | 84,41 | - | - | 0,00 | 0,00 | - |
| T29 | 5 129 | 5 133 | **18,08** | 110,1 | 0,00 | 85,21 | - | - | 0,00 | 0,00 | - |
| T3 | 3 465 | 3 472 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T30 | 8 247 | 8 250 | **13,02** | 110,1 | 0,00 | 89,33 | - | - | 0,00 | 0,00 | - |
| T31 | 7 083 | 7 086 | **14,83** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T32 | 9 327 | 9 330 | **11,46** | 110,1 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| T33 | 8 370 | 8 373 | **12,81** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T34 | 7 081 | 7 084 | **14,79** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T35 | 6 697 | 6 700 | **15,43** | 110,1 | 0,00 | 87,52 | - | - | 0,00 | 0,00 | - |
| T36 | 9 964 | 9 967 | **10,58** | 110,1 | 0,00 | 90,97 | - | - | 0,00 | 0,00 | - |
| T37 | 9 327 | 9 329 | **11,39** | 110,1 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| T38 | 8 296 | 8 299 | **12,87** | 110,1 | 0,00 | 89,38 | - | - | 0,00 | 0,00 | - |
| T39 | 9 699 | 9 702 | **10,87** | 110,1 | 0,00 | 90,74 | - | - | 0,00 | 0,00 | - |
| T4 | 3 990 | 3 996 | **21,45** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T5 | 2 614 | 2 623 | **26,89** | 110,1 | 0,00 | 79,38 | - | - | 0,00 | 0,00 | - |
| T6 | 3 581 | 3 588 | **22,88** | 110,1 | 0,00 | 82,10 | - | - | 0,00 | 0,00 | - |
| T7 | 4 606 | 4 611 | **19,54** | 110,1 | 0,00 | 84,28 | - | - | 0,00 | 0,00 | - |
| T8 | 5 469 | 5 474 | **17,20** | 110,1 | 0,00 | 85,77 | - | - | 0,00 | 0,00 | - |
| T9 | 2 335 | 2 344 | **28,29** | 110,1 | 0,00 | 78,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,55** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: D Lomarakennus D (Mutaniemi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 4 300 | 4 306 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T10 | 3 720 | 3 726 | **22,38** | 110,1 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| T11 | 5 193 | 5 197 | **17,91** | 110,1 | 0,00 | 85,32 | - | - | 0,00 | 0,00 | - |
| T12 | 2 460 | 2 469 | **27,65** | 110,1 | 0,00 | 78,85 | - | - | 0,00 | 0,00 | - |
| T13 | 3 088 | 3 096 | **24,79** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T14 | 4 192 | 4 198 | **20,80** | 110,1 | 0,00 | 83,46 | - | - | 0,00 | 0,00 | - |
| T15 | 5 211 | 5 216 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T16 | 2 157 | 2 168 | **29,24** | 110,1 | 0,00 | 77,72 | - | - | 0,00 | 0,00 | - |
| T17 | 3 717 | 3 724 | **22,39** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T18 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T19 | 2 348 | 2 358 | **28,22** | 110,1 | 0,00 | 78,45 | - | - | 0,00 | 0,00 | - |
| T2 | 4 172 | 4 178 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T20 | 3 258 | 3 265 | **24,10** | 110,1 | 0,00 | 81,28 | - | - | 0,00 | 0,00 | - |
| T21 | 4 615 | 4 621 | **19,51** | 110,1 | 0,00 | 84,29 | - | - | 0,00 | 0,00 | - |
| T22 | 3 268 | 3 276 | **24,06** | 110,1 | 0,00 | 81,31 | - | - | 0,00 | 0,00 | - |
| T23 | 3 898 | 3 904 | **21,76** | 110,1 | 0,00 | 82,83 | - | - | 0,00 | 0,00 | - |
| T24 | 5 268 | 5 273 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T25 | 4 212 | 4 217 | **20,74** | 110,1 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| T26 | 4 559 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T27 | 5 499 | 5 503 | **17,13** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T28 | 4 999 | 5 003 | **18,43** | 110,1 | 0,00 | 84,99 | - | - | 0,00 | 0,00 | - |
| T29 | 5 405 | 5 409 | **17,36** | 110,1 | 0,00 | 85,66 | - | - | 0,00 | 0,00 | - |
| T3 | 3 209 | 3 216 | **24,30** | 110,1 | 0,00 | 81,15 | - | - | 0,00 | 0,00 | - |
| T30 | 8 343 | 8 346 | **13,47** | 110,1 | 0,00 | 89,43 | - | - | 0,00 | 0,00 | - |
| T31 | 7 206 | 7 209 | **15,12** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T32 | 9 426 | 9 429 | **11,92** | 110,1 | 0,00 | 90,49 | - | - | 0,00 | 0,00 | - |
| T33 | 8 495 | 8 497 | **13,12** | 110,1 | 0,00 | 89,59 | - | - | 0,00 | 0,00 | - |
| T34 | 7 239 | 7 242 | **14,97** | 110,1 | 0,00 | 88,20 | - | - | 0,00 | 0,00 | - |
| T35 | 6 886 | 6 889 | **15,25** | 110,1 | 0,00 | 87,76 | - | - | 0,00 | 0,00 | - |
| T36 | 10 087 | 10 089 | **10,93** | 110,1 | 0,00 | 91,08 | - | - | 0,00 | 0,00 | - |
| T37 | 9 472 | 9 475 | **11,70** | 110,1 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |
| T38 | 8 468 | 8 470 | **12,99** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T39 | 9 869 | 9 871 | **11,05** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T4 | 3 792 | 3 798 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| T5 | 2 378 | 2 387 | **28,06** | 110,1 | 0,00 | 78,56 | - | - | 0,00 | 0,00 | - |
| T6 | 3 448 | 3 455 | **23,37** | 110,1 | 0,00 | 81,77 | - | - | 0,00 | 0,00 | - |
| T7 | 4 482 | 4 487 | **19,90** | 110,1 | 0,00 | 84,04 | - | - | 0,00 | 0,00 | - |
| T8 | 5 374 | 5 378 | **17,44** | 110,1 | 0,00 | 85,61 | - | - | 0,00 | 0,00 | - |
| T9 | 2 185 | 2 195 | **29,09** | 110,1 | 0,00 | 77,83 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,42** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: E Asuinrakennus E (Alanko)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 3 999 | 4 006 | **21,42** | 110,1 | 0,00 | 83,05 | - | - | 0,00 | 0,00 | - |
| T10 | 3 660 | 3 666 | **22,60** | 110,1 | 0,00 | 82,28 | - | - | 0,00 | 0,00 | - |
| T11 | 5 149 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T12 | 2 446 | 2 455 | **27,72** | 110,1 | 0,00 | 78,80 | - | - | 0,00 | 0,00 | - |
| T13 | 3 142 | 3 149 | **24,57** | 110,1 | 0,00 | 80,96 | - | - | 0,00 | 0,00 | - |
| T14 | 4 216 | 4 221 | **20,72** | 110,1 | 0,00 | 83,51 | - | - | 0,00 | 0,00 | - |
| T15 | 5 224 | 5 228 | **17,83** | 110,1 | 0,00 | 85,37 | - | - | 0,00 | 0,00 | - |
| T16 | 2 307 | 2 317 | **28,43** | 110,1 | 0,00 | 78,30 | - | - | 0,00 | 0,00 | - |
| T17 | 3 820 | 3 826 | **22,03** | 110,1 | 0,00 | 82,66 | - | - | 0,00 | 0,00 | - |
| T18 | 4 841 | 4 846 | **18,86** | 110,1 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| T19 | 2 607 | 2 616 | **26,93** | 110,1 | 0,00 | 79,35 | - | - | 0,00 | 0,00 | - |
| T2 | 3 906 | 3 913 | **21,73** | 110,1 | 0,00 | 82,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 456 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T21 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T22 | 3 551 | 3 558 | **22,99** | 110,1 | 0,00 | 82,02 | - | - | 0,00 | 0,00 | - |
| T23 | 4 128 | 4 134 | **21,00** | 110,1 | 0,00 | 83,33 | - | - | 0,00 | 0,00 | - |
| T24 | 5 435 | 5 439 | **17,29** | 110,1 | 0,00 | 85,71 | - | - | 0,00 | 0,00 | - |
| T25 | 4 509 | 4 514 | **19,82** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T26 | 4 811 | 4 816 | **18,95** | 110,1 | 0,00 | 84,65 | - | - | 0,00 | 0,00 | - |
| T27 | 5 709 | 5 713 | **16,61** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T28 | 5 318 | 5 322 | **17,58** | 110,1 | 0,00 | 85,52 | - | - | 0,00 | 0,00 | - |
| T29 | 5 677 | 5 680 | **16,69** | 110,1 | 0,00 | 86,09 | - | - | 0,00 | 0,00 | - |
| T3 | 2 950 | 2 958 | **25,37** | 110,1 | 0,00 | 80,42 | - | - | 0,00 | 0,00 | - |
| T30 | 8 473 | 8 476 | **12,23** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T31 | 7 365 | 7 368 | **13,90** | 110,1 | 0,00 | 88,35 | - | - | 0,00 | 0,00 | - |
| T32 | 9 559 | 9 561 | **10,70** | 110,1 | 0,00 | 90,61 | - | - | 0,00 | 0,00 | - |
| T33 | 8 652 | 8 655 | **11,94** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T34 | 7 429 | 7 431 | **13,60** | 110,1 | 0,00 | 88,42 | - | - | 0,00 | 0,00 | - |
| T35 | 7 105 | 7 108 | **14,23** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| T36 | 10 240 | 10 242 | **9,78** | 110,1 | 0,00 | 91,21 | - | - | 0,00 | 0,00 | - |
| T37 | 9 649 | 9 651 | **10,45** | 110,1 | 0,00 | 90,69 | - | - | 0,00 | 0,00 | - |
| T38 | 8 669 | 8 671 | **11,71** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T39 | 10 067 | 10 070 | **9,78** | 110,1 | 0,00 | 91,06 | - | - | 0,00 | 0,00 | - |
| T4 | 3 593 | 3 599 | **22,84** | 110,1 | 0,00 | 82,12 | - | - | 0,00 | 0,00 | - |
| T5 | 2 149 | 2 159 | **29,29** | 110,1 | 0,00 | 77,68 | - | - | 0,00 | 0,00 | - |
| T6 | 3 322 | 3 329 | **23,85** | 110,1 | 0,00 | 81,45 | - | - | 0,00 | 0,00 | - |
| T7 | 4 358 | 4 363 | **20,28** | 110,1 | 0,00 | 83,80 | - | - | 0,00 | 0,00 | - |
| T8 | 5 275 | 5 280 | **17,69** | 110,1 | 0,00 | 85,45 | - | - | 0,00 | 0,00 | - |
| T9 | 2 057 | 2 068 | **29,82** | 110,1 | 0,00 | 77,31 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,41** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: F Asuinrakennus F (Joensuu)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 3 835 | 3 841 | **21,98** | 110,1 | 0,00 | 82,69 | - | - | 0,00 | 0,00 | - |
| T10 | 3 727 | 3 733 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T11 | 5 222 | 5 227 | **17,83** | 110,1 | 0,00 | 85,36 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T12 | 2 557 | 2 565 | **27,17** | 110,1 | 0,00 | 79,18 | - | - | 0,00 | 0,00 | - |
| T13 | 3 291 | 3 297 | **23,98** | 110,1 | 0,00 | 81,36 | - | - | 0,00 | 0,00 | - |
| T14 | 4 340 | 4 345 | **20,34** | 110,1 | 0,00 | 83,76 | - | - | 0,00 | 0,00 | - |
| T15 | 5 338 | 5 342 | **17,53** | 110,1 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| T16 | 2 514 | 2 523 | **27,38** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T17 | 3 995 | 4 001 | **21,44** | 110,1 | 0,00 | 83,04 | - | - | 0,00 | 0,00 | - |
| T18 | 4 998 | 5 003 | **18,43** | 110,1 | 0,00 | 84,98 | - | - | 0,00 | 0,00 | - |
| T19 | 2 857 | 2 865 | **25,78** | 110,1 | 0,00 | 80,14 | - | - | 0,00 | 0,00 | - |
| T2 | 3 786 | 3 793 | **22,15** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T20 | 3 682 | 3 688 | **22,52** | 110,1 | 0,00 | 82,34 | - | - | 0,00 | 0,00 | - |
| T21 | 4 960 | 4 965 | **18,53** | 110,1 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |
| T22 | 3 807 | 3 813 | **22,08** | 110,1 | 0,00 | 82,63 | - | - | 0,00 | 0,00 | - |
| T23 | 4 366 | 4 372 | **20,25** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T24 | 5 642 | 5 646 | **16,77** | 110,1 | 0,00 | 86,03 | - | - | 0,00 | 0,00 | - |
| T25 | 4 768 | 4 773 | **19,07** | 110,1 | 0,00 | 84,58 | - | - | 0,00 | 0,00 | - |
| T26 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,09 | - | - | 0,00 | 0,00 | - |
| T27 | 5 936 | 5 940 | **16,07** | 110,1 | 0,00 | 86,48 | - | - | 0,00 | 0,00 | - |
| T28 | 5 579 | 5 583 | **16,93** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T29 | 5 929 | 5 933 | **16,09** | 110,1 | 0,00 | 86,46 | - | - | 0,00 | 0,00 | - |
| T3 | 2 843 | 2 851 | **25,84** | 110,1 | 0,00 | 80,10 | - | - | 0,00 | 0,00 | - |
| T30 | 8 491 | 8 493 | **12,01** | 110,1 | 0,00 | 89,58 | - | - | 0,00 | 0,00 | - |
| T31 | 7 407 | 7 410 | **13,67** | 110,1 | 0,00 | 88,40 | - | - | 0,00 | 0,00 | - |
| T32 | 9 577 | 9 579 | **10,48** | 110,1 | 0,00 | 90,63 | - | - | 0,00 | 0,00 | - |
| T33 | 8 692 | 8 695 | **11,70** | 110,1 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| T34 | 7 498 | 7 501 | **13,42** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T35 | 7 201 | 7 204 | **13,88** | 110,1 | 0,00 | 88,15 | - | - | 0,00 | 0,00 | - |
| T36 | 10 276 | 10 278 | **9,56** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T37 | 9 704 | 9 706 | **10,24** | 110,1 | 0,00 | 90,74 | - | - | 0,00 | 0,00 | - |
| T38 | 8 747 | 8 749 | **11,51** | 110,1 | 0,00 | 89,84 | - | - | 0,00 | 0,00 | - |
| T39 | 10 142 | 10 144 | **9,62** | 110,1 | 0,00 | 91,12 | - | - | 0,00 | 0,00 | - |
| T4 | 3 543 | 3 550 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T5 | 2 081 | 2 091 | **29,68** | 110,1 | 0,00 | 77,41 | - | - | 0,00 | 0,00 | - |
| T6 | 3 339 | 3 345 | **23,79** | 110,1 | 0,00 | 81,49 | - | - | 0,00 | 0,00 | - |
| T7 | 4 371 | 4 376 | **20,24** | 110,1 | 0,00 | 83,82 | - | - | 0,00 | 0,00 | - |
| T8 | 5 307 | 5 312 | **17,61** | 110,1 | 0,00 | 85,50 | - | - | 0,00 | 0,00 | - |
| T9 | 2 087 | 2 097 | **29,65** | 110,1 | 0,00 | 77,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,10** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: G Asuinrakennus G (Heiniaho)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 060 | 2 071 | **29,79** | 110,1 | 0,00 | 77,33 | - | - | 0,00 | 0,00 | - |
| T10 | 4 264 | 4 269 | **20,57** | 110,1 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| T11 | 5 583 | 5 587 | **16,92** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T12 | 3 725 | 3 731 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T13 | 4 582 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T14 | 5 269 | 5 274 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T15 | 6 057 | 6 061 | **15,79** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T16 | 4 379 | 4 384 | **20,25** | 110,1 | 0,00 | 83,84 | - | - | 0,00 | 0,00 | - |
| T17 | 5 410 | 5 414 | **17,35** | 110,1 | 0,00 | 85,67 | - | - | 0,00 | 0,00 | - |
| T18 | 6 152 | 6 157 | **15,58** | 110,1 | 0,00 | 86,79 | - | - | 0,00 | 0,00 | - |
| T19 | 5 065 | 5 069 | **18,30** | 110,1 | 0,00 | 85,10 | - | - | 0,00 | 0,00 | - |
| T2 | 2 521 | 2 531 | **27,34** | 110,1 | 0,00 | 79,07 | - | - | 0,00 | 0,00 | - |
| T20 | 5 581 | 5 585 | **16,94** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T21 | 6 500 | 6 504 | **14,81** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T22 | 6 055 | 6 059 | **15,84** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T23 | 6 358 | 6 361 | **15,14** | 110,1 | 0,00 | 87,07 | - | - | 0,00 | 0,00 | - |
| T24 | 7 236 | 7 239 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T25 | 7 055 | 7 058 | **13,88** | 110,1 | 0,00 | 87,97 | - | - | 0,00 | 0,00 | - |
| T26 | 7 119 | 7 122 | **13,75** | 110,1 | 0,00 | 88,05 | - | - | 0,00 | 0,00 | - |
| T27 | 7 745 | 7 748 | **12,69** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T28 | 7 962 | 7 964 | **12,41** | 110,1 | 0,00 | 89,02 | - | - | 0,00 | 0,00 | - |
| T29 | 8 064 | 8 066 | **12,23** | 110,1 | 0,00 | 89,13 | - | - | 0,00 | 0,00 | - |
| T3 | 2 071 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T30 | 9 912 | 9 914 | **9,74** | 110,1 | 0,00 | 90,92 | - | - | 0,00 | 0,00 | - |
| T31 | 9 035 | 9 038 | **11,10** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T32 | 10 974 | 10 976 | **8,44** | 110,1 | 0,00 | 91,81 | - | - | 0,00 | 0,00 | - |
| T33 | 10 268 | 10 270 | **9,45** | 110,1 | 0,00 | 91,23 | - | - | 0,00 | 0,00 | - |
| T34 | 9 295 | 9 297 | **10,74** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T35 | 9 163 | 9 165 | **10,89** | 110,1 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| T36 | 11 785 | 11 787 | **7,58** | 110,1 | 0,00 | 92,43 | - | - | 0,00 | 0,00 | - |
| T37 | 11 362 | 11 364 | **8,16** | 110,1 | 0,00 | 92,11 | - | - | 0,00 | 0,00 | - |
| T38 | 10 571 | 10 573 | **9,09** | 110,1 | 0,00 | 91,48 | - | - | 0,00 | 0,00 | - |
| T39 | 11 920 | 11 922 | **7,53** | 110,1 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| T4 | 3 074 | 3 081 | **24,85** | 110,1 | 0,00 | 80,77 | - | - | 0,00 | 0,00 | - |
| T5 | 2 163 | 2 173 | **29,21** | 110,1 | 0,00 | 77,74 | - | - | 0,00 | 0,00 | - |
| T6 | 3 538 | 3 545 | **23,04** | 110,1 | 0,00 | 81,99 | - | - | 0,00 | 0,00 | - |
| T7 | 4 299 | 4 304 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T8 | 5 266 | 5 270 | **17,72** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T9 | 2 879 | 2 887 | **25,69** | 110,1 | 0,00 | 80,21 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,38** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: H Asuinrakennus H (Mäkelä)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 090 | 2 102 | **29,62** | 110,1 | 0,00 | 77,45 | - | - | 0,00 | 0,00 | - |
| T10 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| T11 | 6 241 | 6 244 | **15,38** | 110,1 | 0,00 | 86,91 | - | - | 0,00 | 0,00 | - |
| T12 | 4 712 | 4 716 | **19,23** | 110,1 | 0,00 | 84,47 | - | - | 0,00 | 0,00 | - |
| T13 | 5 551 | 5 555 | **17,00** | 110,1 | 0,00 | 85,89 | - | - | 0,00 | 0,00 | - |
| T14 | 6 120 | 6 123 | **15,65** | 110,1 | 0,00 | 86,74 | - | - | 0,00 | 0,00 | - |
| T15 | 6 813 | 6 816 | **14,24** | 110,1 | 0,00 | 87,67 | - | - | 0,00 | 0,00 | - |
| T16 | 5 460 | 5 464 | **17,22** | 110,1 | 0,00 | 85,75 | - | - | 0,00 | 0,00 | - |
| T17 | 6 379 | 6 383 | **15,08** | 110,1 | 0,00 | 87,10 | - | - | 0,00 | 0,00 | - |
| T18 | 7 035 | 7 038 | **13,85** | 110,1 | 0,00 | 87,95 | - | - | 0,00 | 0,00 | - |
| T19 | 6 182 | 6 186 | **15,52** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T2 | 2 797 | 2 805 | **26,05** | 110,1 | 0,00 | 79,96 | - | - | 0,00 | 0,00 | - |
| T20 | 6 647 | 6 650 | **14,54** | 110,1 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| T21 | 7 475 | 7 478 | **13,12** | 110,1 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| T22 | 7 173 | 7 176 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T23 | 7 432 | 7 435 | **13,19** | 110,1 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| T24 | 8 212 | 8 214 | **11,96** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T25 | 8 175 | 8 177 | **12,02** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T26 | 8 201 | 8 203 | **11,97** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T27 | 8 768 | 8 770 | **11,14** | 110,1 | 0,00 | 89,86 | - | - | 0,00 | 0,00 | - |
| T28 | 9 092 | 9 094 | **10,73** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T29 | 9 154 | 9 157 | **10,60** | 110,1 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| T3 | 2 728 | 2 736 | **26,36** | 110,1 | 0,00 | 79,74 | - | - | 0,00 | 0,00 | - |
| T30 | 10 547 | 10 549 | **8,90** | 110,1 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| T31 | 9 767 | 9 769 | **10,00** | 110,1 | 0,00 | 90,80 | - | - | 0,00 | 0,00 | - |
| T32 | 11 585 | 11 587 | **7,72** | 110,1 | 0,00 | 92,28 | - | - | 0,00 | 0,00 | - |
| T33 | 10 962 | 10 964 | **8,46** | 110,1 | 0,00 | 91,80 | - | - | 0,00 | 0,00 | - |
| T34 | 10 091 | 10 093 | **9,61** | 110,1 | 0,00 | 91,08 | - | - | 0,00 | 0,00 | - |
| T35 | 10 026 | 10 028 | **9,68** | 110,1 | 0,00 | 91,02 | - | - | 0,00 | 0,00 | - |
| T36 | 12 434 | 12 436 | **6,77** | 110,1 | 0,00 | 92,89 | - | - | 0,00 | 0,00 | - |
| T37 | 12 078 | 12 080 | **7,23** | 110,1 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| T38 | 11 364 | 11 366 | **8,08** | 110,1 | 0,00 | 92,11 | - | - | 0,00 | 0,00 | - |
| T39 | 12 682 | 12 684 | **6,66** | 110,1 | 0,00 | 93,07 | - | - | 0,00 | 0,00 | - |
| T4 | 3 644 | 3 650 | **22,65** | 110,1 | 0,00 | 82,25 | - | - | 0,00 | 0,00 | - |
| T5 | 3 094 | 3 100 | **24,77** | 110,1 | 0,00 | 80,83 | - | - | 0,00 | 0,00 | - |
| T6 | 4 292 | 4 297 | **20,49** | 110,1 | 0,00 | 83,66 | - | - | 0,00 | 0,00 | - |
| T7 | 4 883 | 4 887 | **18,75** | 110,1 | 0,00 | 84,78 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T8 | 5 791 | 5 795 | **16,41** | 110,1 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| T9 | 3 860 | 3 866 | **21,89** | 110,1 | 0,00 | 82,74 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,20** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: I Lomarakennus I

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 625 | 2 634 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T10 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T11 | 2 945 | 2 952 | **25,40** | 110,1 | 0,00 | 80,40 | - | - | 0,00 | 0,00 | - |
| T12 | 4 055 | 4 059 | **21,25** | 110,1 | 0,00 | 83,17 | - | - | 0,00 | 0,00 | - |
| T13 | 4 315 | 4 320 | **20,41** | 110,1 | 0,00 | 83,71 | - | - | 0,00 | 0,00 | - |
| T14 | 3 870 | 3 876 | **21,86** | 110,1 | 0,00 | 82,77 | - | - | 0,00 | 0,00 | - |
| T15 | 3 806 | 3 813 | **22,08** | 110,1 | 0,00 | 82,62 | - | - | 0,00 | 0,00 | - |
| T16 | 5 213 | 5 217 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T17 | 4 798 | 4 802 | **18,99** | 110,1 | 0,00 | 84,63 | - | - | 0,00 | 0,00 | - |
| T18 | 4 661 | 4 667 | **19,37** | 110,1 | 0,00 | 84,38 | - | - | 0,00 | 0,00 | - |
| T19 | 6 200 | 6 203 | **15,47** | 110,1 | 0,00 | 86,85 | - | - | 0,00 | 0,00 | - |
| T2 | 2 072 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T20 | 5 814 | 5 818 | **16,36** | 110,1 | 0,00 | 86,30 | - | - | 0,00 | 0,00 | - |
| T21 | 5 603 | 5 607 | **16,87** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T22 | 6 929 | 6 932 | **14,04** | 110,1 | 0,00 | 87,82 | - | - | 0,00 | 0,00 | - |
| T23 | 6 481 | 6 485 | **14,86** | 110,1 | 0,00 | 87,24 | - | - | 0,00 | 0,00 | - |
| T24 | 6 187 | 6 190 | **15,50** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T25 | 7 771 | 7 773 | **12,64** | 110,1 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| T26 | 7 177 | 7 179 | **13,61** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T27 | 7 019 | 7 022 | **13,88** | 110,1 | 0,00 | 87,93 | - | - | 0,00 | 0,00 | - |
| T28 | 8 851 | 8 853 | **11,02** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T29 | 8 087 | 8 089 | **12,15** | 110,1 | 0,00 | 89,16 | - | - | 0,00 | 0,00 | - |
| T3 | 2 832 | 2 840 | **25,89** | 110,1 | 0,00 | 80,07 | - | - | 0,00 | 0,00 | - |
| T30 | 14 064 | 14 065 | **5,38** | 110,1 | 0,00 | 93,96 | - | - | 0,00 | 0,00 | - |
| T31 | 13 015 | 13 017 | **6,41** | 110,1 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| T32 | 15 148 | 15 150 | **4,37** | 110,1 | 0,00 | 94,61 | - | - | 0,00 | 0,00 | - |
| T33 | 14 297 | 14 299 | **5,16** | 110,1 | 0,00 | 94,11 | - | - | 0,00 | 0,00 | - |
| T34 | 13 106 | 13 108 | **6,22** | 110,1 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| T35 | 12 774 | 12 776 | **6,48** | 110,1 | 0,00 | 93,13 | - | - | 0,00 | 0,00 | - |
| T36 | 15 875 | 15 876 | **3,75** | 110,1 | 0,00 | 95,01 | - | - | 0,00 | 0,00 | - |
| T37 | 15 316 | 15 318 | **4,18** | 110,1 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| T38 | 14 348 | 14 349 | **5,01** | 110,1 | 0,00 | 94,14 | - | - | 0,00 | 0,00 | - |
| T39 | 15 746 | 15 748 | **3,76** | 110,1 | 0,00 | 94,94 | - | - | 0,00 | 0,00 | - |
| T4 | 2 100 | 2 111 | **29,57** | 110,1 | 0,00 | 77,49 | - | - | 0,00 | 0,00 | - |
| T5 | 3 534 | 3 539 | **23,06** | 110,1 | 0,00 | 81,98 | - | - | 0,00 | 0,00 | - |
| T6 | 2 703 | 2 711 | **26,48** | 110,1 | 0,00 | 79,66 | - | - | 0,00 | 0,00 | - |
| T7 | 1 994 | 2 005 | **30,19** | 110,1 | 0,00 | 77,04 | - | - | 0,00 | 0,00 | - |
| T8 | 2 093 | 2 104 | **29,61** | 110,1 | 0,00 | 77,46 | - | - | 0,00 | 0,00 | - |
| T9 | 3 792 | 3 797 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,62** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 10 347 | 10 350 | **9,04** | 110,1 | 0,00 | 91,30 | - | - | 0,00 | 0,00 | - |
| T10 | 7 801 | 7 804 | **12,59** | 110,1 | 0,00 | 88,85 | - | - | 0,00 | 0,00 | - |
| T11 | 8 471 | 8 474 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T12 | 6 911 | 6 915 | **14,07** | 110,1 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| T13 | 6 530 | 6 534 | **14,75** | 110,1 | 0,00 | 87,30 | - | - | 0,00 | 0,00 | - |
| T14 | 7 173 | 7 177 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T15 | 7 793 | 7 797 | **12,60** | 110,1 | 0,00 | 88,84 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T16 | 5 758 | 5 762 | **16,49** | 110,1 | 0,00 | 86,21 | - | - | 0,00 | 0,00 | - |
| T17 | 6 144 | 6 149 | **15,59** | 110,1 | 0,00 | 86,78 | - | - | 0,00 | 0,00 | - |
| T18 | 6 738 | 6 742 | **14,37** | 110,1 | 0,00 | 87,58 | - | - | 0,00 | 0,00 | - |
| T19 | 4 792 | 4 798 | **19,00** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T2 | 9 915 | 9 918 | **9,59** | 110,1 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| T20 | 5 038 | 5 043 | **18,32** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T21 | 5 719 | 5 724 | **16,58** | 110,1 | 0,00 | 86,15 | - | - | 0,00 | 0,00 | - |
| T22 | 3 932 | 3 939 | **21,65** | 110,1 | 0,00 | 82,91 | - | - | 0,00 | 0,00 | - |
| T23 | 4 449 | 4 455 | **20,00** | 110,1 | 0,00 | 83,98 | - | - | 0,00 | 0,00 | - |
| T24 | 5 551 | 5 556 | **16,99** | 110,1 | 0,00 | 85,90 | - | - | 0,00 | 0,00 | - |
| T25 | 3 090 | 3 098 | **24,78** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T26 | 3 915 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 4 795 | 4 800 | **18,99** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T28 | 2 023 | 2 035 | **30,01** | 110,1 | 0,00 | 77,17 | - | - | 0,00 | 0,00 | - |
| T29 | 3 336 | 3 343 | **23,80** | 110,1 | 0,00 | 81,48 | - | - | 0,00 | 0,00 | - |
| T3 | 9 032 | 9 035 | **10,77** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T30 | 9 214 | 9 216 | **10,52** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T31 | 7 925 | 7 928 | **12,40** | 110,1 | 0,00 | 88,98 | - | - | 0,00 | 0,00 | - |
| T32 | 9 983 | 9 985 | **9,50** | 110,1 | 0,00 | 90,99 | - | - | 0,00 | 0,00 | - |
| T33 | 8 804 | 8 807 | **11,09** | 110,1 | 0,00 | 89,90 | - | - | 0,00 | 0,00 | - |
| T34 | 7 329 | 7 332 | **13,36** | 110,1 | 0,00 | 88,30 | - | - | 0,00 | 0,00 | - |
| T35 | 6 497 | 6 501 | **14,82** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T36 | 10 073 | 10 075 | **9,39** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T37 | 9 129 | 9 132 | **10,63** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T38 | 7 862 | 7 865 | **12,49** | 110,1 | 0,00 | 88,91 | - | - | 0,00 | 0,00 | - |
| T39 | 8 932 | 8 935 | **10,91** | 110,1 | 0,00 | 90,02 | - | - | 0,00 | 0,00 | - |
| T4 | 9 042 | 9 045 | **10,75** | 110,1 | 0,00 | 90,13 | - | - | 0,00 | 0,00 | - |
| T5 | 8 186 | 8 189 | **12,00** | 110,1 | 0,00 | 89,26 | - | - | 0,00 | 0,00 | - |
| T6 | 8 213 | 8 216 | **11,95** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T7 | 8 871 | 8 874 | **10,99** | 110,1 | 0,00 | 89,96 | - | - | 0,00 | 0,00 | - |
| T8 | 9 214 | 9 217 | **10,51** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 502 | 7 505 | **13,07** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **34,42** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: K Asuinrakennus K (Takalo)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 11 268 | 11 270 | **7,95** | 110,1 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| T10 | 8 473 | 8 476 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T11 | 8 946 | 8 949 | **10,89** | 110,1 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| T12 | 7 729 | 7 732 | **12,70** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T13 | 7 234 | 7 238 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T14 | 7 715 | 7 719 | **12,73** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T15 | 8 196 | 8 199 | **11,98** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T16 | 6 619 | 6 623 | **14,59** | 110,1 | 0,00 | 87,42 | - | - | 0,00 | 0,00 | - |
| T17 | 6 726 | 6 730 | **14,39** | 110,1 | 0,00 | 87,56 | - | - | 0,00 | 0,00 | - |
| T18 | 7 142 | 7 147 | **13,67** | 110,1 | 0,00 | 88,08 | - | - | 0,00 | 0,00 | - |
| T19 | 5 706 | 5 711 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T2 | 10 776 | 10 779 | **8,52** | 110,1 | 0,00 | 91,65 | - | - | 0,00 | 0,00 | - |
| T20 | 5 729 | 5 734 | **16,56** | 110,1 | 0,00 | 86,17 | - | - | 0,00 | 0,00 | - |
| T21 | 6 108 | 6 112 | **15,68** | 110,1 | 0,00 | 86,72 | - | - | 0,00 | 0,00 | - |
| T22 | 4 762 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T23 | 5 033 | 5 038 | **18,33** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T24 | 5 785 | 5 789 | **16,43** | 110,1 | 0,00 | 86,25 | - | - | 0,00 | 0,00 | - |
| T25 | 3 801 | 3 808 | **22,09** | 110,1 | 0,00 | 82,61 | - | - | 0,00 | 0,00 | - |
| T26 | 4 364 | 4 370 | **20,26** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T27 | 4 946 | 4 951 | **18,57** | 110,1 | 0,00 | 84,89 | - | - | 0,00 | 0,00 | - |
| T28 | 2 753 | 2 761 | **26,25** | 110,1 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| T29 | 3 555 | 3 562 | **22,97** | 110,1 | 0,00 | 82,03 | - | - | 0,00 | 0,00 | - |
| T3 | 9 937 | 9 939 | **9,56** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T30 | 10 427 | 10 429 | **8,95** | 110,1 | 0,00 | 91,37 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T31 | 9 160 | 9 162 | **10,59** | 110,1 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| T32 | 11 150 | 11 152 | **8,09** | 110,1 | 0,00 | 91,95 | - | - | 0,00 | 0,00 | - |
| T33 | 9 978 | 9 981 | **9,51** | 110,1 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| T34 | 8 532 | 8 535 | **11,48** | 110,1 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| T35 | 7 692 | 7 695 | **12,76** | 110,1 | 0,00 | 88,72 | - | - | 0,00 | 0,00 | - |
| T36 | 11 178 | 11 180 | **8,06** | 110,1 | 0,00 | 91,97 | - | - | 0,00 | 0,00 | - |
| T37 | 10 222 | 10 225 | **9,20** | 110,1 | 0,00 | 91,19 | - | - | 0,00 | 0,00 | - |
| T38 | 8 970 | 8 973 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |
| T39 | 9 956 | 9 958 | **9,61** | 110,1 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| T4 | 9 838 | 9 841 | **9,69** | 110,1 | 0,00 | 90,86 | - | - | 0,00 | 0,00 | - |
| T5 | 9 120 | 9 123 | **10,64** | 110,1 | 0,00 | 90,20 | - | - | 0,00 | 0,00 | - |
| T6 | 8 970 | 8 972 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |
| T7 | 9 521 | 9 524 | **10,10** | 110,1 | 0,00 | 90,58 | - | - | 0,00 | 0,00 | - |
| T8 | 9 743 | 9 746 | **9,81** | 110,1 | 0,00 | 90,78 | - | - | 0,00 | 0,00 | - |
| T9 | 8 396 | 8 399 | **11,68** | 110,1 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| Sum | | | **32,19** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 12 636 | 12 638 | **7,85** | 110,1 | 0,00 | 93,03 | - | - | 0,00 | 0,00 | - |
| T10 | 11 638 | 11 640 | **8,74** | 110,1 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| T11 | 12 857 | 12 859 | **7,39** | 110,1 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| T12 | 10 368 | 10 370 | **10,26** | 110,1 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| T13 | 10 507 | 10 509 | **10,04** | 110,1 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| T14 | 11 547 | 11 549 | **8,81** | 110,1 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| T15 | 12 471 | 12 473 | **7,78** | 110,1 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| T16 | 9 350 | 9 352 | **11,55** | 110,1 | 0,00 | 90,42 | - | - | 0,00 | 0,00 | - |
| T17 | 10 591 | 10 594 | **9,92** | 110,1 | 0,00 | 91,50 | - | - | 0,00 | 0,00 | - |
| T18 | 11 555 | 11 557 | **8,75** | 110,1 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| T19 | 8 505 | 8 507 | **12,74** | 110,1 | 0,00 | 89,60 | - | - | 0,00 | 0,00 | - |
| T2 | 12 590 | 12 592 | **7,85** | 110,1 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| T20 | 9 434 | 9 436 | **11,38** | 110,1 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| T21 | 10 738 | 10 741 | **9,69** | 110,1 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| T22 | 8 288 | 8 291 | **13,00** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T23 | 9 295 | 9 298 | **11,54** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T24 | 10 912 | 10 914 | **9,46** | 110,1 | 0,00 | 91,76 | - | - | 0,00 | 0,00 | - |
| T25 | 8 107 | 8 110 | **13,23** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T26 | 9 191 | 9 194 | **11,65** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T27 | 10 402 | 10 404 | **10,05** | 110,1 | 0,00 | 91,34 | - | - | 0,00 | 0,00 | - |
| T28 | 7 498 | 7 501 | **14,15** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T29 | 9 098 | 9 101 | **11,74** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T3 | 11 631 | 11 633 | **8,89** | 110,1 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| T30 | 3 990 | 3 996 | **22,70** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T31 | 3 257 | 3 264 | **25,30** | 110,1 | 0,00 | 81,27 | - | - | 0,00 | 0,00 | - |
| T32 | 4 286 | 4 292 | **21,76** | 110,1 | 0,00 | 83,65 | - | - | 0,00 | 0,00 | - |
| T33 | 3 287 | 3 294 | **25,20** | 110,1 | 0,00 | 81,35 | - | - | 0,00 | 0,00 | - |
| T34 | 2 492 | 2 501 | **28,63** | 110,1 | 0,00 | 78,96 | - | - | 0,00 | 0,00 | - |
| T35 | 2 024 | 2 036 | **31,10** | 110,1 | 0,00 | 77,18 | - | - | 0,00 | 0,00 | - |
| T36 | 4 031 | 4 037 | **22,56** | 110,1 | 0,00 | 83,12 | - | - | 0,00 | 0,00 | - |
| T37 | 3 077 | 3 085 | **26,03** | 110,1 | 0,00 | 80,79 | - | - | 0,00 | 0,00 | - |
| T38 | 2 006 | 2 018 | **31,25** | 110,1 | 0,00 | 77,10 | - | - | 0,00 | 0,00 | - |
| T39 | 2 662 | 2 671 | **27,82** | 110,1 | 0,00 | 79,53 | - | - | 0,00 | 0,00 | - |
| T4 | 12 167 | 12 169 | **8,25** | 110,1 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| T5 | 10 799 | 10 801 | **9,84** | 110,1 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| T6 | 11 650 | 11 653 | **8,75** | 110,1 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |
| T7 | 12 619 | 12 621 | **7,69** | 110,1 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| T8 | 13 338 | 13 340 | **6,92** | 110,1 | 0,00 | 93,50 | - | - | 0,00 | 0,00 | - |
| T9 | 10 475 | 10 477 | **10,19** | 110,1 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,68** | | | | | | | | |

- Data undefined due to calculation with octave data

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: M Lomarakennus M (Haukilahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 960 | 8 963 | **12,33** | 110,1 | 0,00 | 90,05 | - | - | 0,00 | 0,00 | - |
| T10 | 9 035 | 9 038 | **12,29** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T11 | 10 479 | 10 481 | **10,37** | 110,1 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| T12 | 7 744 | 7 747 | **14,21** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T13 | 8 221 | 8 224 | **13,43** | 110,1 | 0,00 | 89,30 | - | - | 0,00 | 0,00 | - |
| T14 | 9 357 | 9 360 | **11,80** | 110,1 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| T15 | 10 380 | 10 383 | **10,44** | 110,1 | 0,00 | 91,33 | - | - | 0,00 | 0,00 | - |
| T16 | 7 082 | 7 086 | **15,11** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T17 | 8 642 | 8 645 | **12,63** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T18 | 9 724 | 9 726 | **11,12** | 110,1 | 0,00 | 90,76 | - | - | 0,00 | 0,00 | - |
| T19 | 6 612 | 6 615 | **15,77** | 110,1 | 0,00 | 87,41 | - | - | 0,00 | 0,00 | - |
| T2 | 9 123 | 9 126 | **12,11** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T20 | 7 735 | 7 738 | **13,91** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T21 | 9 235 | 9 237 | **11,67** | 110,1 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| T22 | 6 954 | 6 958 | **15,01** | 110,1 | 0,00 | 87,85 | - | - | 0,00 | 0,00 | - |
| T23 | 7 994 | 7 997 | **13,36** | 110,1 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| T24 | 9 693 | 9 696 | **10,94** | 110,1 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| T25 | 7 352 | 7 355 | **14,28** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T26 | 8 286 | 8 288 | **12,85** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T27 | 9 533 | 9 536 | **11,07** | 110,1 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| T28 | 7 363 | 7 366 | **14,12** | 110,1 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| T29 | 8 685 | 8 688 | **12,17** | 110,1 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| T3 | 8 241 | 8 244 | **13,43** | 110,1 | 0,00 | 89,32 | - | - | 0,00 | 0,00 | - |
| T30 | 3 016 | 3 023 | **25,10** | 110,1 | 0,00 | 80,61 | - | - | 0,00 | 0,00 | - |
| T31 | 2 008 | 2 018 | **30,11** | 110,1 | 0,00 | 77,10 | - | - | 0,00 | 0,00 | - |
| T32 | 4 102 | 4 107 | **21,09** | 110,1 | 0,00 | 83,27 | - | - | 0,00 | 0,00 | - |
| T33 | 3 257 | 3 264 | **24,11** | 110,1 | 0,00 | 81,27 | - | - | 0,00 | 0,00 | - |
| T34 | 2 361 | 2 371 | **28,15** | 110,1 | 0,00 | 78,50 | - | - | 0,00 | 0,00 | - |
| T35 | 2 541 | 2 550 | **27,25** | 110,1 | 0,00 | 79,13 | - | - | 0,00 | 0,00 | - |
| T36 | 4 817 | 4 822 | **18,93** | 110,1 | 0,00 | 84,66 | - | - | 0,00 | 0,00 | - |
| T37 | 4 335 | 4 341 | **20,35** | 110,1 | 0,00 | 83,75 | - | - | 0,00 | 0,00 | - |
| T38 | 3 614 | 3 621 | **22,76** | 110,1 | 0,00 | 82,18 | - | - | 0,00 | 0,00 | - |
| T39 | 4 913 | 4 917 | **18,66** | 110,1 | 0,00 | 84,83 | - | - | 0,00 | 0,00 | - |
| T4 | 9 015 | 9 018 | **12,33** | 110,1 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| T5 | 7 547 | 7 550 | **14,53** | 110,1 | 0,00 | 88,56 | - | - | 0,00 | 0,00 | - |
| T6 | 8 773 | 8 776 | **12,68** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T7 | 9 809 | 9 812 | **11,25** | 110,1 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| T8 | 10 705 | 10 707 | **10,09** | 110,1 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| T9 | 7 508 | 7 510 | **14,60** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,96** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: N Lomarakennus N (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 779 | 8 782 | **12,71** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T10 | 8 649 | 8 652 | **11,97** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T11 | 10 073 | 10 075 | **9,90** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T12 | 7 349 | 7 352 | **13,93** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T13 | 7 785 | 7 788 | **12,96** | 110,1 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| T14 | 8 920 | 8 923 | **11,25** | 110,1 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| T15 | 9 939 | 9 941 | **9,82** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T16 | 6 632 | 6 635 | **14,80** | 110,1 | 0,00 | 87,44 | - | - | 0,00 | 0,00 | - |
| T17 | 8 172 | 8 175 | **12,18** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T18 | 9 250 | 9 253 | **10,62** | 110,1 | 0,00 | 90,33 | - | - | 0,00 | 0,00 | - |
| T19 | 6 113 | 6 117 | **15,75** | 110,1 | 0,00 | 86,73 | - | - | 0,00 | 0,00 | - |
| T2 | 8 894 | 8 896 | **12,43** | 110,1 | 0,00 | 89,98 | - | - | 0,00 | 0,00 | - |
| T20 | 7 232 | 7 235 | **13,60** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T21 | 8 727 | 8 730 | **11,25** | 110,1 | 0,00 | 89,82 | - | - | 0,00 | 0,00 | - |
| T22 | 6 413 | 6 417 | **15,04** | 110,1 | 0,00 | 87,15 | - | - | 0,00 | 0,00 | - |
| T23 | 7 461 | 7 464 | **13,20** | 110,1 | 0,00 | 88,46 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 9 167 | 9 169 | **10,63** | 110,1 | 0,00 | 90,25 | - | - | 0,00 | 0,00 | - |
| T25 | 6 781 | 6 784 | **14,33** | 110,1 | 0,00 | 87,63 | - | - | 0,00 | 0,00 | - |
| T26 | 7 729 | 7 732 | **12,75** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T27 | 8 983 | 8 986 | **10,87** | 110,1 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| T28 | 6 771 | 6 774 | **14,34** | 110,1 | 0,00 | 87,62 | - | - | 0,00 | 0,00 | - |
| T29 | 8 108 | 8 111 | **12,15** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T3 | 7 988 | 7 991 | **13,69** | 110,1 | 0,00 | 89,05 | - | - | 0,00 | 0,00 | - |
| T30 | 3 392 | 3 398 | **23,59** | 110,1 | 0,00 | 81,62 | - | - | 0,00 | 0,00 | - |
| T31 | 2 230 | 2 240 | **28,85** | 110,1 | 0,00 | 78,00 | - | - | 0,00 | 0,00 | - |
| T32 | 4 465 | 4 470 | **19,95** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T33 | 3 517 | 3 524 | **23,11** | 110,1 | 0,00 | 81,94 | - | - | 0,00 | 0,00 | - |
| T34 | 2 390 | 2 400 | **28,00** | 110,1 | 0,00 | 78,60 | - | - | 0,00 | 0,00 | - |
| T35 | 2 363 | 2 373 | **28,14** | 110,1 | 0,00 | 78,50 | - | - | 0,00 | 0,00 | - |
| T36 | 5 107 | 5 112 | **18,14** | 110,1 | 0,00 | 85,17 | - | - | 0,00 | 0,00 | - |
| T37 | 4 532 | 4 537 | **19,75** | 110,1 | 0,00 | 84,14 | - | - | 0,00 | 0,00 | - |
| T38 | 3 666 | 3 672 | **22,57** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |
| T39 | 5 026 | 5 030 | **18,36** | 110,1 | 0,00 | 85,03 | - | - | 0,00 | 0,00 | - |
| T4 | 8 720 | 8 723 | **12,40** | 110,1 | 0,00 | 89,81 | - | - | 0,00 | 0,00 | - |
| T5 | 7 259 | 7 262 | **14,70** | 110,1 | 0,00 | 88,22 | - | - | 0,00 | 0,00 | - |
| T6 | 8 428 | 8 431 | **12,52** | 110,1 | 0,00 | 89,52 | - | - | 0,00 | 0,00 | - |
| T7 | 9 461 | 9 463 | **11,02** | 110,1 | 0,00 | 90,52 | - | - | 0,00 | 0,00 | - |
| T8 | 10 335 | 10 338 | **9,77** | 110,1 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 165 | 7 168 | **14,53** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,51** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: O Lomarakennus O (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 734 | 8 737 | **12,50** | 110,1 | 0,00 | 89,83 | - | - | 0,00 | 0,00 | - |
| T10 | 8 587 | 8 589 | **12,36** | 110,1 | 0,00 | 89,68 | - | - | 0,00 | 0,00 | - |
| T11 | 10 009 | 10 011 | **10,24** | 110,1 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| T12 | 7 286 | 7 289 | **14,33** | 110,1 | 0,00 | 88,25 | - | - | 0,00 | 0,00 | - |
| T13 | 7 719 | 7 722 | **13,24** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T14 | 8 854 | 8 857 | **11,51** | 110,1 | 0,00 | 89,95 | - | - | 0,00 | 0,00 | - |
| T15 | 9 872 | 9 875 | **10,08** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| T16 | 6 565 | 6 569 | **15,10** | 110,1 | 0,00 | 87,35 | - | - | 0,00 | 0,00 | - |
| T17 | 8 105 | 8 108 | **12,47** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T18 | 9 182 | 9 185 | **10,87** | 110,1 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| T19 | 6 045 | 6 048 | **15,94** | 110,1 | 0,00 | 86,63 | - | - | 0,00 | 0,00 | - |
| T2 | 8 844 | 8 846 | **12,35** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T20 | 7 163 | 7 166 | **13,71** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| T21 | 8 658 | 8 661 | **11,35** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T22 | 6 343 | 6 347 | **15,19** | 110,1 | 0,00 | 87,05 | - | - | 0,00 | 0,00 | - |
| T23 | 7 391 | 7 394 | **13,31** | 110,1 | 0,00 | 88,38 | - | - | 0,00 | 0,00 | - |
| T24 | 9 097 | 9 099 | **10,72** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T25 | 6 711 | 6 714 | **14,45** | 110,1 | 0,00 | 87,54 | - | - | 0,00 | 0,00 | - |
| T26 | 7 659 | 7 662 | **12,86** | 110,1 | 0,00 | 88,69 | - | - | 0,00 | 0,00 | - |
| T27 | 8 913 | 8 916 | **10,97** | 110,1 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| T28 | 6 703 | 6 707 | **14,46** | 110,1 | 0,00 | 87,53 | - | - | 0,00 | 0,00 | - |
| T29 | 8 039 | 8 042 | **12,26** | 110,1 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |
| T3 | 7 936 | 7 939 | **13,68** | 110,1 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| T30 | 3 457 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T31 | 2 287 | 2 297 | **28,54** | 110,1 | 0,00 | 78,22 | - | - | 0,00 | 0,00 | - |
| T32 | 4 529 | 4 534 | **19,76** | 110,1 | 0,00 | 84,13 | - | - | 0,00 | 0,00 | - |
| T33 | 3 575 | 3 582 | **22,90** | 110,1 | 0,00 | 82,08 | - | - | 0,00 | 0,00 | - |
| T34 | 2 431 | 2 440 | **27,79** | 110,1 | 0,00 | 78,75 | - | - | 0,00 | 0,00 | - |
| T35 | 2 381 | 2 391 | **28,04** | 110,1 | 0,00 | 78,57 | - | - | 0,00 | 0,00 | - |
| T36 | 5 166 | 5 171 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T37 | 4 584 | 4 589 | **19,60** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T38 | 3 706 | 3 712 | **22,43** | 110,1 | 0,00 | 82,39 | - | - | 0,00 | 0,00 | - |
| T39 | 5 070 | 5 075 | **18,24** | 110,1 | 0,00 | 85,11 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T4 | 8 664 | 8 667 | **12,54** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T5 | 7 204 | 7 207 | **14,81** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T6 | 8 368 | 8 371 | **12,80** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T7 | 9 401 | 9 403 | **11,32** | 110,1 | 0,00 | 90,47 | - | - | 0,00 | 0,00 | - |
| T8 | 10 274 | 10 276 | **10,11** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T9 | 7 106 | 7 109 | **14,84** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,37** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Assumptions for noise calculation

## Calculation: Haarasuonkangas_VE1_V172x39xHH214_2023058

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuonkangas_melu ja varjot_1.w2r (11)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)
**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:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 214,0 | 8,0 | 110,1 | No | 91,5 | 100,2 | 104,1 | 105,0 | 103,7 | 99,3 | 91,6 | 80,8 |

## Noise sensitive area: A Lomarakennus A (Syvälahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: C Lomarakennus C (Mutalahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058

## Noise sensitive area: D Lomarakennus D (Mutaniemi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: E Asuinrakennus E (Alanko)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: F Asuinrakennus F (Joensuu)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: G Asuinrakennus G (Heiniaho)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: H Asuinrakennus H (Mäkelä)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: I Lomarakennus I
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: J Lomarakennus J (Hautakaarto)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: K Asuinrakennus K (Takalo)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: L Lomarakennus L (Haukijärvi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: N Lomarakennus N (Kuusela)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: O Lomarakennus O (Kuusela)

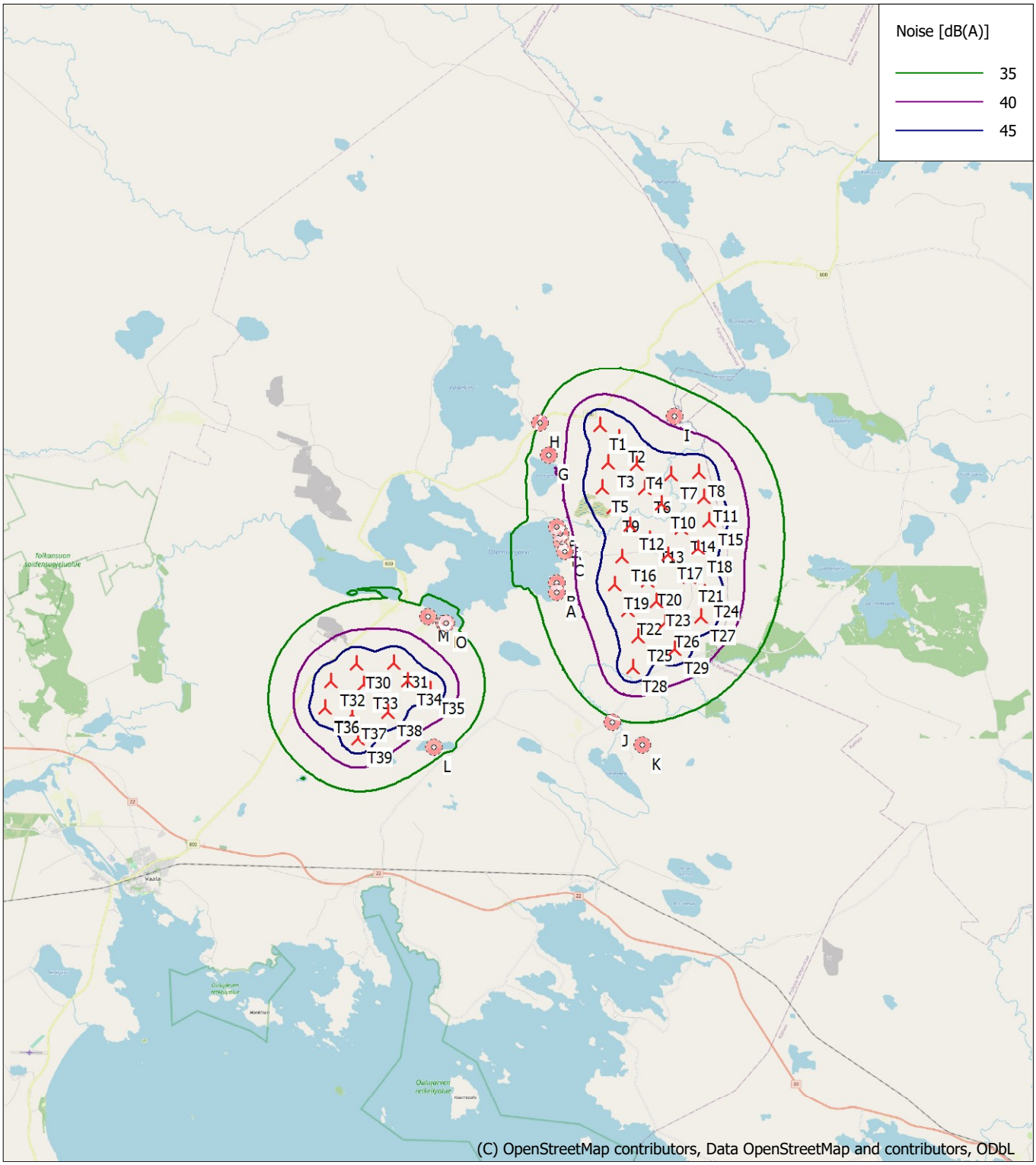
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 12.57/3.5.584

# DECIBEL - Map 8,0 m/s

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058




0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 505 414 North: 7 169 394

New WTG  Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

## Liite 2. Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 - Hankevaihtoehto 2

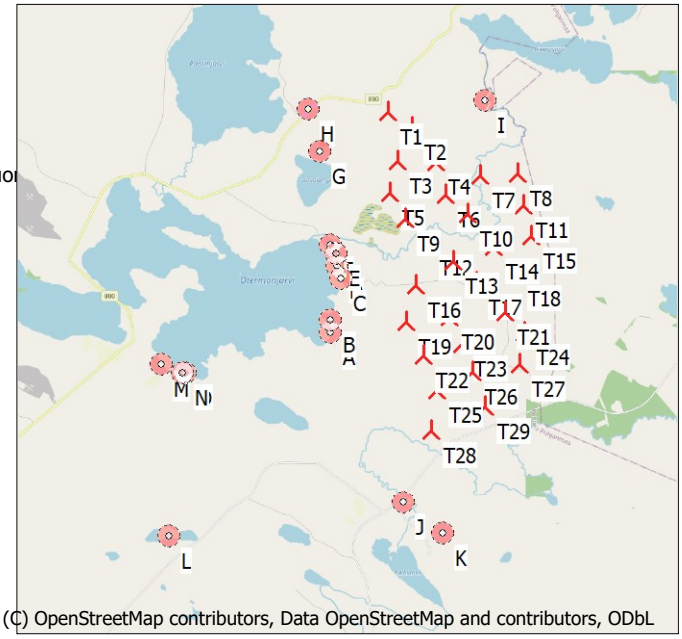
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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE2_V172x39xHH214_2023058

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuo
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:200 000
New WTG
Noise sensitive area

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | Wind speed | LwA,ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 72... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |

# Calculation Results

## Sound level

| Noise sensitive area No. | Name | East | North | Z | Immission height | Demands Noise | Sound level From WTGs | Distance to noise demand |
|---|---|---|---|---|---|---|---|---|
| | | | | [m] | [m] | [dB(A)] | [dB(A)] | [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 40,0 | 37,0 | 689 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 40,0 | 37,1 | 672 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 40,0 | 38,4 | 400 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 40,0 | 38,3 | 442 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 40,0 | 38,3 | 425 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 40,0 | 38,0 | 489 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 40,0 | 37,3 | 578 |

To be continued on next page...

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# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058

...continued from previous page

| Noise sensitive area | | | | | | Demands | Sound level | |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z [m] | Immission height [m] | Noise [dB(A)] | From WTGs [dB(A)] | Distance to noise demand [m] |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 40,0 | 35,1 | 983 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 40,0 | 38,6 | 334 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 40,0 | 34,2 | 1 036 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 40,0 | 31,9 | 1 740 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 40,0 | 25,0 | 6 449 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 40,0 | 27,6 | 5 279 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 40,0 | 27,5 | 4 777 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 40,0 | 27,7 | 4 708 |

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

| | |
|---|---|
| LWA,ref: | Sound pressure level at WTG |
| K: | Pure tone |
| Dc: | Directivity correction |
| Adiv: | the attenuation due to geometrical divergence |
| Aatm: | the attenuation due to atmospheric absorption |
| Agr: | the attenuation due to ground effect |
| Abar: | the attenuation due to a barrier |
| Amisc: | the attenuation due to miscellaneous other effects |
| Cmet: | Meteorological correction |

## Calculation Results

### Noise sensitive area: A Lomarakennus A (Syvälahti)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6 000 | 6 004 | **15,94** | 110,1 | 0,00 | 86,57 | - | - | 0,00 | 0,00 | - |
| T10 | 4 760 | 4 765 | **19,09** | 110,1 | 0,00 | 84,56 | - | - | 0,00 | 0,00 | - |
| T11 | 6 091 | 6 094 | **15,72** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T12 | 3 465 | 3 471 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T13 | 3 747 | 3 753 | **22,28** | 110,1 | 0,00 | 82,49 | - | - | 0,00 | 0,00 | - |
| T14 | 4 867 | 4 872 | **18,79** | 110,1 | 0,00 | 84,75 | - | - | 0,00 | 0,00 | - |
| T15 | 5 872 | 5 876 | **16,22** | 110,1 | 0,00 | 86,38 | - | - | 0,00 | 0,00 | - |
| T16 | 2 570 | 2 579 | **27,10** | 110,1 | 0,00 | 79,23 | - | - | 0,00 | 0,00 | - |
| T17 | 4 073 | 4 079 | **21,18** | 110,1 | 0,00 | 83,21 | - | - | 0,00 | 0,00 | - |
| T18 | 5 148 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T19 | 2 022 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 802 | 5 806 | **16,39** | 110,1 | 0,00 | 86,28 | - | - | 0,00 | 0,00 | - |
| T20 | 3 148 | 3 155 | **24,55** | 110,1 | 0,00 | 80,98 | - | - | 0,00 | 0,00 | - |
| T21 | 4 649 | 4 654 | **19,41** | 110,1 | 0,00 | 84,36 | - | - | 0,00 | 0,00 | - |
| T22 | 2 516 | 2 525 | **27,37** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T23 | 3 482 | 3 489 | **23,24** | 110,1 | 0,00 | 81,85 | - | - | 0,00 | 0,00 | - |
| T24 | 5 142 | 5 147 | **18,04** | 110,1 | 0,00 | 85,23 | - | - | 0,00 | 0,00 | - |
| T25 | 3 207 | 3 214 | **24,31** | 110,1 | 0,00 | 81,14 | - | - | 0,00 | 0,00 | - |
| T26 | 3 916 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 5 092 | 5 096 | **18,18** | 110,1 | 0,00 | 85,14 | - | - | 0,00 | 0,00 | - |
| T28 | 3 716 | 3 722 | **22,40** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T29 | 4 551 | 4 556 | **19,70** | 110,1 | 0,00 | 84,17 | - | - | 0,00 | 0,00 | - |
| T3 | 4 836 | 4 841 | **18,88** | 110,1 | 0,00 | 84,70 | - | - | 0,00 | 0,00 | - |
| T4 | 5 263 | 5 268 | **17,73** | 110,1 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |
| T5 | 3 967 | 3 973 | **21,53** | 110,1 | 0,00 | 82,98 | - | - | 0,00 | 0,00 | - |
| T6 | 4 724 | 4 729 | **19,19** | 110,1 | 0,00 | 84,50 | - | - | 0,00 | 0,00 | - |
| T7 | 5 704 | 5 708 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T8 | 6 472 | 6 476 | **14,87** | 110,1 | 0,00 | 87,23 | - | - | 0,00 | 0,00 | - |
| T9 | 3 559 | 3 565 | **22,96** | 110,1 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **36,98** | | | | | | | | |

- Data undefined due to calculation with octave data

### Noise sensitive area: B Asuinrakennus B (Syväänlahti)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 5 708 | 5 712 | **16,64** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T10 | 4 581 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T11 | 5 943 | 5 947 | **16,06** | 110,1 | 0,00 | 86,49 | - | - | 0,00 | 0,00 | - |
| T12 | 3 277 | 3 284 | **24,03** | 110,1 | 0,00 | 81,33 | - | - | 0,00 | 0,00 | - |
| T13 | 3 619 | 3 625 | **22,74** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T14 | 4 750 | 4 755 | **19,12** | 110,1 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T15 | 5 764 | 5 769 | **16,48** | 110,1 | 0,00 | 86,22 | - | - | 0,00 | 0,00 | - |
| T16 | 2 455 | 2 465 | **27,67** | 110,1 | 0,00 | 78,84 | - | - | 0,00 | 0,00 | - |
| T17 | 4 001 | 4 007 | **21,42** | 110,1 | 0,00 | 83,06 | - | - | 0,00 | 0,00 | - |
| T18 | 5 082 | 5 088 | **18,20** | 110,1 | 0,00 | 85,13 | - | - | 0,00 | 0,00 | - |
| T19 | 2 021 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 525 | 5 530 | **17,06** | 110,1 | 0,00 | 85,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 143 | 3 151 | **24,56** | 110,1 | 0,00 | 80,97 | - | - | 0,00 | 0,00 | - |
| T21 | 4 641 | 4 646 | **19,43** | 110,1 | 0,00 | 84,34 | - | - | 0,00 | 0,00 | - |
| T22 | 2 624 | 2 633 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T23 | 3 542 | 3 549 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T24 | 5 168 | 5 172 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T25 | 3 380 | 3 387 | **23,63** | 110,1 | 0,00 | 81,60 | - | - | 0,00 | 0,00 | - |
| T26 | 4 026 | 4 032 | **21,34** | 110,1 | 0,00 | 83,11 | - | - | 0,00 | 0,00 | - |
| T27 | 5 168 | 5 173 | **17,97** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T28 | 3 949 | 3 955 | **21,59** | 110,1 | 0,00 | 82,94 | - | - | 0,00 | 0,00 | - |
| T29 | 4 707 | 4 712 | **19,24** | 110,1 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| T3 | 4 558 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T4 | 5 014 | 5 019 | **18,39** | 110,1 | 0,00 | 85,01 | - | - | 0,00 | 0,00 | - |
| T5 | 3 694 | 3 700 | **22,47** | 110,1 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| T6 | 4 506 | 4 511 | **19,83** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T7 | 5 500 | 5 504 | **17,12** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T8 | 6 292 | 6 296 | **15,27** | 110,1 | 0,00 | 86,98 | - | - | 0,00 | 0,00 | - |
| T9 | 3 317 | 3 323 | **23,88** | 110,1 | 0,00 | 81,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,10** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: C Lomarakennus C (Mutalahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 4 594 | 4 600 | **19,57** | 110,1 | 0,00 | 84,25 | - | - | 0,00 | 0,00 | - |
| T10 | 3 787 | 3 794 | **22,14** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T11 | 5 236 | 5 240 | **17,80** | 110,1 | 0,00 | 85,39 | - | - | 0,00 | 0,00 | - |
| T12 | 2 497 | 2 506 | **27,46** | 110,1 | 0,00 | 78,98 | - | - | 0,00 | 0,00 | - |
| T13 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T14 | 4 173 | 4 179 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T15 | 5 198 | 5 203 | **17,89** | 110,1 | 0,00 | 85,33 | - | - | 0,00 | 0,00 | - |
| T16 | 2 032 | 2 044 | **29,96** | 110,1 | 0,00 | 77,21 | - | - | 0,00 | 0,00 | - |
| T17 | 3 622 | 3 629 | **22,73** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T18 | 4 686 | 4 692 | **19,30** | 110,1 | 0,00 | 84,43 | - | - | 0,00 | 0,00 | - |
| T19 | 2 097 | 2 108 | **29,58** | 110,1 | 0,00 | 77,48 | - | - | 0,00 | 0,00 | - |
| T2 | 4 431 | 4 437 | **20,05** | 110,1 | 0,00 | 83,94 | - | - | 0,00 | 0,00 | - |
| T20 | 3 066 | 3 074 | **24,88** | 110,1 | 0,00 | 80,75 | - | - | 0,00 | 0,00 | - |
| T21 | 4 469 | 4 475 | **19,94** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T22 | 2 986 | 2 994 | **25,22** | 110,1 | 0,00 | 80,52 | - | - | 0,00 | 0,00 | - |
| T23 | 3 668 | 3 675 | **22,56** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |
| T24 | 5 099 | 5 104 | **18,16** | 110,1 | 0,00 | 85,16 | - | - | 0,00 | 0,00 | - |
| T25 | 3 912 | 3 917 | **21,88** | 110,1 | 0,00 | 82,86 | - | - | 0,00 | 0,00 | - |
| T26 | 4 304 | 4 310 | **20,45** | 110,1 | 0,00 | 83,69 | - | - | 0,00 | 0,00 | - |
| T27 | 5 286 | 5 290 | **17,67** | 110,1 | 0,00 | 85,47 | - | - | 0,00 | 0,00 | - |
| T28 | 4 677 | 4 682 | **19,80** | 110,1 | 0,00 | 84,41 | - | - | 0,00 | 0,00 | - |
| T29 | 5 129 | 5 133 | **18,08** | 110,1 | 0,00 | 85,21 | - | - | 0,00 | 0,00 | - |
| T3 | 3 465 | 3 472 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T4 | 3 990 | 3 996 | **21,45** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T5 | 2 614 | 2 623 | **26,89** | 110,1 | 0,00 | 79,38 | - | - | 0,00 | 0,00 | - |
| T6 | 3 581 | 3 588 | **22,88** | 110,1 | 0,00 | 82,10 | - | - | 0,00 | 0,00 | - |
| T7 | 4 606 | 4 611 | **19,54** | 110,1 | 0,00 | 84,28 | - | - | 0,00 | 0,00 | - |
| T8 | 5 469 | 5 474 | **17,20** | 110,1 | 0,00 | 85,77 | - | - | 0,00 | 0,00 | - |
| T9 | 2 335 | 2 344 | **28,29** | 110,1 | 0,00 | 78,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,43** | | | | | | | | |

- Data undefined due to calculation with octave data

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9.5.2023 12.59/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: D Lomarakennus D (Mutaniemi)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 4 300 | 4 306 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T10 | 3 720 | 3 726 | **22,38** | 110,1 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| T11 | 5 193 | 5 197 | **17,91** | 110,1 | 0,00 | 85,32 | - | - | 0,00 | 0,00 | - |
| T12 | 2 460 | 2 469 | **27,65** | 110,1 | 0,00 | 78,85 | - | - | 0,00 | 0,00 | - |
| T13 | 3 088 | 3 096 | **24,79** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T14 | 4 192 | 4 198 | **20,80** | 110,1 | 0,00 | 83,46 | - | - | 0,00 | 0,00 | - |
| T15 | 5 211 | 5 216 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T16 | 2 157 | 2 168 | **29,24** | 110,1 | 0,00 | 77,72 | - | - | 0,00 | 0,00 | - |
| T17 | 3 717 | 3 724 | **22,39** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T18 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T19 | 2 348 | 2 358 | **28,22** | 110,1 | 0,00 | 78,45 | - | - | 0,00 | 0,00 | - |
| T2 | 4 172 | 4 178 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T20 | 3 258 | 3 265 | **24,10** | 110,1 | 0,00 | 81,28 | - | - | 0,00 | 0,00 | - |
| T21 | 4 615 | 4 621 | **19,51** | 110,1 | 0,00 | 84,29 | - | - | 0,00 | 0,00 | - |
| T22 | 3 268 | 3 276 | **24,06** | 110,1 | 0,00 | 81,31 | - | - | 0,00 | 0,00 | - |
| T23 | 3 898 | 3 904 | **21,76** | 110,1 | 0,00 | 82,83 | - | - | 0,00 | 0,00 | - |
| T24 | 5 268 | 5 273 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T25 | 4 212 | 4 217 | **20,74** | 110,1 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| T26 | 4 559 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T27 | 5 499 | 5 503 | **17,13** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T28 | 4 999 | 5 003 | **18,43** | 110,1 | 0,00 | 84,99 | - | - | 0,00 | 0,00 | - |
| T29 | 5 405 | 5 409 | **17,36** | 110,1 | 0,00 | 85,66 | - | - | 0,00 | 0,00 | - |
| T3 | 3 209 | 3 216 | **24,30** | 110,1 | 0,00 | 81,15 | - | - | 0,00 | 0,00 | - |
| T4 | 3 792 | 3 798 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| T5 | 2 378 | 2 387 | **28,06** | 110,1 | 0,00 | 78,56 | - | - | 0,00 | 0,00 | - |
| T6 | 3 448 | 3 455 | **23,37** | 110,1 | 0,00 | 81,77 | - | - | 0,00 | 0,00 | - |
| T7 | 4 482 | 4 487 | **19,90** | 110,1 | 0,00 | 84,04 | - | - | 0,00 | 0,00 | - |
| T8 | 5 374 | 5 378 | **17,44** | 110,1 | 0,00 | 85,61 | - | - | 0,00 | 0,00 | - |
| T9 | 2 185 | 2 195 | **29,09** | 110,1 | 0,00 | 77,83 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,29** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: E Asuinrakennus E (Alanko)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 3 999 | 4 006 | **21,42** | 110,1 | 0,00 | 83,05 | - | - | 0,00 | 0,00 | - |
| T10 | 3 660 | 3 666 | **22,60** | 110,1 | 0,00 | 82,28 | - | - | 0,00 | 0,00 | - |
| T11 | 5 149 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T12 | 2 446 | 2 455 | **27,72** | 110,1 | 0,00 | 78,80 | - | - | 0,00 | 0,00 | - |
| T13 | 3 142 | 3 149 | **24,57** | 110,1 | 0,00 | 80,96 | - | - | 0,00 | 0,00 | - |
| T14 | 4 216 | 4 221 | **20,72** | 110,1 | 0,00 | 83,51 | - | - | 0,00 | 0,00 | - |
| T15 | 5 224 | 5 228 | **17,83** | 110,1 | 0,00 | 85,37 | - | - | 0,00 | 0,00 | - |
| T16 | 2 307 | 2 317 | **28,43** | 110,1 | 0,00 | 78,30 | - | - | 0,00 | 0,00 | - |
| T17 | 3 820 | 3 826 | **22,03** | 110,1 | 0,00 | 82,66 | - | - | 0,00 | 0,00 | - |
| T18 | 4 841 | 4 846 | **18,86** | 110,1 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| T19 | 2 607 | 2 616 | **26,93** | 110,1 | 0,00 | 79,35 | - | - | 0,00 | 0,00 | - |
| T2 | 3 906 | 3 913 | **21,73** | 110,1 | 0,00 | 82,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 456 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T21 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T22 | 3 551 | 3 558 | **22,99** | 110,1 | 0,00 | 82,02 | - | - | 0,00 | 0,00 | - |
| T23 | 4 128 | 4 134 | **21,00** | 110,1 | 0,00 | 83,33 | - | - | 0,00 | 0,00 | - |
| T24 | 5 435 | 5 439 | **17,29** | 110,1 | 0,00 | 85,71 | - | - | 0,00 | 0,00 | - |
| T25 | 4 509 | 4 514 | **19,82** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T26 | 4 811 | 4 816 | **18,95** | 110,1 | 0,00 | 84,65 | - | - | 0,00 | 0,00 | - |
| T27 | 5 709 | 5 713 | **16,61** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T28 | 5 318 | 5 322 | **17,58** | 110,1 | 0,00 | 85,52 | - | - | 0,00 | 0,00 | - |
| T29 | 5 677 | 5 680 | **16,69** | 110,1 | 0,00 | 86,09 | - | - | 0,00 | 0,00 | - |
| T3 | 2 950 | 2 958 | **25,37** | 110,1 | 0,00 | 80,42 | - | - | 0,00 | 0,00 | - |
| T4 | 3 593 | 3 599 | **22,84** | 110,1 | 0,00 | 82,12 | - | - | 0,00 | 0,00 | - |
| T5 | 2 149 | 2 159 | **29,29** | 110,1 | 0,00 | 77,68 | - | - | 0,00 | 0,00 | - |
| T6 | 3 322 | 3 329 | **23,85** | 110,1 | 0,00 | 81,45 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T7 | 4 358 | 4 363 | **20,28** | 110,1 | 0,00 | 83,80 | - | - | 0,00 | 0,00 | - |
| T8 | 5 275 | 5 280 | **17,69** | 110,1 | 0,00 | 85,45 | - | - | 0,00 | 0,00 | - |
| T9 | 2 057 | 2 068 | **29,82** | 110,1 | 0,00 | 77,31 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,31** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: F Asuinrakennus F (Joensuu)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 3 835 | 3 841 | **21,98** | 110,1 | 0,00 | 82,69 | - | - | 0,00 | 0,00 | - |
| T10 | 3 727 | 3 733 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T11 | 5 222 | 5 227 | **17,83** | 110,1 | 0,00 | 85,36 | - | - | 0,00 | 0,00 | - |
| T12 | 2 557 | 2 565 | **27,17** | 110,1 | 0,00 | 79,18 | - | - | 0,00 | 0,00 | - |
| T13 | 3 291 | 3 297 | **23,98** | 110,1 | 0,00 | 81,36 | - | - | 0,00 | 0,00 | - |
| T14 | 4 340 | 4 345 | **20,34** | 110,1 | 0,00 | 83,76 | - | - | 0,00 | 0,00 | - |
| T15 | 5 338 | 5 342 | **17,53** | 110,1 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| T16 | 2 514 | 2 523 | **27,38** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T17 | 3 995 | 4 001 | **21,44** | 110,1 | 0,00 | 83,04 | - | - | 0,00 | 0,00 | - |
| T18 | 4 998 | 5 003 | **18,43** | 110,1 | 0,00 | 84,98 | - | - | 0,00 | 0,00 | - |
| T19 | 2 857 | 2 865 | **25,78** | 110,1 | 0,00 | 80,14 | - | - | 0,00 | 0,00 | - |
| T2 | 3 786 | 3 793 | **22,15** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T20 | 3 682 | 3 688 | **22,52** | 110,1 | 0,00 | 82,34 | - | - | 0,00 | 0,00 | - |
| T21 | 4 960 | 4 965 | **18,53** | 110,1 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |
| T22 | 3 807 | 3 813 | **22,08** | 110,1 | 0,00 | 82,63 | - | - | 0,00 | 0,00 | - |
| T23 | 4 366 | 4 372 | **20,25** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T24 | 5 642 | 5 646 | **16,77** | 110,1 | 0,00 | 86,03 | - | - | 0,00 | 0,00 | - |
| T25 | 4 768 | 4 773 | **19,07** | 110,1 | 0,00 | 84,58 | - | - | 0,00 | 0,00 | - |
| T26 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,09 | - | - | 0,00 | 0,00 | - |
| T27 | 5 936 | 5 940 | **16,07** | 110,1 | 0,00 | 86,48 | - | - | 0,00 | 0,00 | - |
| T28 | 5 579 | 5 583 | **16,93** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T29 | 5 929 | 5 933 | **16,09** | 110,1 | 0,00 | 86,46 | - | - | 0,00 | 0,00 | - |
| T3 | 2 843 | 2 851 | **25,84** | 110,1 | 0,00 | 80,10 | - | - | 0,00 | 0,00 | - |
| T4 | 3 543 | 3 550 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T5 | 2 081 | 2 091 | **29,68** | 110,1 | 0,00 | 77,41 | - | - | 0,00 | 0,00 | - |
| T6 | 3 339 | 3 345 | **23,79** | 110,1 | 0,00 | 81,49 | - | - | 0,00 | 0,00 | - |
| T7 | 4 371 | 4 376 | **20,24** | 110,1 | 0,00 | 83,82 | - | - | 0,00 | 0,00 | - |
| T8 | 5 307 | 5 312 | **17,61** | 110,1 | 0,00 | 85,50 | - | - | 0,00 | 0,00 | - |
| T9 | 2 087 | 2 097 | **29,65** | 110,1 | 0,00 | 77,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,00** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: G Asuinrakennus G (Heiniaho)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 060 | 2 071 | **29,79** | 110,1 | 0,00 | 77,33 | - | - | 0,00 | 0,00 | - |
| T10 | 4 264 | 4 269 | **20,57** | 110,1 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| T11 | 5 583 | 5 587 | **16,92** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T12 | 3 725 | 3 731 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T13 | 4 582 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T14 | 5 269 | 5 274 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T15 | 6 057 | 6 061 | **15,79** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T16 | 4 379 | 4 384 | **20,25** | 110,1 | 0,00 | 83,84 | - | - | 0,00 | 0,00 | - |
| T17 | 5 410 | 5 414 | **17,35** | 110,1 | 0,00 | 85,67 | - | - | 0,00 | 0,00 | - |
| T18 | 6 152 | 6 157 | **15,58** | 110,1 | 0,00 | 86,79 | - | - | 0,00 | 0,00 | - |
| T19 | 5 065 | 5 069 | **18,30** | 110,1 | 0,00 | 85,10 | - | - | 0,00 | 0,00 | - |
| T2 | 2 521 | 2 531 | **27,34** | 110,1 | 0,00 | 79,07 | - | - | 0,00 | 0,00 | - |
| T20 | 5 581 | 5 585 | **16,94** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T21 | 6 500 | 6 504 | **14,81** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T22 | 6 055 | 6 059 | **15,84** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T23 | 6 358 | 6 361 | **15,14** | 110,1 | 0,00 | 87,07 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 7 236 | 7 239 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T25 | 7 055 | 7 058 | **13,88** | 110,1 | 0,00 | 87,97 | - | - | 0,00 | 0,00 | - |
| T26 | 7 119 | 7 122 | **13,75** | 110,1 | 0,00 | 88,05 | - | - | 0,00 | 0,00 | - |
| T27 | 7 745 | 7 748 | **12,69** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T28 | 7 962 | 7 964 | **12,41** | 110,1 | 0,00 | 89,02 | - | - | 0,00 | 0,00 | - |
| T29 | 8 064 | 8 066 | **12,23** | 110,1 | 0,00 | 89,13 | - | - | 0,00 | 0,00 | - |
| T3 | 2 071 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T4 | 3 074 | 3 081 | **24,85** | 110,1 | 0,00 | 80,77 | - | - | 0,00 | 0,00 | - |
| T5 | 2 163 | 2 173 | **29,21** | 110,1 | 0,00 | 77,74 | - | - | 0,00 | 0,00 | - |
| T6 | 3 538 | 3 545 | **23,04** | 110,1 | 0,00 | 81,99 | - | - | 0,00 | 0,00 | - |
| T7 | 4 299 | 4 304 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T8 | 5 266 | 5 270 | **17,72** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T9 | 2 879 | 2 887 | **25,69** | 110,1 | 0,00 | 80,21 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,31** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: H Asuinrakennus H (Mäkelä)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 090 | 2 102 | **29,62** | 110,1 | 0,00 | 77,45 | - | - | 0,00 | 0,00 | - |
| T10 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| T11 | 6 241 | 6 244 | **15,38** | 110,1 | 0,00 | 86,91 | - | - | 0,00 | 0,00 | - |
| T12 | 4 712 | 4 716 | **19,23** | 110,1 | 0,00 | 84,47 | - | - | 0,00 | 0,00 | - |
| T13 | 5 551 | 5 555 | **17,00** | 110,1 | 0,00 | 85,89 | - | - | 0,00 | 0,00 | - |
| T14 | 6 120 | 6 123 | **15,65** | 110,1 | 0,00 | 86,74 | - | - | 0,00 | 0,00 | - |
| T15 | 6 813 | 6 816 | **14,24** | 110,1 | 0,00 | 87,67 | - | - | 0,00 | 0,00 | - |
| T16 | 5 460 | 5 464 | **17,22** | 110,1 | 0,00 | 85,75 | - | - | 0,00 | 0,00 | - |
| T17 | 6 379 | 6 383 | **15,08** | 110,1 | 0,00 | 87,10 | - | - | 0,00 | 0,00 | - |
| T18 | 7 035 | 7 038 | **13,85** | 110,1 | 0,00 | 87,95 | - | - | 0,00 | 0,00 | - |
| T19 | 6 182 | 6 186 | **15,52** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T2 | 2 797 | 2 805 | **26,05** | 110,1 | 0,00 | 79,96 | - | - | 0,00 | 0,00 | - |
| T20 | 6 647 | 6 650 | **14,54** | 110,1 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| T21 | 7 475 | 7 478 | **13,12** | 110,1 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| T22 | 7 173 | 7 176 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T23 | 7 432 | 7 435 | **13,19** | 110,1 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| T24 | 8 212 | 8 214 | **11,96** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T25 | 8 175 | 8 177 | **12,02** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T26 | 8 201 | 8 203 | **11,97** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T27 | 8 768 | 8 770 | **11,14** | 110,1 | 0,00 | 89,86 | - | - | 0,00 | 0,00 | - |
| T28 | 9 092 | 9 094 | **10,73** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T29 | 9 154 | 9 157 | **10,60** | 110,1 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| T3 | 2 728 | 2 736 | **26,36** | 110,1 | 0,00 | 79,74 | - | - | 0,00 | 0,00 | - |
| T4 | 3 644 | 3 650 | **22,65** | 110,1 | 0,00 | 82,25 | - | - | 0,00 | 0,00 | - |
| T5 | 3 094 | 3 100 | **24,77** | 110,1 | 0,00 | 80,83 | - | - | 0,00 | 0,00 | - |
| T6 | 4 292 | 4 297 | **20,49** | 110,1 | 0,00 | 83,66 | - | - | 0,00 | 0,00 | - |
| T7 | 4 883 | 4 887 | **18,75** | 110,1 | 0,00 | 84,78 | - | - | 0,00 | 0,00 | - |
| T8 | 5 791 | 5 795 | **16,41** | 110,1 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| T9 | 3 860 | 3 866 | **21,89** | 110,1 | 0,00 | 82,74 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,11** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: I Lomarakennus I

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2 625 | 2 634 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T10 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T11 | 2 945 | 2 952 | **25,40** | 110,1 | 0,00 | 80,40 | - | - | 0,00 | 0,00 | - |
| T12 | 4 055 | 4 059 | **21,25** | 110,1 | 0,00 | 83,17 | - | - | 0,00 | 0,00 | - |
| T13 | 4 315 | 4 320 | **20,41** | 110,1 | 0,00 | 83,71 | - | - | 0,00 | 0,00 | - |
| T14 | 3 870 | 3 876 | **21,86** | 110,1 | 0,00 | 82,77 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T15 | 3 806 | 3 813 | **22,08** | 110,1 | 0,00 | 82,62 | - | - | 0,00 | 0,00 | - |
| T16 | 5 213 | 5 217 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T17 | 4 798 | 4 802 | **18,99** | 110,1 | 0,00 | 84,63 | - | - | 0,00 | 0,00 | - |
| T18 | 4 661 | 4 667 | **19,37** | 110,1 | 0,00 | 84,38 | - | - | 0,00 | 0,00 | - |
| T19 | 6 200 | 6 203 | **15,47** | 110,1 | 0,00 | 86,85 | - | - | 0,00 | 0,00 | - |
| T2 | 2 072 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T20 | 5 814 | 5 818 | **16,36** | 110,1 | 0,00 | 86,30 | - | - | 0,00 | 0,00 | - |
| T21 | 5 603 | 5 607 | **16,87** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T22 | 6 929 | 6 932 | **14,04** | 110,1 | 0,00 | 87,82 | - | - | 0,00 | 0,00 | - |
| T23 | 6 481 | 6 485 | **14,86** | 110,1 | 0,00 | 87,24 | - | - | 0,00 | 0,00 | - |
| T24 | 6 187 | 6 190 | **15,50** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T25 | 7 771 | 7 773 | **12,64** | 110,1 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| T26 | 7 177 | 7 179 | **13,61** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T27 | 7 019 | 7 022 | **13,88** | 110,1 | 0,00 | 87,93 | - | - | 0,00 | 0,00 | - |
| T28 | 8 851 | 8 853 | **11,02** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T29 | 8 087 | 8 089 | **12,15** | 110,1 | 0,00 | 89,16 | - | - | 0,00 | 0,00 | - |
| T3 | 2 832 | 2 840 | **25,89** | 110,1 | 0,00 | 80,07 | - | - | 0,00 | 0,00 | - |
| T4 | 2 100 | 2 111 | **29,57** | 110,1 | 0,00 | 77,49 | - | - | 0,00 | 0,00 | - |
| T5 | 3 534 | 3 539 | **23,06** | 110,1 | 0,00 | 81,98 | - | - | 0,00 | 0,00 | - |
| T6 | 2 703 | 2 711 | **26,48** | 110,1 | 0,00 | 79,66 | - | - | 0,00 | 0,00 | - |
| T7 | 1 994 | 2 005 | **30,19** | 110,1 | 0,00 | 77,04 | - | - | 0,00 | 0,00 | - |
| T8 | 2 093 | 2 104 | **29,61** | 110,1 | 0,00 | 77,46 | - | - | 0,00 | 0,00 | - |
| T9 | 3 792 | 3 797 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,60** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 10 347 | 10 350 | **9,04** | 110,1 | 0,00 | 91,30 | - | - | 0,00 | 0,00 | - |
| T10 | 7 801 | 7 804 | **12,59** | 110,1 | 0,00 | 88,85 | - | - | 0,00 | 0,00 | - |
| T11 | 8 471 | 8 474 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T12 | 6 911 | 6 915 | **14,07** | 110,1 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| T13 | 6 530 | 6 534 | **14,75** | 110,1 | 0,00 | 87,30 | - | - | 0,00 | 0,00 | - |
| T14 | 7 173 | 7 177 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T15 | 7 793 | 7 797 | **12,60** | 110,1 | 0,00 | 88,84 | - | - | 0,00 | 0,00 | - |
| T16 | 5 758 | 5 762 | **16,49** | 110,1 | 0,00 | 86,21 | - | - | 0,00 | 0,00 | - |
| T17 | 6 144 | 6 149 | **15,59** | 110,1 | 0,00 | 86,78 | - | - | 0,00 | 0,00 | - |
| T18 | 6 738 | 6 742 | **14,37** | 110,1 | 0,00 | 87,58 | - | - | 0,00 | 0,00 | - |
| T19 | 4 792 | 4 798 | **19,00** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T2 | 9 915 | 9 918 | **9,59** | 110,1 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| T20 | 5 038 | 5 043 | **18,32** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T21 | 5 719 | 5 724 | **16,58** | 110,1 | 0,00 | 86,15 | - | - | 0,00 | 0,00 | - |
| T22 | 3 932 | 3 939 | **21,65** | 110,1 | 0,00 | 82,91 | - | - | 0,00 | 0,00 | - |
| T23 | 4 449 | 4 455 | **20,00** | 110,1 | 0,00 | 83,98 | - | - | 0,00 | 0,00 | - |
| T24 | 5 551 | 5 556 | **16,99** | 110,1 | 0,00 | 85,90 | - | - | 0,00 | 0,00 | - |
| T25 | 3 090 | 3 098 | **24,78** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T26 | 3 915 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 4 795 | 4 800 | **18,99** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T28 | 2 023 | 2 035 | **30,01** | 110,1 | 0,00 | 77,17 | - | - | 0,00 | 0,00 | - |
| T29 | 3 336 | 3 343 | **23,80** | 110,1 | 0,00 | 81,48 | - | - | 0,00 | 0,00 | - |
| T3 | 9 032 | 9 035 | **10,77** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T4 | 9 042 | 9 045 | **10,75** | 110,1 | 0,00 | 90,13 | - | - | 0,00 | 0,00 | - |
| T5 | 8 186 | 8 189 | **12,00** | 110,1 | 0,00 | 89,26 | - | - | 0,00 | 0,00 | - |
| T6 | 8 213 | 8 216 | **11,95** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T7 | 8 871 | 8 874 | **10,99** | 110,1 | 0,00 | 89,96 | - | - | 0,00 | 0,00 | - |
| T8 | 9 214 | 9 217 | **10,51** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 502 | 7 505 | **13,07** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **34,17** | | | | | | | | |

- Data undefined due to calculation with octave data

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: K Asuinrakennus K (Takalo)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 11 268 | 11 270 | **7,95** | 110,1 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| T10 | 8 473 | 8 476 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T11 | 8 946 | 8 949 | **10,89** | 110,1 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| T12 | 7 729 | 7 732 | **12,70** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T13 | 7 234 | 7 238 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T14 | 7 715 | 7 719 | **12,73** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T15 | 8 196 | 8 199 | **11,98** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T16 | 6 619 | 6 623 | **14,59** | 110,1 | 0,00 | 87,42 | - | - | 0,00 | 0,00 | - |
| T17 | 6 726 | 6 730 | **14,39** | 110,1 | 0,00 | 87,56 | - | - | 0,00 | 0,00 | - |
| T18 | 7 142 | 7 147 | **13,67** | 110,1 | 0,00 | 88,08 | - | - | 0,00 | 0,00 | - |
| T19 | 5 706 | 5 711 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T2 | 10 776 | 10 779 | **8,52** | 110,1 | 0,00 | 91,65 | - | - | 0,00 | 0,00 | - |
| T20 | 5 729 | 5 734 | **16,56** | 110,1 | 0,00 | 86,17 | - | - | 0,00 | 0,00 | - |
| T21 | 6 108 | 6 112 | **15,68** | 110,1 | 0,00 | 86,72 | - | - | 0,00 | 0,00 | - |
| T22 | 4 762 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T23 | 5 033 | 5 038 | **18,33** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T24 | 5 785 | 5 789 | **16,43** | 110,1 | 0,00 | 86,25 | - | - | 0,00 | 0,00 | - |
| T25 | 3 801 | 3 808 | **22,09** | 110,1 | 0,00 | 82,61 | - | - | 0,00 | 0,00 | - |
| T26 | 4 364 | 4 370 | **20,26** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T27 | 4 946 | 4 951 | **18,57** | 110,1 | 0,00 | 84,89 | - | - | 0,00 | 0,00 | - |
| T28 | 2 753 | 2 761 | **26,25** | 110,1 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| T29 | 3 555 | 3 562 | **22,97** | 110,1 | 0,00 | 82,03 | - | - | 0,00 | 0,00 | - |
| T3 | 9 937 | 9 939 | **9,56** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T4 | 9 838 | 9 841 | **9,69** | 110,1 | 0,00 | 90,86 | - | - | 0,00 | 0,00 | - |
| T5 | 9 120 | 9 123 | **10,64** | 110,1 | 0,00 | 90,20 | - | - | 0,00 | 0,00 | - |
| T6 | 8 970 | 8 972 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |
| T7 | 9 521 | 9 524 | **10,10** | 110,1 | 0,00 | 90,58 | - | - | 0,00 | 0,00 | - |
| T8 | 9 743 | 9 746 | **9,81** | 110,1 | 0,00 | 90,78 | - | - | 0,00 | 0,00 | - |
| T9 | 8 396 | 8 399 | **11,68** | 110,1 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| Sum | | | **31,91** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 12 636 | 12 638 | **7,85** | 110,1 | 0,00 | 93,03 | - | - | 0,00 | 0,00 | - |
| T10 | 11 638 | 11 640 | **8,74** | 110,1 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| T11 | 12 857 | 12 859 | **7,39** | 110,1 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| T12 | 10 368 | 10 370 | **10,26** | 110,1 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| T13 | 10 507 | 10 509 | **10,04** | 110,1 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| T14 | 11 547 | 11 549 | **8,81** | 110,1 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| T15 | 12 471 | 12 473 | **7,78** | 110,1 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| T16 | 9 350 | 9 352 | **11,55** | 110,1 | 0,00 | 90,42 | - | - | 0,00 | 0,00 | - |
| T17 | 10 591 | 10 594 | **9,92** | 110,1 | 0,00 | 91,50 | - | - | 0,00 | 0,00 | - |
| T18 | 11 555 | 11 557 | **8,75** | 110,1 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| T19 | 8 505 | 8 507 | **12,74** | 110,1 | 0,00 | 89,60 | - | - | 0,00 | 0,00 | - |
| T2 | 12 590 | 12 592 | **7,85** | 110,1 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| T20 | 9 434 | 9 436 | **11,38** | 110,1 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| T21 | 10 738 | 10 741 | **9,69** | 110,1 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| T22 | 8 288 | 8 291 | **13,00** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T23 | 9 295 | 9 298 | **11,54** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T24 | 10 912 | 10 914 | **9,46** | 110,1 | 0,00 | 91,76 | - | - | 0,00 | 0,00 | - |
| T25 | 8 107 | 8 110 | **13,23** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T26 | 9 191 | 9 194 | **11,65** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T27 | 10 402 | 10 404 | **10,05** | 110,1 | 0,00 | 91,34 | - | - | 0,00 | 0,00 | - |
| T28 | 7 498 | 7 501 | **14,15** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T29 | 9 098 | 9 101 | **11,74** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T3 | 11 631 | 11 633 | **8,89** | 110,1 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| T4 | 12 167 | 12 169 | **8,25** | 110,1 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| T5 | 10 799 | 10 801 | **9,84** | 110,1 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| T6 | 11 650 | 11 653 | **8,75** | 110,1 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T7 | 12 619 | 12 621 | **7,69** | 110,1 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| T8 | 13 338 | 13 340 | **6,92** | 110,1 | 0,00 | 93,50 | - | - | 0,00 | 0,00 | - |
| T9 | 10 475 | 10 477 | **10,19** | 110,1 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **24,99** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: M Lomarakennus M (Haukilahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 960 | 8 963 | **12,33** | 110,1 | 0,00 | 90,05 | - | - | 0,00 | 0,00 | - |
| T10 | 9 035 | 9 038 | **12,29** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T11 | 10 479 | 10 481 | **10,37** | 110,1 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| T12 | 7 744 | 7 747 | **14,21** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T13 | 8 221 | 8 224 | **13,43** | 110,1 | 0,00 | 89,30 | - | - | 0,00 | 0,00 | - |
| T14 | 9 357 | 9 360 | **11,80** | 110,1 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| T15 | 10 380 | 10 383 | **10,44** | 110,1 | 0,00 | 91,33 | - | - | 0,00 | 0,00 | - |
| T16 | 7 082 | 7 086 | **15,11** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T17 | 8 642 | 8 645 | **12,63** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T18 | 9 724 | 9 726 | **11,12** | 110,1 | 0,00 | 90,76 | - | - | 0,00 | 0,00 | - |
| T19 | 6 612 | 6 615 | **15,77** | 110,1 | 0,00 | 87,41 | - | - | 0,00 | 0,00 | - |
| T2 | 9 123 | 9 126 | **12,11** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T20 | 7 735 | 7 738 | **13,91** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T21 | 9 235 | 9 237 | **11,67** | 110,1 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| T22 | 6 954 | 6 958 | **15,01** | 110,1 | 0,00 | 87,85 | - | - | 0,00 | 0,00 | - |
| T23 | 7 994 | 7 997 | **13,36** | 110,1 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| T24 | 9 693 | 9 696 | **10,94** | 110,1 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| T25 | 7 352 | 7 355 | **14,28** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T26 | 8 286 | 8 288 | **12,85** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T27 | 9 533 | 9 536 | **11,07** | 110,1 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| T28 | 7 363 | 7 366 | **14,12** | 110,1 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| T29 | 8 685 | 8 688 | **12,17** | 110,1 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| T3 | 8 241 | 8 244 | **13,43** | 110,1 | 0,00 | 89,32 | - | - | 0,00 | 0,00 | - |
| T4 | 9 015 | 9 018 | **12,33** | 110,1 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| T5 | 7 547 | 7 550 | **14,53** | 110,1 | 0,00 | 88,56 | - | - | 0,00 | 0,00 | - |
| T6 | 8 773 | 8 776 | **12,68** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T7 | 9 809 | 9 812 | **11,25** | 110,1 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| T8 | 10 705 | 10 707 | **10,09** | 110,1 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| T9 | 7 508 | 7 510 | **14,60** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **27,65** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: N Lomarakennus N (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 779 | 8 782 | **12,71** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T10 | 8 649 | 8 652 | **11,97** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T11 | 10 073 | 10 075 | **9,90** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T12 | 7 349 | 7 352 | **13,93** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T13 | 7 785 | 7 788 | **12,96** | 110,1 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| T14 | 8 920 | 8 923 | **11,25** | 110,1 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| T15 | 9 939 | 9 941 | **9,82** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T16 | 6 632 | 6 635 | **14,80** | 110,1 | 0,00 | 87,44 | - | - | 0,00 | 0,00 | - |
| T17 | 8 172 | 8 175 | **12,18** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T18 | 9 250 | 9 253 | **10,62** | 110,1 | 0,00 | 90,33 | - | - | 0,00 | 0,00 | - |
| T19 | 6 113 | 6 117 | **15,75** | 110,1 | 0,00 | 86,73 | - | - | 0,00 | 0,00 | - |
| T2 | 8 894 | 8 896 | **12,43** | 110,1 | 0,00 | 89,98 | - | - | 0,00 | 0,00 | - |
| T20 | 7 232 | 7 235 | **13,60** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T21 | 8 727 | 8 730 | **11,25** | 110,1 | 0,00 | 89,82 | - | - | 0,00 | 0,00 | - |
| T22 | 6 413 | 6 417 | **15,04** | 110,1 | 0,00 | 87,15 | - | - | 0,00 | 0,00 | - |
| T23 | 7 461 | 7 464 | **13,20** | 110,1 | 0,00 | 88,46 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058**Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 9 167 | 9 169 | **10,63** | 110,1 | 0,00 | 90,25 | - | - | 0,00 | 0,00 | - |
| T25 | 6 781 | 6 784 | **14,33** | 110,1 | 0,00 | 87,63 | - | - | 0,00 | 0,00 | - |
| T26 | 7 729 | 7 732 | **12,75** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T27 | 8 983 | 8 986 | **10,87** | 110,1 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| T28 | 6 771 | 6 774 | **14,34** | 110,1 | 0,00 | 87,62 | - | - | 0,00 | 0,00 | - |
| T29 | 8 108 | 8 111 | **12,15** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T3 | 7 988 | 7 991 | **13,69** | 110,1 | 0,00 | 89,05 | - | - | 0,00 | 0,00 | - |
| T4 | 8 720 | 8 723 | **12,40** | 110,1 | 0,00 | 89,81 | - | - | 0,00 | 0,00 | - |
| T5 | 7 259 | 7 262 | **14,70** | 110,1 | 0,00 | 88,22 | - | - | 0,00 | 0,00 | - |
| T6 | 8 428 | 8 431 | **12,52** | 110,1 | 0,00 | 89,52 | - | - | 0,00 | 0,00 | - |
| T7 | 9 461 | 9 463 | **11,02** | 110,1 | 0,00 | 90,52 | - | - | 0,00 | 0,00 | - |
| T8 | 10 335 | 10 338 | **9,77** | 110,1 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 165 | 7 168 | **14,53** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| Sum | | | **27,53** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: O Lomarakennus O (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 8 734 | 8 737 | **12,50** | 110,1 | 0,00 | 89,83 | - | - | 0,00 | 0,00 | - |
| T10 | 8 587 | 8 589 | **12,36** | 110,1 | 0,00 | 89,68 | - | - | 0,00 | 0,00 | - |
| T11 | 10 009 | 10 011 | **10,24** | 110,1 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| T12 | 7 286 | 7 289 | **14,33** | 110,1 | 0,00 | 88,25 | - | - | 0,00 | 0,00 | - |
| T13 | 7 719 | 7 722 | **13,24** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T14 | 8 854 | 8 857 | **11,51** | 110,1 | 0,00 | 89,95 | - | - | 0,00 | 0,00 | - |
| T15 | 9 872 | 9 875 | **10,08** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| T16 | 6 565 | 6 569 | **15,10** | 110,1 | 0,00 | 87,35 | - | - | 0,00 | 0,00 | - |
| T17 | 8 105 | 8 108 | **12,47** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T18 | 9 182 | 9 185 | **10,87** | 110,1 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| T19 | 6 045 | 6 048 | **15,94** | 110,1 | 0,00 | 86,63 | - | - | 0,00 | 0,00 | - |
| T2 | 8 844 | 8 846 | **12,35** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T20 | 7 163 | 7 166 | **13,71** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| T21 | 8 658 | 8 661 | **11,35** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T22 | 6 343 | 6 347 | **15,19** | 110,1 | 0,00 | 87,05 | - | - | 0,00 | 0,00 | - |
| T23 | 7 391 | 7 394 | **13,31** | 110,1 | 0,00 | 88,38 | - | - | 0,00 | 0,00 | - |
| T24 | 9 097 | 9 099 | **10,72** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T25 | 6 711 | 6 714 | **14,45** | 110,1 | 0,00 | 87,54 | - | - | 0,00 | 0,00 | - |
| T26 | 7 659 | 7 662 | **12,86** | 110,1 | 0,00 | 88,69 | - | - | 0,00 | 0,00 | - |
| T27 | 8 913 | 8 916 | **10,97** | 110,1 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| T28 | 6 703 | 6 707 | **14,46** | 110,1 | 0,00 | 87,53 | - | - | 0,00 | 0,00 | - |
| T29 | 8 039 | 8 042 | **12,26** | 110,1 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |
| T3 | 7 936 | 7 939 | **13,68** | 110,1 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| T4 | 8 664 | 8 667 | **12,54** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T5 | 7 204 | 7 207 | **14,81** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T6 | 8 368 | 8 371 | **12,80** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T7 | 9 401 | 9 403 | **11,32** | 110,1 | 0,00 | 90,47 | - | - | 0,00 | 0,00 | - |
| T8 | 10 274 | 10 276 | **10,11** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T9 | 7 106 | 7 109 | **14,84** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **27,71** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Assumptions for noise calculation

## Calculation: Haarasuonkangas_VE2_V172x39xHH214_2023058

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuonkangas_melu ja varjot_1.w2r (11)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)
**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:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 214,0 | 8,0 | 110,1 | No | 91,5 | 100,2 | 104,1 | 105,0 | 103,7 | 99,3 | 91,6 | 80,8 |

## Noise sensitive area: A Lomarakennus A (Syvälahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: C Lomarakennus C (Mutalahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058

## Noise sensitive area: D Lomarakennus D (Mutaniemi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: E Asuinrakennus E (Alanko)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: F Asuinrakennus F (Joensuu)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: G Asuinrakennus G (Heiniaho)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: H Asuinrakennus H (Mäkelä)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: I Lomarakennus I
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: J Lomarakennus J (Hautakaarto)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: K Asuinrakennus K (Takalo)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: L Lomarakennus L (Haukijärvi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: N Lomarakennus N (Kuusela)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: O Lomarakennus O (Kuusela)

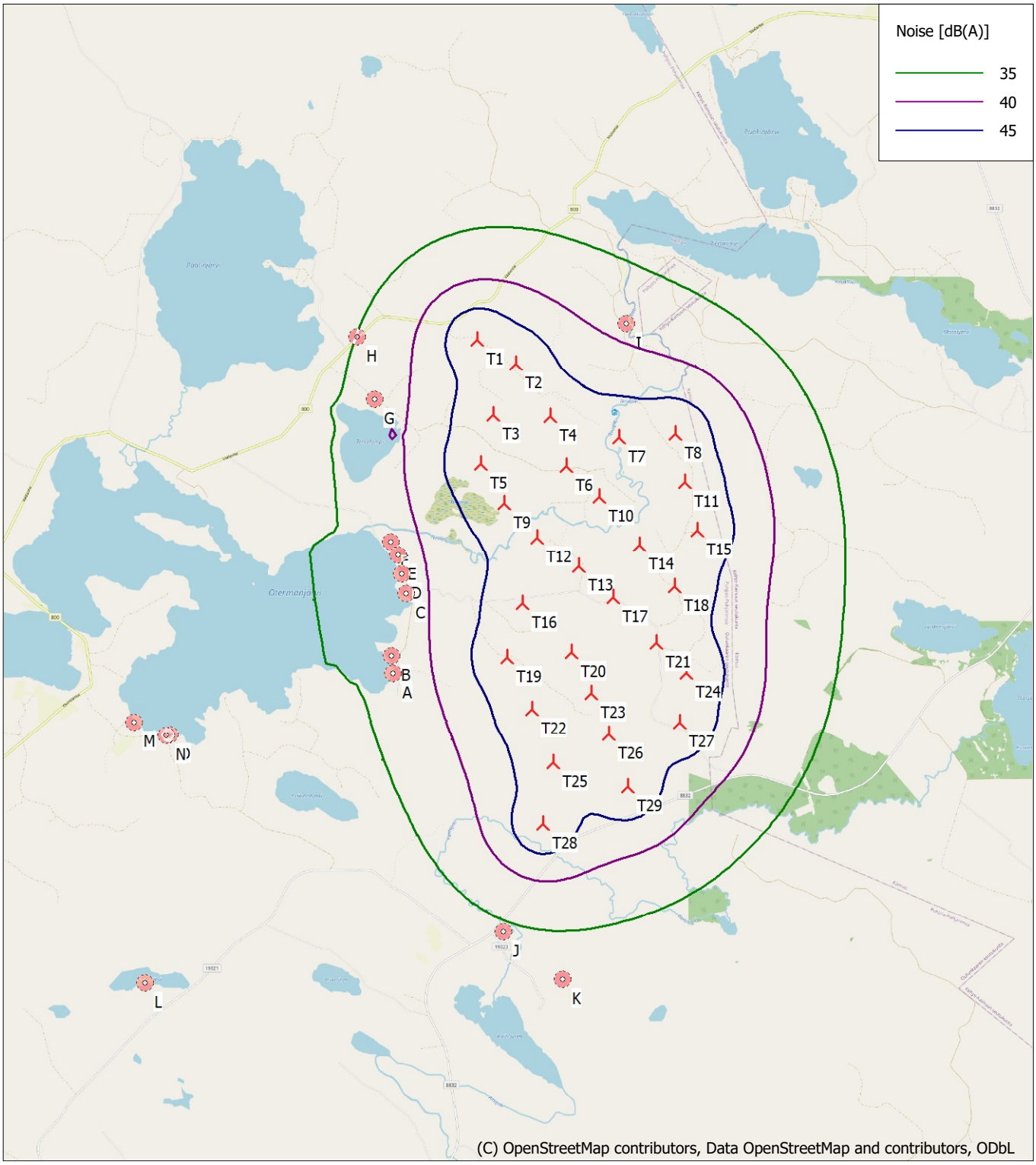
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 12.59/3.5.584

# DECIBEL - Map 8,0 m/s

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058




0 1 2 3 4 km

Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 508 964 North: 7 170 644

New WTG  Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

## Liite 3. Matalataajuisen melun rakennuskohtaiset arvot - Hankevaihtoehto 1

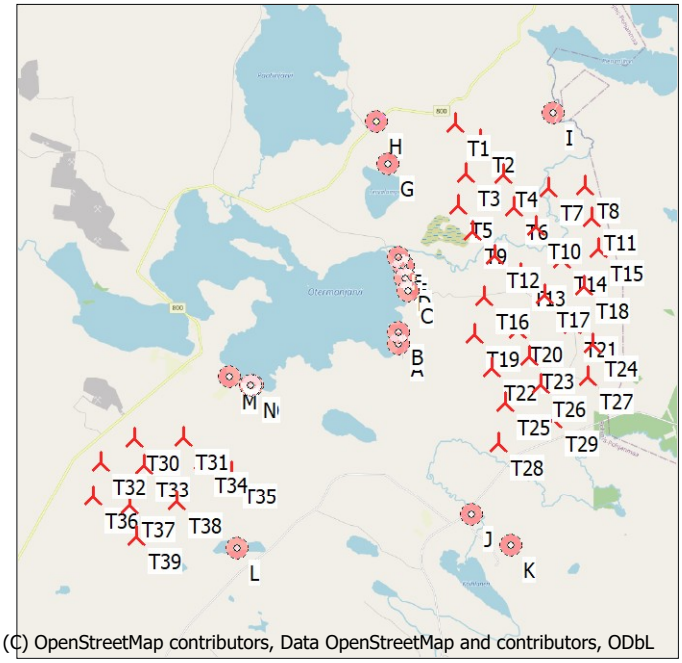
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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Main Result

## Calculation: Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model has priority
**Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:**
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



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

Scale 1:200 000

New WTG  Noise sensitive area

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T30 | 499 777 | 7 166 541 | 137,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T31 | 501 112 | 7 166 571 | 140,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T32 | 498 884 | 7 165 924 | 140,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T33 | 500 060 | 7 165 826 | 146,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T34 | 501 577 | 7 165 939 | 141,7 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T35 | 502 368 | 7 165 645 | 147,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T36 | 498 706 | 7 164 985 | 147,2 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T37 | 499 643 | 7 164 765 | 154,4 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T38 | 500 913 | 7 164 850 | 150,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T39 | 499 856 | 7 163 927 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |

## Calculation Results

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

## Sound level

| Noise sensitive area | | | | | | Most critical demand | | Predicted sound level |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z [m] | Immission height [m] | Frequency [Hz] | Noise [dB] | WTG noise [dB] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 63,0 | 42,0 | 35,1 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 63,0 | 42,0 | 35,2 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 63,0 | 42,0 | 36,0 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 63,0 | 42,0 | 35,9 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 63,0 | 42,0 | 35,9 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 63,0 | 42,0 | 35,6 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 63,0 | 42,0 | 34,8 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 63,0 | 42,0 | 33,2 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 63,0 | 42,0 | 35,7 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 63,0 | 42,0 | 32,7 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 63,0 | 42,0 | 31,4 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 63,0 | 42,0 | 33,7 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 63,0 | 42,0 | 33,5 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 63,0 | 42,0 | 33,3 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 63,0 | 42,0 | 33,3 |

***)Spectral distribution, please see details in report "Detailed results"**

## Distances (m)

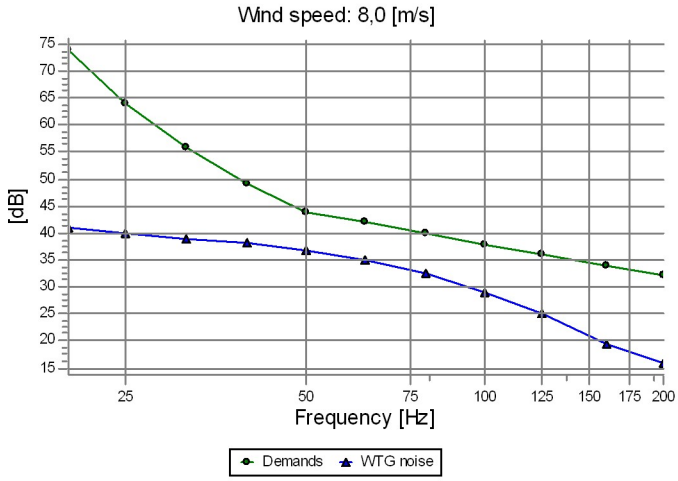
| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T30 | 7471 | 7562 | 8247 | 8343 | 8473 | 8491 | 9912 | 10547 | 14064 | 9214 | 10427 | 3990 | 3016 | 3392 | 3457 |
| T31 | 6218 | 6329 | 7083 | 7206 | 7365 | 7407 | 9035 | 9767 | 13015 | 7925 | 9160 | 3257 | 2008 | 2230 | 2287 |
| T32 | 8524 | 8625 | 9327 | 9426 | 9559 | 9577 | 10974 | 11585 | 15148 | 9983 | 11150 | 4286 | 4102 | 4465 | 4529 |
| T33 | 7483 | 7604 | 8370 | 8495 | 8652 | 8692 | 10268 | 10962 | 14297 | 8804 | 9978 | 3287 | 3257 | 3517 | 3575 |
| T34 | 6090 | 6237 | 7081 | 7239 | 7429 | 7498 | 9295 | 10091 | 13106 | 7329 | 8532 | 2492 | 2361 | 2390 | 2431 |
| T35 | 5598 | 5775 | 6697 | 6886 | 7105 | 7201 | 9163 | 10026 | 12774 | 6497 | 7692 | 2024 | 2541 | 2363 | 2381 |
| T36 | 9070 | 9195 | 9964 | 10087 | 10240 | 10276 | 11785 | 12434 | 15875 | 10073 | 11178 | 4031 | 4817 | 5107 | 5166 |
| T37 | 8353 | 8499 | 9327 | 9472 | 9649 | 9704 | 11362 | 12078 | 15316 | 9129 | 10222 | 3077 | 4335 | 4532 | 4584 |
| T38 | 7241 | 7409 | 8296 | 8468 | 8669 | 8747 | 10571 | 11364 | 14348 | 7862 | 8970 | 2006 | 3614 | 3666 | 3706 |
| T39 | 8639 | 8809 | 9699 | 9869 | 10067 | 10142 | 11920 | 12682 | 15746 | 8932 | 9956 | 2662 | 4913 | 5026 | 5070 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE**Noise calculation model:** Finland Low frequency

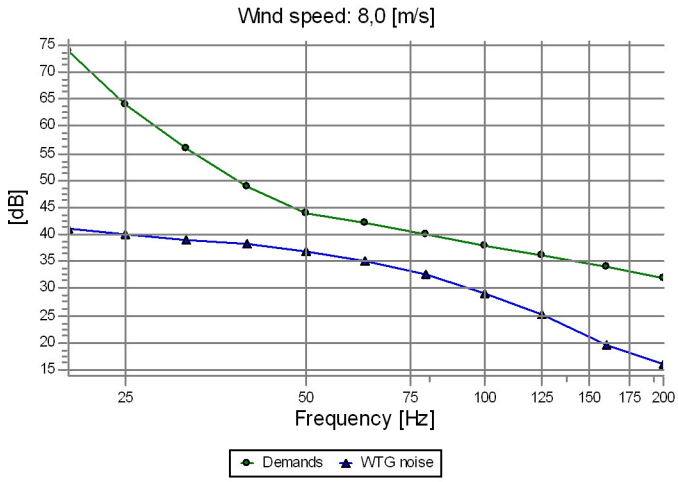
### A Lomarakennus A (Syvälahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,1 | Yes |
| 25,0 | 64,0 | 40,0 | Yes |
| 31,5 | 56,0 | 39,0 | Yes |
| 40,0 | 49,0 | 38,0 | Yes |
| 50,0 | 44,0 | 36,8 | Yes |
| 63,0 | 42,0 | 35,1 | Yes |
| 80,0 | 40,0 | 32,5 | Yes |
| 100,0 | 38,0 | 29,1 | Yes |
| 125,0 | 36,0 | 25,0 | Yes |
| 160,0 | 34,0 | 19,5 | Yes |
| 200,0 | 32,0 | 15,8 | Yes |

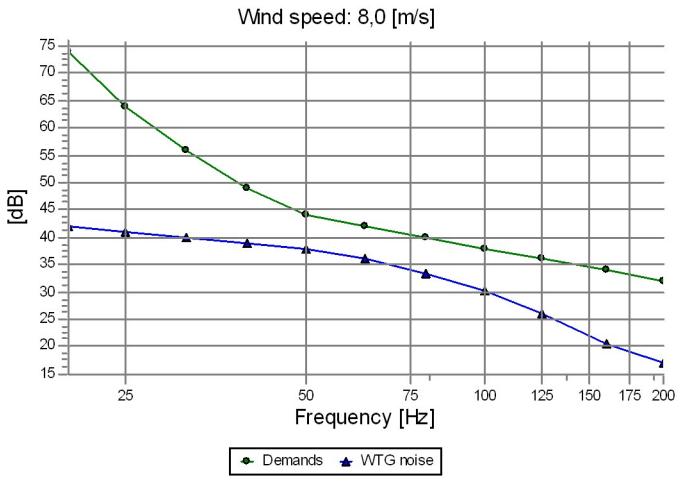
### B Asuinrakennus B (Syväänlahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,2 | Yes |
| 25,0 | 64,0 | 40,1 | Yes |
| 31,5 | 56,0 | 39,1 | Yes |
| 40,0 | 49,0 | 38,1 | Yes |
| 50,0 | 44,0 | 36,9 | Yes |
| 63,0 | 42,0 | 35,2 | Yes |
| 80,0 | 40,0 | 32,6 | Yes |
| 100,0 | 38,0 | 29,2 | Yes |
| 125,0 | 36,0 | 25,1 | Yes |
| 160,0 | 34,0 | 19,6 | Yes |
| 200,0 | 32,0 | 15,9 | Yes |

### C Lomarakennus C (Mutalahti)




**Sound level**

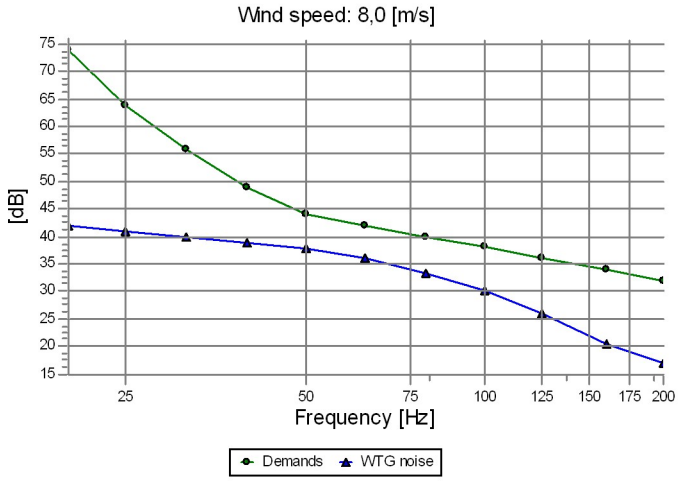
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,0 | Yes |
| 25,0 | 64,0 | 40,9 | Yes |
| 31,5 | 56,0 | 39,9 | Yes |
| 40,0 | 49,0 | 38,9 | Yes |
| 50,0 | 44,0 | 37,7 | Yes |
| 63,0 | 42,0 | 36,0 | Yes |
| 80,0 | 40,0 | 33,4 | Yes |
| 100,0 | 38,0 | 30,1 | Yes |
| 125,0 | 36,0 | 26,0 | Yes |
| 160,0 | 34,0 | 20,6 | Yes |
| 200,0 | 32,0 | 17,0 | Yes |

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

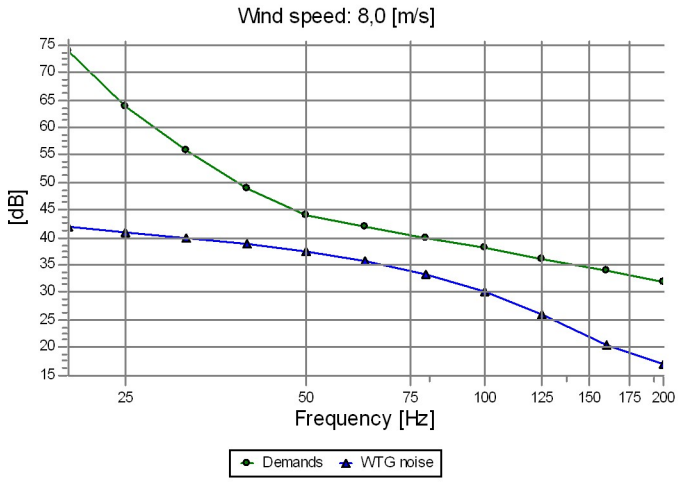
## D Lomarakennus D (Mutaniemi)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,9 | Yes |
| 25,0 | 64,0 | 40,8 | Yes |
| 31,5 | 56,0 | 39,8 | Yes |
| 40,0 | 49,0 | 38,8 | Yes |
| 50,0 | 44,0 | 37,6 | Yes |
| 63,0 | 42,0 | 35,9 | Yes |
| 80,0 | 40,0 | 33,3 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,5 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

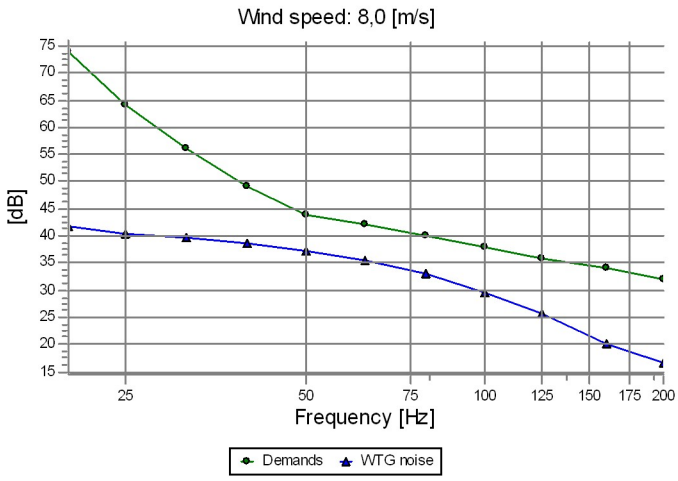
## E Asuinrakennus E (Alanko)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,9 | Yes |
| 25,0 | 64,0 | 40,8 | Yes |
| 31,5 | 56,0 | 39,7 | Yes |
| 40,0 | 49,0 | 38,8 | Yes |
| 50,0 | 44,0 | 37,6 | Yes |
| 63,0 | 42,0 | 35,9 | Yes |
| 80,0 | 40,0 | 33,3 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,5 | Yes |
| 200,0 | 32,0 | 16,8 | Yes |

## F Asuinrakennus F (Joensuu)




**Sound level**

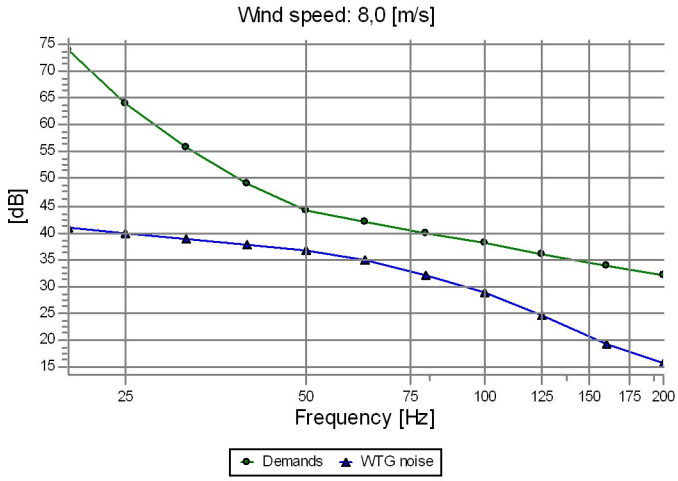
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,6 | Yes |
| 25,0 | 64,0 | 40,6 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,6 | Yes |
| 50,0 | 44,0 | 37,4 | Yes |
| 63,0 | 42,0 | 35,6 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,7 | Yes |
| 125,0 | 36,0 | 25,7 | Yes |
| 160,0 | 34,0 | 20,2 | Yes |
| 200,0 | 32,0 | 16,6 | Yes |

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Calculated:
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# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

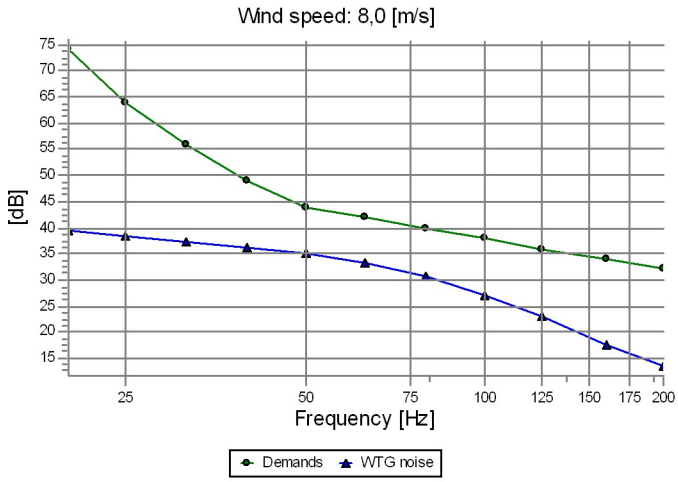
## G Asuinrakennus G (Heiniaho)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,8 | Yes |
| 25,0 | 64,0 | 39,7 | Yes |
| 31,5 | 56,0 | 38,7 | Yes |
| 40,0 | 49,0 | 37,7 | Yes |
| 50,0 | 44,0 | 36,5 | Yes |
| 63,0 | 42,0 | 34,8 | Yes |
| 80,0 | 40,0 | 32,2 | Yes |
| 100,0 | 38,0 | 28,9 | Yes |
| 125,0 | 36,0 | 24,8 | Yes |
| 160,0 | 34,0 | 19,3 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

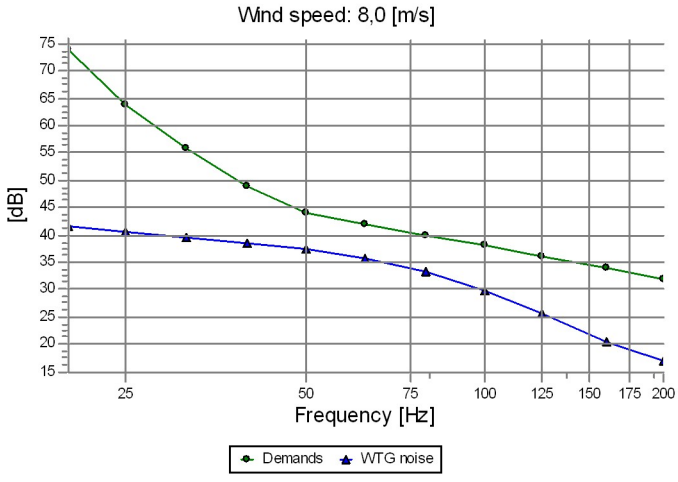
## H Asuinrakennus H (Mäkelä)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,3 | Yes |
| 25,0 | 64,0 | 38,3 | Yes |
| 31,5 | 56,0 | 37,2 | Yes |
| 40,0 | 49,0 | 36,2 | Yes |
| 50,0 | 44,0 | 35,0 | Yes |
| 63,0 | 42,0 | 33,2 | Yes |
| 80,0 | 40,0 | 30,6 | Yes |
| 100,0 | 38,0 | 27,2 | Yes |
| 125,0 | 36,0 | 23,1 | Yes |
| 160,0 | 34,0 | 17,5 | Yes |
| 200,0 | 32,0 | 13,7 | Yes |

## I Lomarakennus I




**Sound level**

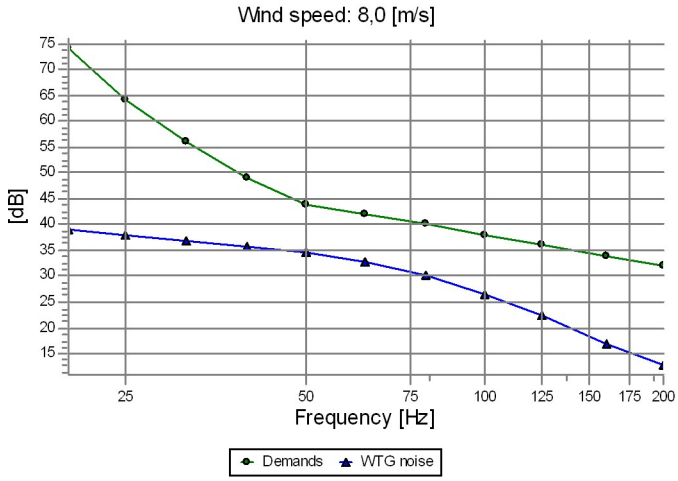
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,7 | Yes |
| 25,0 | 64,0 | 40,6 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,6 | Yes |
| 50,0 | 44,0 | 37,4 | Yes |
| 63,0 | 42,0 | 35,7 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,8 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE**Noise calculation model:** Finland Low frequency

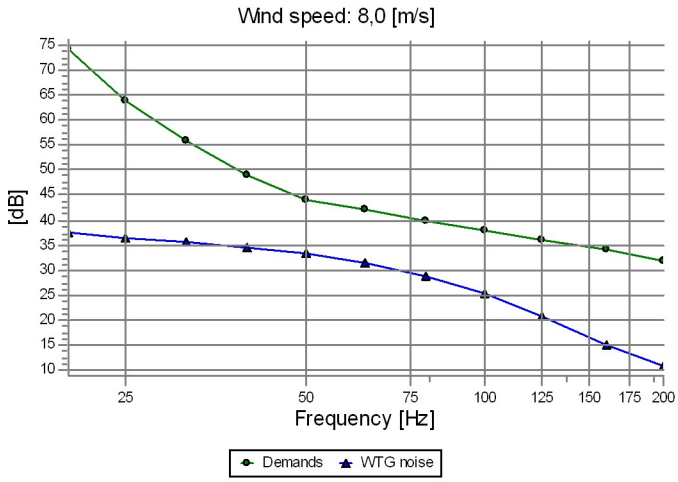
## J Lomarakennus J (Hautakaarto)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,9 | Yes |
| 25,0 | 64,0 | 37,8 | Yes |
| 31,5 | 56,0 | 36,7 | Yes |
| 40,0 | 49,0 | 35,7 | Yes |
| 50,0 | 44,0 | 34,5 | Yes |
| 63,0 | 42,0 | 32,7 | Yes |
| 80,0 | 40,0 | 30,1 | Yes |
| 100,0 | 38,0 | 26,7 | Yes |
| 125,0 | 36,0 | 22,5 | Yes |
| 160,0 | 34,0 | 16,8 | Yes |
| 200,0 | 32,0 | 13,0 | Yes |

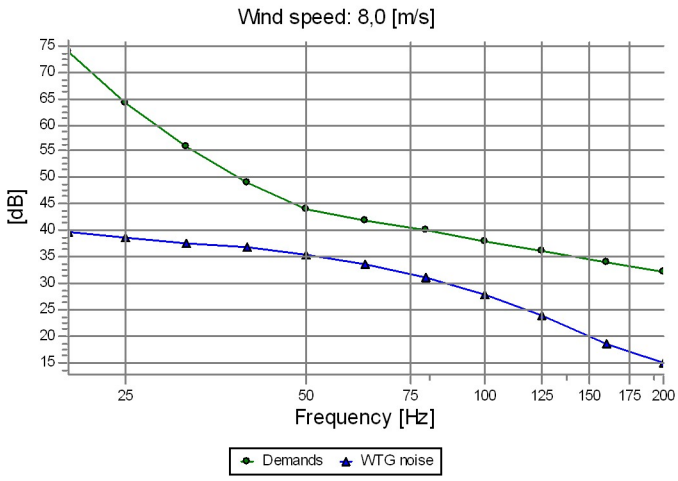
## K Asuinrakennus K (Takalo)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 37,6 | Yes |
| 25,0 | 64,0 | 36,5 | Yes |
| 31,5 | 56,0 | 35,4 | Yes |
| 40,0 | 49,0 | 34,4 | Yes |
| 50,0 | 44,0 | 33,2 | Yes |
| 63,0 | 42,0 | 31,4 | Yes |
| 80,0 | 40,0 | 28,7 | Yes |
| 100,0 | 38,0 | 25,2 | Yes |
| 125,0 | 36,0 | 20,9 | Yes |
| 160,0 | 34,0 | 15,0 | Yes |
| 200,0 | 32,0 | 11,0 | Yes |

## L Lomarakennus L (Haukijärvi)




**Sound level**

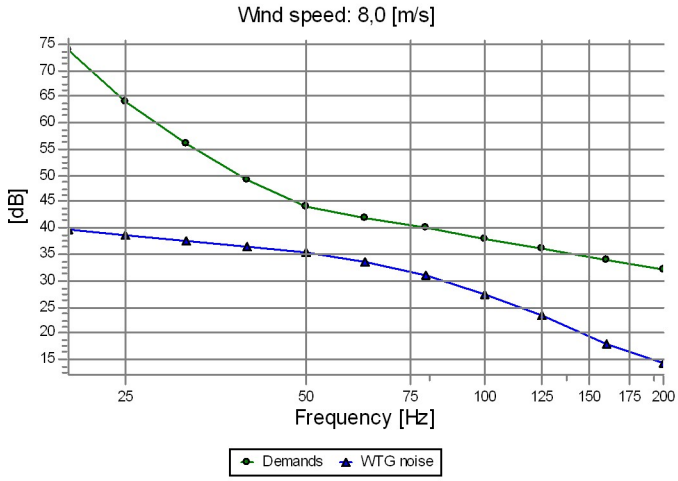
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,7 | Yes |
| 25,0 | 64,0 | 38,7 | Yes |
| 31,5 | 56,0 | 37,6 | Yes |
| 40,0 | 49,0 | 36,6 | Yes |
| 50,0 | 44,0 | 35,5 | Yes |
| 63,0 | 42,0 | 33,7 | Yes |
| 80,0 | 40,0 | 31,1 | Yes |
| 100,0 | 38,0 | 27,8 | Yes |
| 125,0 | 36,0 | 23,7 | Yes |
| 160,0 | 34,0 | 18,3 | Yes |
| 200,0 | 32,0 | 14,7 | Yes |

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

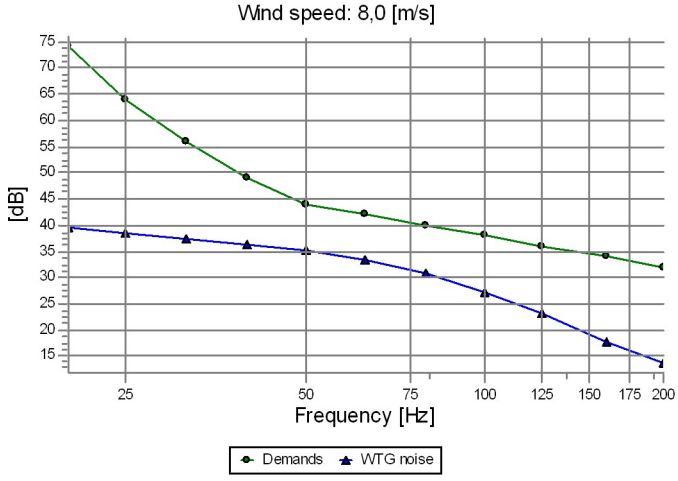
**M Lomarakennus M (Haukilahti)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,6 | Yes |
| 25,0 | 64,0 | 38,5 | Yes |
| 31,5 | 56,0 | 37,4 | Yes |
| 40,0 | 49,0 | 36,4 | Yes |
| 50,0 | 44,0 | 35,2 | Yes |
| 63,0 | 42,0 | 33,5 | Yes |
| 80,0 | 40,0 | 30,9 | Yes |
| 100,0 | 38,0 | 27,5 | Yes |
| 125,0 | 36,0 | 23,4 | Yes |
| 160,0 | 34,0 | 17,8 | Yes |
| 200,0 | 32,0 | 14,1 | Yes |

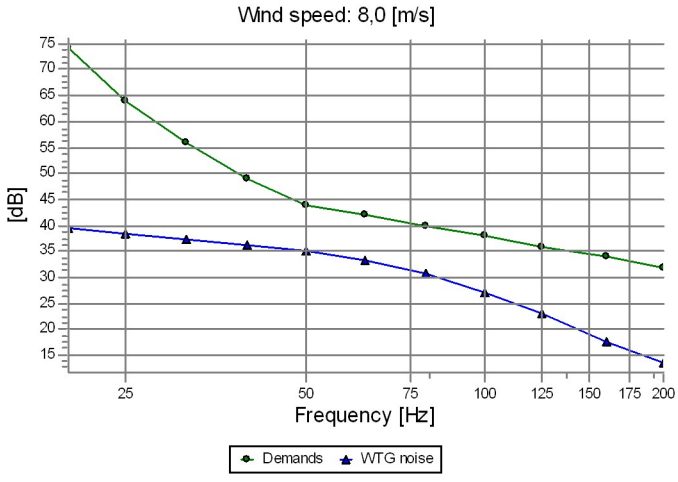
**N Lomarakennus N (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,4 | Yes |
| 25,0 | 64,0 | 38,4 | Yes |
| 31,5 | 56,0 | 37,3 | Yes |
| 40,0 | 49,0 | 36,3 | Yes |
| 50,0 | 44,0 | 35,1 | Yes |
| 63,0 | 42,0 | 33,3 | Yes |
| 80,0 | 40,0 | 30,7 | Yes |
| 100,0 | 38,0 | 27,3 | Yes |
| 125,0 | 36,0 | 23,2 | Yes |
| 160,0 | 34,0 | 17,6 | Yes |
| 200,0 | 32,0 | 13,9 | Yes |

**O Lomarakennus O (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,4 | Yes |
| 25,0 | 64,0 | 38,3 | Yes |
| 31,5 | 56,0 | 37,2 | Yes |
| 40,0 | 49,0 | 36,2 | Yes |
| 50,0 | 44,0 | 35,1 | Yes |
| 63,0 | 42,0 | 33,3 | Yes |
| 80,0 | 40,0 | 30,6 | Yes |
| 100,0 | 38,0 | 27,2 | Yes |
| 125,0 | 36,0 | 23,1 | Yes |
| 160,0 | 34,0 | 17,5 | Yes |
| 200,0 | 32,0 | 13,7 | Yes |

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model 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:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| 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 | 214,0 | 8,0 | 102,8 | 60,4 | 66,1 | 71,5 | 76,7 | 81,5 | 85,8 | 89,5 | 92,6 | 95,2 | 97,2 | 98,6 |

## Noise sensitive area: A Lomarakennus A (Syvälahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: B Asuinrakennus B (Syväänlahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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**

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

## Noise sensitive area: C Lomarakennus C (Mutalahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: D Lomarakennus D (Mutaniemi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: E Asuinrakennus E (Alanko)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: F Asuinrakennus F (Joensuu)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: G Asuinrakennus G (Heiniaho)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: H Asuinrakennus H (Mäkelä)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:**

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

| 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: I Lomarakennus I

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: K Asuinrakennus K (Takalo)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: N Lomarakennus N (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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Calculated:
9.5.2023 16.59/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_V172-7,2MW_No_STE

**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: O Lomarakennus O (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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 4. Matalataajuisen melun rakennuskohtaiset arvot - Hankevaihtoehto 2

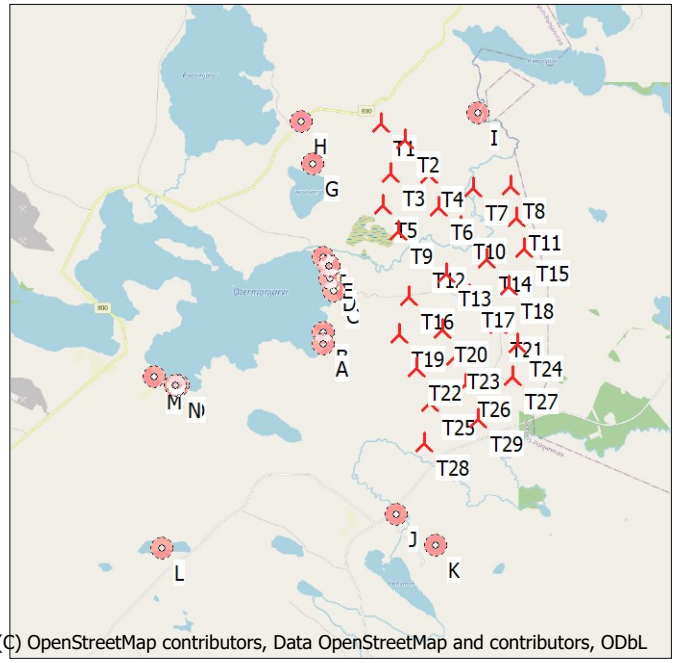
Licensed user:
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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Main Result

## Calculation: Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model has priority
**Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:**
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:200 000
New WTG
Noise sensitive area

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 7200 1... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |

# Calculation Results

## Sound level

| Noise sensitive area | | | | | Most critical demand | | Predicted sound level |
|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z | Immission height | Frequency | Noise | WTG noise |
| | | | | [m] | [m] | [Hz] | [dB] | [dB] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 63,0 | 42,0 | 34,7 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 63,0 | 42,0 | 34,8 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 63,0 | 42,0 | 35,7 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 63,0 | 42,0 | 35,7 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 63,0 | 42,0 | 35,6 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 63,0 | 42,0 | 35,4 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 63,0 | 42,0 | 34,6 |

To be continued on next page...

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

...continued from previous page

| Noise sensitive area | | | | | | Most critical demand | | Predicted sound level |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z [m] | Immission height [m] | Frequency [Hz] | Noise [dB] | WTG noise [dB] |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 63,0 | 42,0 | 33,0 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 63,0 | 42,0 | 35,6 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 63,0 | 42,0 | 32,2 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 63,0 | 42,0 | 30,9 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 50,0 | 44,0 | 27,5 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 63,0 | 42,0 | 27,5 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 63,0 | 42,0 | 28,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 63,0 | 42,0 | 28,1 |

***)Spectral distribution, please see details in report "Detailed results"**

## Distances (m)

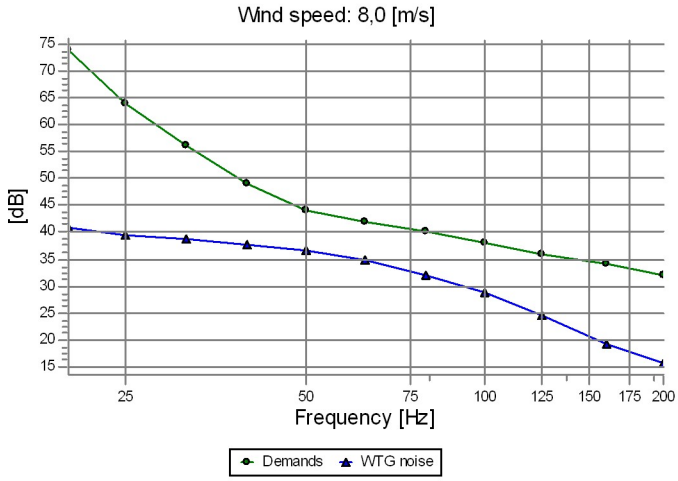
| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE**Noise calculation model:** Finland Low frequency

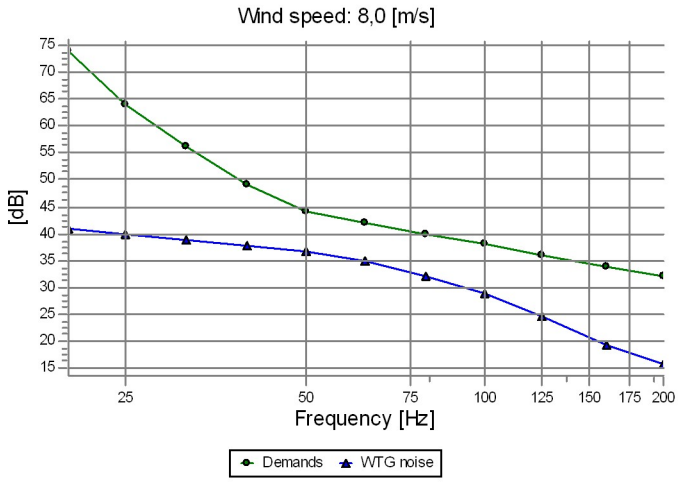
### A Lomarakennus A (Syvälahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,7 | Yes |
| 25,0 | 64,0 | 39,6 | Yes |
| 31,5 | 56,0 | 38,6 | Yes |
| 40,0 | 49,0 | 37,6 | Yes |
| 50,0 | 44,0 | 36,4 | Yes |
| 63,0 | 42,0 | 34,7 | Yes |
| 80,0 | 40,0 | 32,1 | Yes |
| 100,0 | 38,0 | 28,8 | Yes |
| 125,0 | 36,0 | 24,7 | Yes |
| 160,0 | 34,0 | 19,2 | Yes |
| 200,0 | 32,0 | 15,6 | Yes |

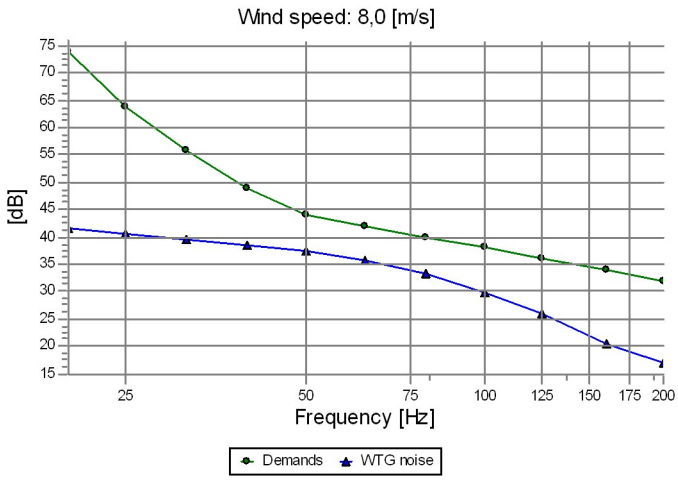
### B Asuinrakennus B (Syväänlahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,8 | Yes |
| 25,0 | 64,0 | 39,7 | Yes |
| 31,5 | 56,0 | 38,7 | Yes |
| 40,0 | 49,0 | 37,7 | Yes |
| 50,0 | 44,0 | 36,5 | Yes |
| 63,0 | 42,0 | 34,8 | Yes |
| 80,0 | 40,0 | 32,2 | Yes |
| 100,0 | 38,0 | 28,9 | Yes |
| 125,0 | 36,0 | 24,8 | Yes |
| 160,0 | 34,0 | 19,4 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

### C Lomarakennus C (Mutalahti)




**Sound level**

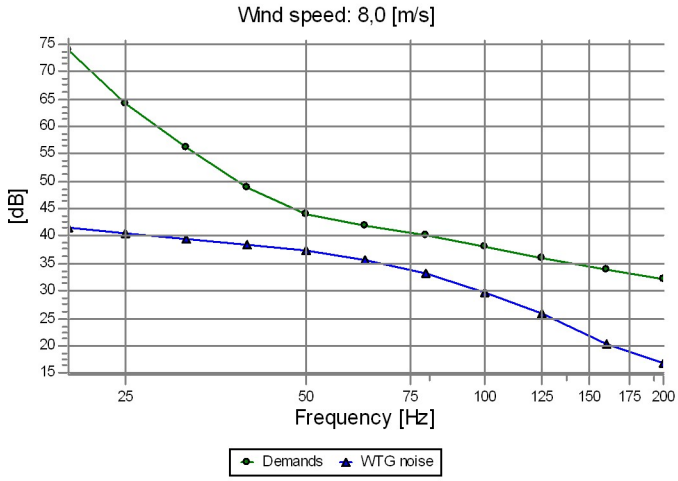
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,7 | Yes |
| 25,0 | 64,0 | 40,6 | Yes |
| 31,5 | 56,0 | 39,6 | Yes |
| 40,0 | 49,0 | 38,6 | Yes |
| 50,0 | 44,0 | 37,5 | Yes |
| 63,0 | 42,0 | 35,7 | Yes |
| 80,0 | 40,0 | 33,2 | Yes |
| 100,0 | 38,0 | 29,9 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

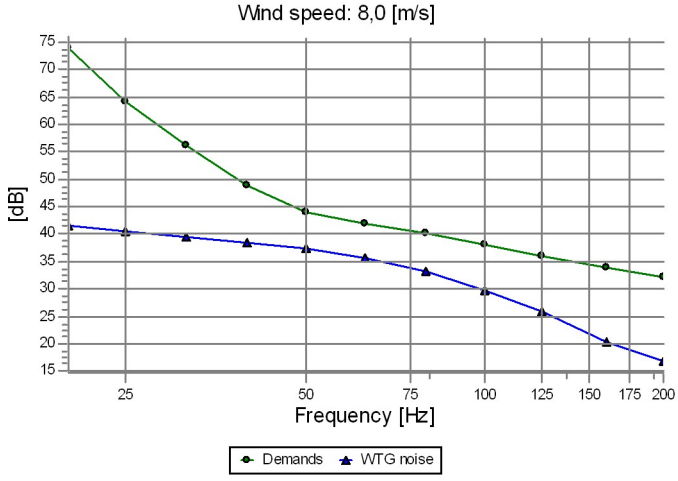
**D Lomarakennus D (Mutaniemi)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,6 | Yes |
| 25,0 | 64,0 | 40,6 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,6 | Yes |
| 50,0 | 44,0 | 37,4 | Yes |
| 63,0 | 42,0 | 35,7 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,8 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,3 | Yes |
| 200,0 | 32,0 | 16,7 | Yes |

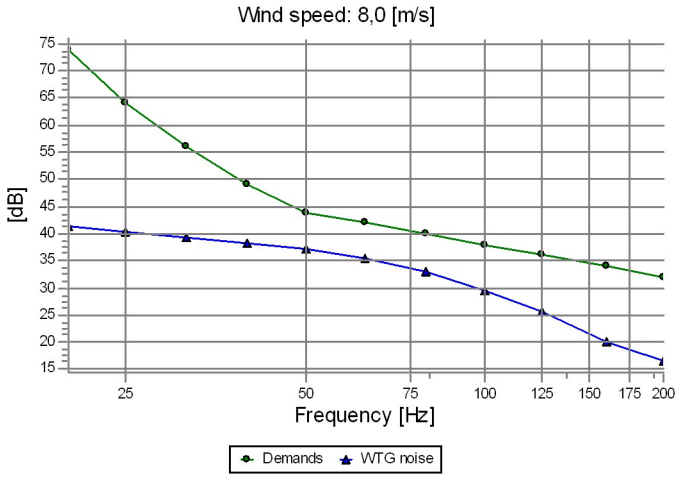
**E Asuinrakennus E (Alanko)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,6 | Yes |
| 25,0 | 64,0 | 40,5 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,5 | Yes |
| 50,0 | 44,0 | 37,4 | Yes |
| 63,0 | 42,0 | 35,6 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,8 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,3 | Yes |
| 200,0 | 32,0 | 16,7 | Yes |

**F Asuinrakennus F (Joensuu)**




**Sound level**

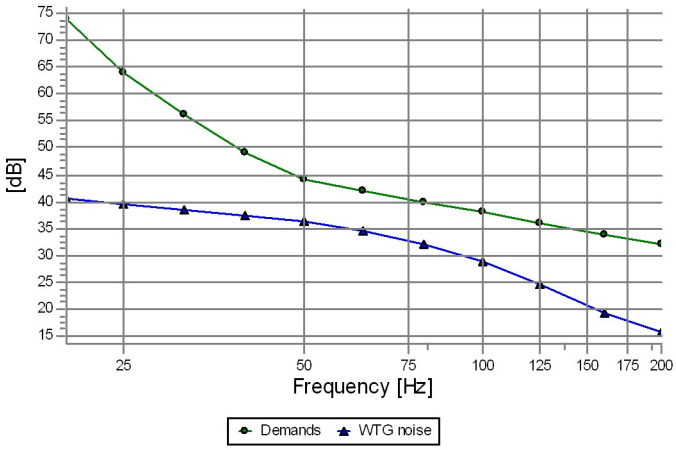
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,4 | Yes |
| 25,0 | 64,0 | 40,3 | Yes |
| 31,5 | 56,0 | 39,3 | Yes |
| 40,0 | 49,0 | 38,3 | Yes |
| 50,0 | 44,0 | 37,1 | Yes |
| 63,0 | 42,0 | 35,4 | Yes |
| 80,0 | 40,0 | 32,8 | Yes |
| 100,0 | 38,0 | 29,5 | Yes |
| 125,0 | 36,0 | 25,5 | Yes |
| 160,0 | 34,0 | 20,1 | Yes |
| 200,0 | 32,0 | 16,5 | Yes |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

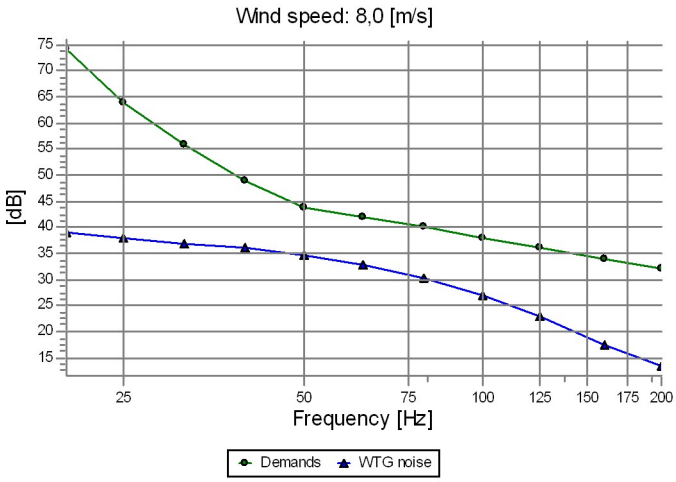
**G Asuinrakennus G (Heiniaho)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,6 | Yes |
| 25,0 | 64,0 | 39,5 | Yes |
| 31,5 | 56,0 | 38,5 | Yes |
| 40,0 | 49,0 | 37,5 | Yes |
| 50,0 | 44,0 | 36,4 | Yes |
| 63,0 | 42,0 | 34,6 | Yes |
| 80,0 | 40,0 | 32,0 | Yes |
| 100,0 | 38,0 | 28,7 | Yes |
| 125,0 | 36,0 | 24,7 | Yes |
| 160,0 | 34,0 | 19,3 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

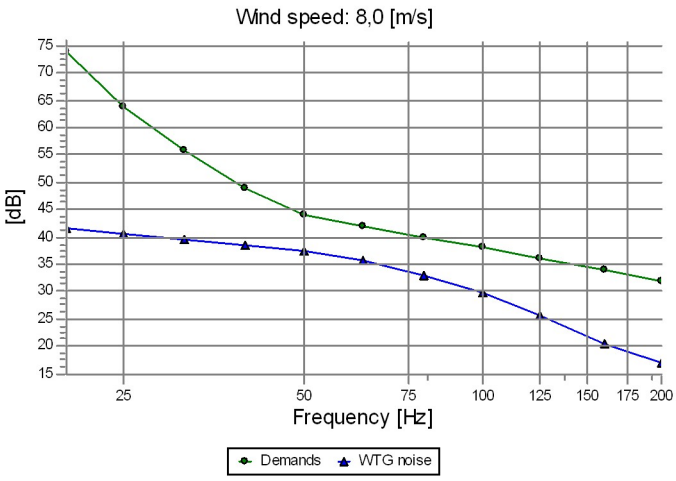
**H Asuinrakennus H (Mäkelä)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 39,1 | Yes |
| 25,0 | 64,0 | 38,0 | Yes |
| 31,5 | 56,0 | 37,0 | Yes |
| 40,0 | 49,0 | 36,0 | Yes |
| 50,0 | 44,0 | 34,8 | Yes |
| 63,0 | 42,0 | 33,0 | Yes |
| 80,0 | 40,0 | 30,4 | Yes |
| 100,0 | 38,0 | 27,0 | Yes |
| 125,0 | 36,0 | 22,9 | Yes |
| 160,0 | 34,0 | 17,4 | Yes |
| 200,0 | 32,0 | 13,6 | Yes |

**I Lomarakennus I**




**Sound level**

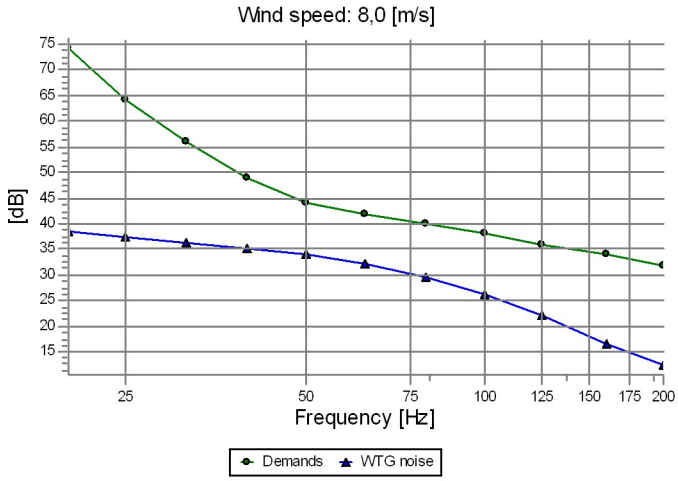
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,6 | Yes |
| 25,0 | 64,0 | 40,5 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,5 | Yes |
| 50,0 | 44,0 | 37,3 | Yes |
| 63,0 | 42,0 | 35,6 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,8 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

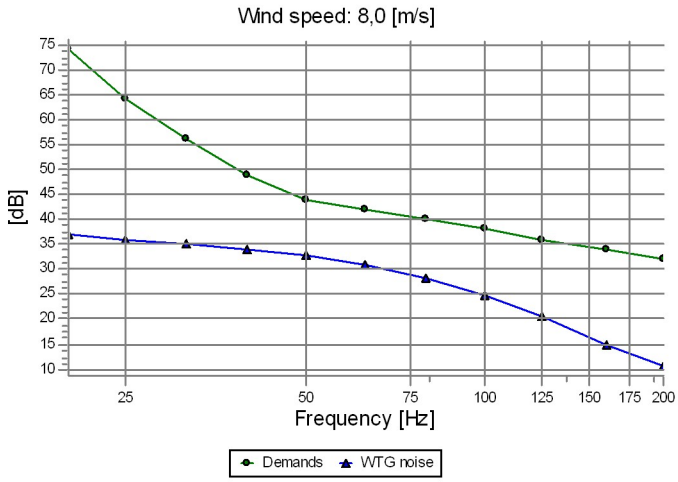
**J Lomarakennus J (Hautakaarto)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,4 | Yes |
| 25,0 | 64,0 | 37,3 | Yes |
| 31,5 | 56,0 | 36,2 | Yes |
| 40,0 | 49,0 | 35,2 | Yes |
| 50,0 | 44,0 | 34,0 | Yes |
| 63,0 | 42,0 | 32,2 | Yes |
| 80,0 | 40,0 | 29,6 | Yes |
| 100,0 | 38,0 | 26,2 | Yes |
| 125,0 | 36,0 | 22,1 | Yes |
| 160,0 | 34,0 | 16,5 | Yes |
| 200,0 | 32,0 | 12,7 | Yes |

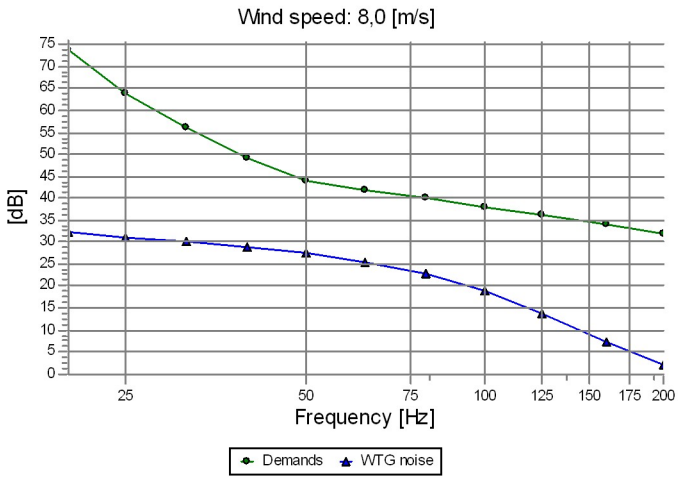
**K Asuinrakennus K (Takalo)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 37,1 | Yes |
| 25,0 | 64,0 | 36,0 | Yes |
| 31,5 | 56,0 | 34,9 | Yes |
| 40,0 | 49,0 | 33,9 | Yes |
| 50,0 | 44,0 | 32,7 | Yes |
| 63,0 | 42,0 | 30,9 | Yes |
| 80,0 | 40,0 | 28,2 | Yes |
| 100,0 | 38,0 | 24,7 | Yes |
| 125,0 | 36,0 | 20,5 | Yes |
| 160,0 | 34,0 | 14,7 | Yes |
| 200,0 | 32,0 | 10,7 | Yes |

**L Lomarakennus L (Haukijärvi)**




**Sound level**

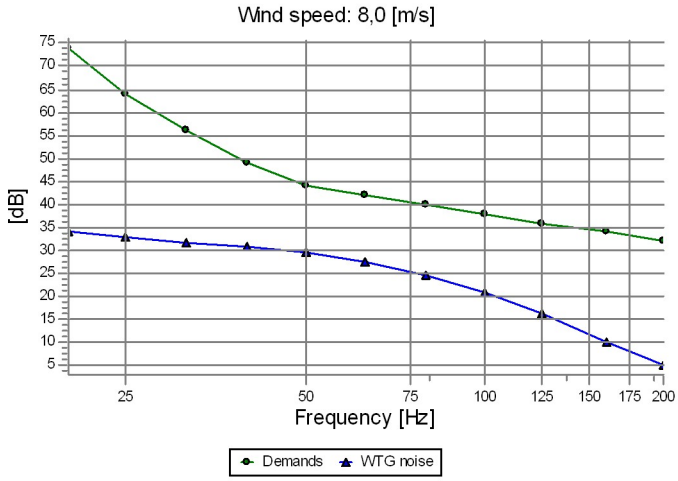
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 32,2 | Yes |
| 25,0 | 64,0 | 31,0 | Yes |
| 31,5 | 56,0 | 29,9 | Yes |
| 40,0 | 49,0 | 28,8 | Yes |
| 50,0 | 44,0 | 27,5 | Yes |
| 63,0 | 42,0 | 25,5 | Yes |
| 80,0 | 40,0 | 22,6 | Yes |
| 100,0 | 38,0 | 18,7 | Yes |
| 125,0 | 36,0 | 13,8 | Yes |
| 160,0 | 34,0 | 7,1 | Yes |
| 200,0 | 32,0 | 1,9 | Yes |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE **Noise calculation model:** Finland Low frequency

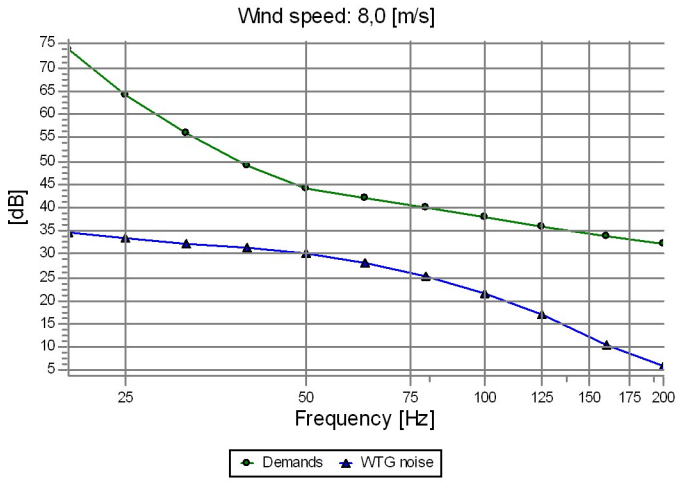
**M Lomarakennus M (Haukilahti)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 34,0 | Yes |
| 25,0 | 64,0 | 32,9 | Yes |
| 31,5 | 56,0 | 31,8 | Yes |
| 40,0 | 49,0 | 30,7 | Yes |
| 50,0 | 44,0 | 29,4 | Yes |
| 63,0 | 42,0 | 27,5 | Yes |
| 80,0 | 40,0 | 24,7 | Yes |
| 100,0 | 38,0 | 21,0 | Yes |
| 125,0 | 36,0 | 16,3 | Yes |
| 160,0 | 34,0 | 9,9 | Yes |
| 200,0 | 32,0 | 5,1 | Yes |

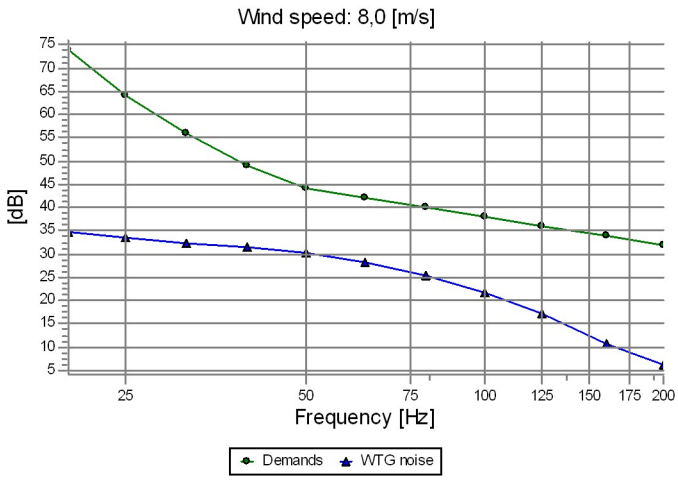
**N Lomarakennus N (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 34,5 | Yes |
| 25,0 | 64,0 | 33,4 | Yes |
| 31,5 | 56,0 | 32,3 | Yes |
| 40,0 | 49,0 | 31,2 | Yes |
| 50,0 | 44,0 | 30,0 | Yes |
| 63,0 | 42,0 | 28,0 | Yes |
| 80,0 | 40,0 | 25,3 | Yes |
| 100,0 | 38,0 | 21,6 | Yes |
| 125,0 | 36,0 | 16,9 | Yes |
| 160,0 | 34,0 | 10,7 | Yes |
| 200,0 | 32,0 | 5,9 | Yes |

**O Lomarakennus O (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 34,6 | Yes |
| 25,0 | 64,0 | 33,4 | Yes |
| 31,5 | 56,0 | 32,4 | Yes |
| 40,0 | 49,0 | 31,3 | Yes |
| 50,0 | 44,0 | 30,0 | Yes |
| 63,0 | 42,0 | 28,1 | Yes |
| 80,0 | 40,0 | 25,3 | Yes |
| 100,0 | 38,0 | 21,6 | Yes |
| 125,0 | 36,0 | 17,0 | Yes |
| 160,0 | 34,0 | 10,8 | Yes |
| 200,0 | 32,0 | 6,1 | Yes |

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model 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:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| 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 | 214,0 | 8,0 | 102,8 | 60,4 | 66,1 | 71,5 | 76,7 | 81,5 | 85,8 | 89,5 | 92,6 | 95,2 | 97,2 | 98,6 |

## Noise sensitive area: A Lomarakennus A (Syvälahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: B Asuinrakennus B (Syväänlahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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**

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

## Noise sensitive area: C Lomarakennus C (Mutalahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: D Lomarakennus D (Mutaniemi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: E Asuinrakennus E (Alanko)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: F Asuinrakennus F (Joensuu)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: G Asuinrakennus G (Heiniaho)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: H Asuinrakennus H (Mäkelä)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:**

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Calculated:
9.5.2023 17.09/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

| 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: I Lomarakennus I

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: K Asuinrakennus K (Takalo)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: N Lomarakennus N (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE

**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: O Lomarakennus O (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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 5. Varjostusmallinnuksen tulokset ”Real Case, No Forest” - Hankevaihtoehto 1

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

## Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

| | |
|---|---|
| Minimum sun height over horizon for influence | 3 ° |
| Day step for calculation | 1 days |
| Time step for calculation | 1 minutes |

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA_N64,50_E027,335 (12)

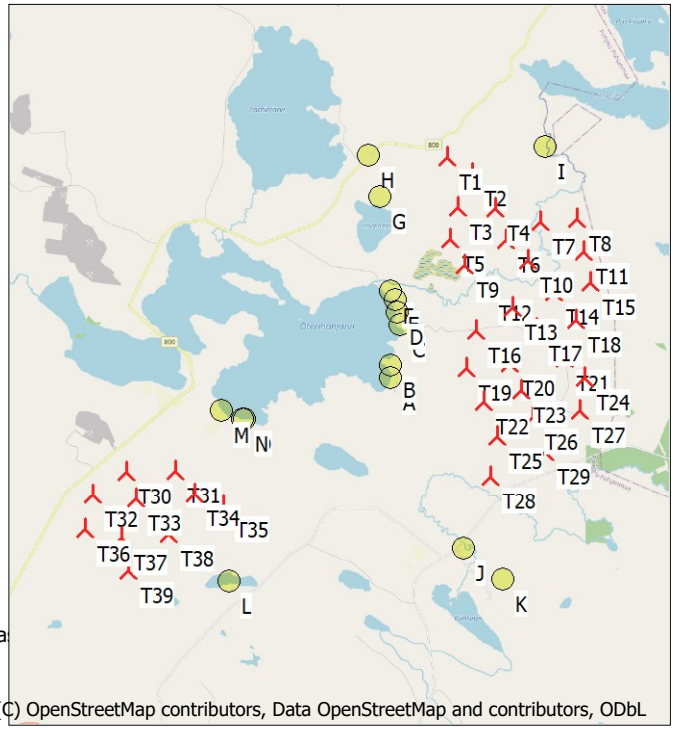
Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankanga
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:200 000

New WTG  Shadow receptor

## WTGs

| | East | North | Z [m] | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Shadow data Calculation distance [m] | RPM [RPM] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 508 282 | 7 174 861 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T10 | 510 426 | 7 172 148 | 146,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T11 | 511 902 | 7 172 395 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T12 | 509 346 | 7 171 412 | 143,2 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T13 | 510 056 | 7 170 927 | 146,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T14 | 511 130 | 7 171 298 | 148,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T15 | 512 122 | 7 171 560 | 159,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T16 | 509 073 | 7 170 275 | 147,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T17 | 510 668 | 7 170 368 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T18 | 511 731 | 7 170 576 | 165,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T19 | 508 820 | 7 169 317 | 148,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T2 | 508 948 | 7 174 439 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T20 | 509 941 | 7 169 425 | 149,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T21 | 511 434 | 7 169 585 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T22 | 509 256 | 7 168 427 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T23 | 510 283 | 7 168 708 | 149,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T24 | 511 959 | 7 169 067 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T25 | 509 625 | 7 167 494 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T26 | 510 589 | 7 167 991 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T27 | 511 839 | 7 168 207 | 148,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T28 | 509 456 | 7 166 427 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T29 | 510 920 | 7 167 074 | 142,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T3 | 508 557 | 7 173 555 | 151,9 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T30 | 499 777 | 7 166 541 | 137,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T31 | 501 112 | 7 166 571 | 140,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T32 | 498 884 | 7 165 924 | 140,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T33 | 500 060 | 7 165 826 | 146,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T34 | 501 577 | 7 165 939 | 141,7 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T35 | 502 368 | 7 165 645 | 147,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T36 | 498 706 | 7 164 985 | 147,2 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T37 | 499 643 | 7 164 765 | 154,4 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

To be continued on next page...

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Shadow data Calculation distance | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| T38 | 500 913 | 7 164 850 | 150,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T39 | 499 856 | 7 163 927 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T4 | 509 564 | 7 173 532 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T5 | 508 354 | 7 172 700 | 144,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T6 | 509 849 | 7 172 666 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T7 | 510 753 | 7 173 171 | 147,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T8 | 511 738 | 7 173 247 | 154,9 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T9 | 508 756 | 7 172 027 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

## Shadow receptor-Input

| No. | Name | East | North | Z | Width | Height | Elevation a.g.l. | Slope of window | Direction mode | Eye height (ZVI) a.g.l. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | [m] | [m] | [m] | [m] | [°] | | [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |

## Calculation Results

Shadow receptor

| No. | Name | Shadow, expected values Shadow hours per year [h/year] |
|---|---|---|
| A | Lomarakennus A (Syvälahti) | 2:19 |
| B | Asuinrakennus B (Syväänlahti) | 1:59 |
| C | Lomarakennus C (Mutalahti) | 1:52 |
| D | Lomarakennus D (Mutaniemi) | 0:00 |
| E | Asuinrakennus E (Alanko) | 3:13 |
| F | Asuinrakennus F (Joensuu) | 0:00 |
| G | Asuinrakennus G (Heiniaho) | 5:39 |
| H | Asuinrakennus H (Mäkelä) | 0:00 |
| I | Lomarakennus I | 3:16 |
| J | Lomarakennus J (Hautakaarto) | 0:00 |
| K | Asuinrakennus K (Takalo) | 0:00 |
| L | Lomarakennus L (Haukijärvi) | 7:32 |
| M | Lomarakennus M (Haukilahti) | 1:51 |
| N | Lomarakennus N (Kuusela) | 0:00 |
| O | Lomarakennus O (Kuusela) | 0:00 |

Total amount of flickering on the shadow receptors caused by each WTG

| No. | Name | Expected [h/year] |
|---|---|---|
| T1 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678) | 3:54 |
| T10 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (671) | 0:00 |
| T11 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (673) | 0:00 |
| T12 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (668) | 0:00 |
| T13 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (666) | 0:00 |
| T14 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (667) | 0:00 |

To be continued on next page...

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

...continued from previous page

| No. | Name | Expected [h/year] |
|---|---|---|
| T15 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (669) | 0:00 |
| T16 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663) | 1:52 |
| T17 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (664) | 0:00 |
| T18 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (665) | 0:00 |
| T19 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660) | 4:18 |
| T2 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677) | 1:37 |
| T20 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (662) | 0:00 |
| T21 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (661) | 0:00 |
| T22 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (657) | 0:00 |
| T23 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (658) | 0:00 |
| T24 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (659) | 0:00 |
| T25 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (654) | 0:00 |
| T26 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (655) | 0:00 |
| T27 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (656) | 0:00 |
| T28 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (651) | 0:00 |
| T29 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (653) | 0:00 |
| T3 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681) | 1:44 |
| T30 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (649) | 0:00 |
| T31 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (652) | 1:51 |
| T32 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (680) | 0:00 |
| T33 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (679) | 0:00 |
| T34 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (650) | 0:00 |
| T35 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (648) | 0:00 |
| T36 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (647) | 0:00 |
| T37 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (645) | 0:00 |
| T38 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (646) | 7:32 |
| T39 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (644) | 0:00 |
| T4 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (676) | 0:00 |
| T5 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (674) | 0:00 |
| T6 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (672) | 0:00 |
| T7 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682) | 1:35 |
| T8 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (675) | 0:00 |
| T9 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670) | 3:13 |

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** A - Lomarakennus A (Syvälahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | May | June | July | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | 04.44 | 03.00 | 02.37 | 04.10 | | 05.49 | 06.42 (T19) | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | | 21.37 | 23.21 | 23.55 | 22.24 | | 20.33 23 | 07.05 (T19) | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | 04.40 | 02.55 | 02.39 | 04.13 | | 05.52 | 06.42 (T19) | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | | 21.40 | 23.25 | 23.53 | 22.21 | | 20.29 23 | 07.05 (T19) | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | 04.37 | 02.52 | 02.42 | 04.17 | | 05.55 | 06.42 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | | 21.43 | 23.28 | 23.51 | 22.17 | | 20.26 22 | 07.04 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 06.54 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | | 05.58 | 06.41 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 6 | 07.00 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | | 20.22 22 | 07.03 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 06.51 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | | 06.01 | 06.42 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 12 | 07.03 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | | 20.18 20 | 07.02 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 | 06.47 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | | 06.04 | 06.43 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 17 | 07.04 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | | 20.15 17 | 07.00 (T19) | 18.26 | 15.38 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 06.46 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | | 06.07 | 06.46 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 19 | 07.05 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | | 20.11 12 | 06.58 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 06.44 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | | 06.10 | 06.49 (T19) | 07.39 | 08.18 | 09.53 |
| | 14.34 | 16.17 | 17.48 | 20.23 22 | 07.06 (T19) | 22.00 | 23.42 | 23.39 | 21.59 | | 20.08 7 | 06.56 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 06.44 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | | 06.13 | | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 22 | 07.06 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | | 20.04 | | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 06.43 (T19) | 04.12 | 02.36 | 03.01 | 04.40 | | 06.16 | | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 23 | 07.06 (T19) | 22.07 | 23.47 | 23.34 | 21.52 | | 20.00 | | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 06.43 (T19) | 04.09 | 02.34 | 03.01 | 04.43 | | 06.19 | | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 23 | 07.06 (T19) | 22.11 | 23.49 | 23.31 | 21.49 | | 19.57 | | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 06.42 (T19) | 04.05 | 02.32 | 03.04 | 04.47 | | 06.22 | | 07.51 | 08.32 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 24 | 07.06 (T19) | 22.14 | 23.51 | 23.29 | 21.45 | | 19.53 | | 18.05 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.42 | 05.49 | 06.42 (T19) | 04.02 | 02.30 | 03.07 | 04.50 | | 06.25 | | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 24 | 07.06 (T19) | 22.17 | 23.53 | 23.26 | 21.42 | | 19.49 | | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 06.42 (T19) | 03.58 | 02.29 | 03.10 | 04.53 | | 06.28 | | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 22 | 07.04 (T19) | 22.21 | 23.55 | 23.23 | 21.38 | | 19.46 | | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 06.43 (T19) | 03.55 | 02.28 | 03.13 | 04.56 | | 06.31 | | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 21 | 07.04 (T19) | 22.24 | 23.57 | 23.20 | 21.35 | | 19.42 | | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 06.43 (T19) | 03.51 | 02.27 | 03.16 | 04.59 | | 06.34 | | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 19 | 07.02 (T19) | 22.28 | 23.58 | 23.17 | 21.31 | | 19.38 | | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 06.44 (T19) | 03.48 | 02.26 | 03.20 | 05.03 | | 06.37 | | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 17 | 07.01 (T19) | 22.31 | 23.59 | 23.14 | 21.27 | | 19.35 | | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 06.46 (T19) | 03.45 | 02.25 | 03.23 | 05.06 | | 06.40 | | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 13 | 06.59 (T19) | 22.35 | 00.00 | 23.11 | 21.24 | | 19.31 | | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 06.48 (T19) | 03.41 | 02.25 | 03.26 | 05.09 | | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 8 | 06.56 (T19) | 22.38 | 00.01 | 23.07 | 21.20 | | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | | 03.31 | 02.25 | 03.36 | 05.19 | | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.04 | 18.31 | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | | 19.17 | | 17.29 | 14.49 | 14.05 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | | 22.52 | 00.02 | 22.54 | 21.06 | | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.51 (T19) | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 9 | 07.00 (T19) | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 06.48 (T19) | 07.01 | | 07.32 | 09.15 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 14 | 07.02 (T19) | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 06.47 (T19) | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 17 | 07.04 (T19) | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 04.58 | | 03.15 | 02.30 | 03.53 | 05.34 | 06.46 (T19) | 07.06 | | 07.39 | 09.22 | 10.16 |
| | 15.35 | 17.20 | 18.46 | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 19 | 07.05 (T19) | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 06.45 (T19) | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 21 | 07.06 (T19) | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 06.43 (T19) | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 22 | 07.05 (T19) | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | | 03.06 | 02.35 | 04.03 | 05.43 | 06.42 (T19) | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.33 | | 23.15 | 23.56 | 22.31 | 20.40 23 | 07.05 (T19) | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.02 | | 06.36 | | | 03.03 | | 04.07 | 05.46 | 06.42 (T19) | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | | 23.18 | | 22.27 | 20.37 23 | 07.05 (T19) | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | | 576 | 638 | 618 | 512 | | 394 | | 303 | 193 | 127 |
| Total, worst case | | | | 292 | | | | | 148 | | 146 | | | | |
| Sun reduction | | | | 0,43 | | | | | 0,42 | | 0,32 | | | | |
| Oper. time red. | | | | 0,97 | | | | | 0,97 | | 0,97 | | | | |
| Wind dir. red. | | | | 0,62 | | | | | 0,62 | | 0,62 | | | | |
| Total reduction | | | | 0,25 | | | | | 0,25 | | 0,19 | | | | |
| Total, real | | | | 74 | | | | | 37 | | 28 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** B - Asuinrakennus B (Syväänlahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.17 (T19) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 23 07.40 (T19) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.17 (T19) | 04.40 | 02.55 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | 24 07.41 (T19) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.17 (T19) | 04.37 | 02.52 | 02.42 | 04.17 | 05.55 | 07.23 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | 23 07.40 (T19) | 21.43 | 23.28 | 23.51 | 22.17 | 20.26 | 3 07.26 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 07.17 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.17 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 | 22 07.39 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 12 07.29 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 07.17 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | 06.01 | 07.15 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 | 21 07.38 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 16 07.31 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 | 07.18 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.14 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 18 07.36 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18 07.32 (T19) | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 07.19 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.13 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 16 07.35 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 20 07.33 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 07.20 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | 06.10 | 07.12 (T19) | 07.39 | 08.18 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 12 07.32 (T19) | 22.00 | 23.42 | 23.39 | 22.00 | 20.08 | 22 07.34 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 07.24 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | 06.13 | 07.11 (T19) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 4 07.28 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 23 07.34 (T19) | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.36 | 03.01 | 04.40 | 06.16 | 07.10 (T19) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 23 07.33 (T19) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.34 | 03.01 | 04.43 | 06.19 | 07.09 (T19) | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.31 | 21.49 | 19.57 | 24 07.33 (T19) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.47 | 06.22 | 07.09 (T19) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.51 | 23.29 | 21.45 | 19.53 | 23 07.32 (T19) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.10 (T19) | 07.55 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 | | 22.18 | 23.53 | 23.26 | 21.42 | 19.49 | 22 07.32 (T19) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.10 (T19) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 21 07.31 (T19) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.28 | 03.13 | 04.56 | 06.31 | 07.11 (T19) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 19 07.30 (T19) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.27 | 03.16 | 04.59 | 06.34 | 07.12 (T19) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.58 | 23.17 | 21.31 | 19.38 | 16 07.28 (T19) | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.20 | 05.03 | 06.37 | 07.14 (T19) | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 11 07.25 (T19) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.45 | 02.25 | 03.23 | 05.06 | 06.40 | 07.17 (T19) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 4 07.21 (T19) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.01 | 23.07 | 21.20 | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | 19.17 | | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 06.27 (T19) | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 10 06.37 (T19) | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 06.23 (T19) | 04.58 | 03.15 | 02.30 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 15 06.38 (T19) | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.21 (T19) | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 19 06.40 (T19) | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.20 (T19) | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 20 07.40 (T19) | 21.30 | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 07.18 (T19) | 04.48 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 22 07.40 (T19) | 21.33 | 23.15 | 23.56 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.18 (T19) | | 03.03 | | 04.07 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 23 07.41 (T19) | | 23.18 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | | 576 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | 109 | 163 | | | | | | 277 | | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | | 0,32 | | | | |
| Oper. time red. | | | 0,97 | 0,97 | | | | | | 0,97 | | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | | 0,62 | | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | | 0,19 | | | | |
| Total, real | | | 24 | 42 | | | | | | 54 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** C - Lomarakennus C (Mutalahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.32 (T16) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.01 | 07.52 (T16) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.33 (T16) | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 07.51 (T16) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.34 (T16) | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 07.49 (T16) | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 07.35 (T16) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 07.46 (T16) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | 04.30 | 02.47 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 07.31 (T16) | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | 22.00 | 23.42 | 23.40 | 22.00 | 20.08 10 07.41 (T16) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | | 04.16 | 02.37 | 02.58 | 04.37 | 06.13 07.28 (T16) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 15 07.43 (T16) | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 07.25 (T16) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 18 07.43 (T16) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 07.24 (T16) | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 20 07.44 (T16) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.46 | 06.22 07.23 (T16) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 22 07.45 (T16) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 07.23 (T16) | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 22 07.45 (T16) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 07.22 (T16) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 23 07.45 (T16) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 07.22 (T16) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 23 07.45 (T16) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 07.22 (T16) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 22 07.44 (T16) | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 07.21 (T16) | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 22 07.43 (T16) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 07.21 (T16) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 21 07.42 (T16) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 07.22 (T16) | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 19 07.41 (T16) | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 07.23 (T16) | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 16 07.39 (T16) | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 07.26 (T16) | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 11 07.37 (T16) | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 06.41 (T16) | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 07.29 (T16) | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 10 06.51 (T16) | 21.07 | | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 5 07.34 (T16) | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 06.38 (T16) | 05.13 | | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 15 06.53 (T16) | 21.11 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 06.35 (T16) | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 19 06.54 (T16) | 21.14 | | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 06.33 (T16) | 05.05 | | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 21 06.54 (T16) | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 06.33 (T16) | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 22 06.55 (T16) | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 06.32 (T16) | 04.58 | | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 23 06.55 (T16) | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 06.31 (T16) | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 23 06.54 (T16) | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 07.31 (T16) | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 24 07.55 (T16) | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 07.31 (T16) | 04.47 | | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 23 07.54 (T16) | 21.34 | | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 07.32 (T16) | | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 21 07.53 (T16) | | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 638 | 618 | 512 | 394 | 303 | 193 | 127 |
| Total, worst case | | | 201 | 64 | | | | | 269 | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | 0,32 | | | |
| Oper. time red. | | | 0,97 | 0,97 | | | | | 0,97 | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | 0,62 | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | 0,19 | | | |
| Total, real | | | 43 | 17 | | | | | 52 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** D - Lomarakennus D (Mutaniemi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 04.16 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.34 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.32 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

Project:
**Haarasuonkangas**

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** E - Asuinrakennus E (Alanko)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | | May | | | June | July | | | August | | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | | 04.44 | | 05.28 (T9) | 03.00 | 02.37 | | | 04.10 | | 05.41 (T9) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | | | 21.37 | 22 | 05.50 (T9) | 23.22 | 23.55 | | | 22.24 | 16 | 05.57 (T9) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | | 04.40 | | 05.28 (T9) | 02.54 | 02.39 | | | 04.13 | | 05.39 (T9) | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | | | 21.40 | 23 | 05.51 (T9) | 23.25 | 23.53 | | | 22.21 | 19 | 05.58 (T9) | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | | 04.37 | | 05.27 (T9) | 02.52 | 02.41 | | | 04.17 | | 05.38 (T9) | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | | | 21.44 | 24 | 05.51 (T9) | 23.28 | 23.51 | | | 22.17 | 21 | 05.59 (T9) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | | | 04.33 | | 05.27 (T9) | 02.49 | 02.44 | | | 04.20 | | 05.38 (T9) | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | | | 21.47 | 24 | 05.51 (T9) | 23.31 | 23.49 | | | 22.14 | 21 | 05.59 (T9) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | | 04.30 | | 05.27 (T9) | 02.46 | 02.46 | | | 04.23 | | 05.38 (T9) | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | | 21.50 | 24 | 05.51 (T9) | 23.34 | 23.47 | | | 22.10 | 22 | 06.00 (T9) | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | | 04.26 | | 05.27 (T9) | 02.44 | 02.49 | | | 04.27 | | 05.36 (T9) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | | 21.54 | 24 | 05.51 (T9) | 23.37 | 23.45 | | | 22.07 | 24 | 06.00 (T9) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | | 04.23 | | 05.28 (T9) | 02.42 | 02.52 | | | 04.30 | | 05.36 (T9) | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | | 21.57 | 22 | 05.50 (T9) | 23.40 | 23.42 | | | 22.03 | 24 | 06.00 (T9) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | | | 04.19 | | 05.28 (T9) | 02.39 | 02.54 | | | 04.33 | | 05.36 (T9) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | | 22.01 | 22 | 05.50 (T9) | 23.42 | 23.40 | | | 22.00 | 24 | 06.00 (T9) | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | | | 04.15 | | 05.28 (T9) | 02.37 | 02.57 | | | 04.37 | | 05.36 (T9) | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | | 22.04 | 21 | 05.49 (T9) | 23.45 | 23.37 | | | 21.56 | 24 | 06.00 (T9) | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | | 04.12 | | 05.29 (T9) | 02.35 | 03.00 | | | 04.40 | | 05.36 (T9) | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | | 22.07 | 19 | 05.48 (T9) | 23.47 | 23.35 | | | 21.53 | 24 | 06.00 (T9) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | | 04.08 | | 05.29 (T9) | 02.33 | 03.00 | | | 04.43 | | 05.36 (T9) | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | | 22.11 | 18 | 05.47 (T9) | 23.50 | 23.32 | | | 21.49 | 23 | 05.59 (T9) | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | | 04.05 | | 05.30 (T9) | 02.31 | 03.03 | | | 04.46 | | 05.36 (T9) | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | | 22.14 | 16 | 05.46 (T9) | 23.52 | 23.29 | | | 21.45 | 22 | 05.58 (T9) | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | | 04.02 | | 05.31 (T9) | 02.30 | 03.07 | | | 04.50 | | 05.37 (T9) | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | | 22.18 | 13 | 05.44 (T9) | 23.54 | 23.26 | | | 21.42 | 21 | 05.58 (T9) | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | | 03.58 | | 05.33 (T9) | 02.29 | 03.10 | | | 04.53 | | 05.38 (T9) | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | | 22.21 | 9 | 05.42 (T9) | 23.56 | 23.23 | | | 21.38 | 19 | 05.57 (T9) | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | | 03.55 | | | 02.27 | 03.13 | | | 04.56 | | 05.41 (T9) | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | | 22.25 | | | 23.57 | 23.20 | | | 21.35 | 15 | 05.56 (T9) | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | | | 03.51 | | | 02.26 | 03.16 | | | 04.59 | | 05.44 (T9) | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | | 22.28 | | | 23.59 | 23.17 | | | 21.31 | 11 | 05.55 (T9) | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | | 03.48 | | | 02.25 | 03.19 | | | 05.03 | | 05.46 (T9) | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | | 22.31 | | | 00.00 | 23.14 | | | 21.27 | 6 | 05.52 (T9) | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | | 03.44 | | | 02.25 | 03.23 | | | 05.06 | | | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | | | 22.35 | | | 00.01 | 23.11 | | | 21.24 | | | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | | | 03.41 | | | 02.24 | 03.26 | | | 05.09 | | | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | | 22.38 | | | 00.02 | 23.08 | | | 21.20 | | | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | | 03.38 | | | 02.24 | 03.29 | | | 05.12 | | | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | | 22.42 | | | 00.03 | 23.05 | | | 21.17 | | | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | | 03.34 | | | 02.24 | 03.33 | | | 05.15 | | | 06.49 | 08.19 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | | 22.45 | | | 00.03 | 23.01 | | | 21.13 | | | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | | | 03.31 | | | 02.25 | 03.36 | | | 05.18 | | | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | | 22.49 | | | 00.03 | 22.58 | | | 21.09 | | | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | | 03.28 | | | 02.25 | 03.39 | | | 05.22 | | | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | | | 22.52 | | | 00.03 | 22.55 | | | 21.06 | | | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | | 03.25 | | | 02.26 | 03.43 | | | 05.25 | | | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | | 22.55 | | | 00.03 | 22.51 | | | 21.02 | | | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | | 03.21 | | | 02.27 | 03.46 | | | 05.28 | | | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | | 22.59 | | | 00.02 | 22.48 | | | 20.59 | | | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 05.39 (T9) | 03.18 | | | 02.28 | 03.49 | | | 05.31 | | | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 7 | 05.46 (T9) | 23.02 | | | 00.02 | 22.45 | | | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | | 05.36 (T9) | 03.15 | | | 02.29 | 03.53 | | | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 12 | 05.48 (T9) | 23.06 | | | 00.01 | 22.41 | | | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 05.33 (T9) | 03.12 | | | 02.31 | 03.56 | | | 05.37 | | | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 16 | 05.49 (T9) | 23.09 | | | 00.00 | 22.38 | | | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 05.29 (T9) | 03.09 | | | 02.33 | 04.00 | | 05.45 (T9) | 05.40 | | | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 20 | 05.49 (T9) | 23.12 | | | 23.58 | 22.35 | 6 | 05.51 (T9) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | | 05.28 (T9) | 03.06 | | | 02.34 | 04.03 | | 05.43 (T9) | 05.43 | | | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 22 | 05.50 (T9) | 23.15 | | | 23.57 | 22.31 | 11 | 05.54 (T9) | 20.40 | | | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | | | 03.03 | | | | 04.06 | | 05.42 (T9) | 05.46 | | | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | | | 23.19 | | | | 22.28 | 14 | 05.56 (T9) | 20.37 | | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | | | 577 | | | 639 | 618 | | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | 77 | | | 281 | | | | 31 | | | 336 | | | | | |
| Sun reduction | | | | | 0,43 | | | 0,47 | | | | 0,48 | | | 0,42 | | | | | |
| Oper. time red. | | | | | 0,97 | | | 0,97 | | | | 0,97 | | | 0,97 | | | | | |
| Wind dir. red. | | | | | 0,62 | | | 0,62 | | | | 0,62 | | | 0,62 | | | | | |
| Total reduction | | | | | 0,26 | | | 0,29 | | | | 0,29 | | | 0,25 | | | | | |
| Total, real | | | | | 20 | | | 80 | | | | 9 | | | 84 | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** F - Asuinrakennus F (Joensuu)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.24 | 06.33 | 04.44 | 03.00 | 02.36 | 04.10 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.09 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.40 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.19 | 02.39 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | 04.15 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.08 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.50 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.56 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.25 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.32 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.03 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.03 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.24 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.49 | 05.31 | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.02 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.17 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 00.00 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | | April | | | May | | | June | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 09.00 | | 07.25 | | | 06.33 | | 07.49 (T3) | 04.44 | | 05.23 (T1) | 03.00 | |
| | 14.17 | | 15.52 | | 17.26 | | | 20.02 | 6 | 07.55 (T3) | 21.37 | 8 | 05.31 (T1) | 23.22 | |
| 2 | 10.13 | | 08.57 | | 07.21 | | | 06.29 | | | 04.40 | | 05.20 (T1) | 02.54 | |
| | 14.19 | | 15.56 | | 17.29 | | | 20.05 | | | 21.40 | 13 | 05.33 (T1) | 23.25 | |
| 3 | 10.12 | | 08.53 | | 07.17 | | | 06.25 | | | 04.37 | | 05.18 (T1) | 02.51 | |
| | 14.21 | | 15.59 | | 17.32 | | | 20.08 | | | 21.44 | 16 | 05.34 (T1) | 23.29 | |
| 4 | 10.10 | | 08.50 | | 07.14 | | | 06.22 | | | 04.33 | | 05.17 (T1) | 02.48 | |
| | 14.23 | | 16.03 | | 17.35 | | | 20.11 | | | 21.47 | 18 | 05.35 (T1) | 23.32 | |
| 5 | 10.09 | | 08.47 | | 07.10 | | | 06.18 | | | 04.29 | | 05.15 (T1) | 02.46 | |
| | 14.26 | | 16.06 | | 17.39 | | | 20.14 | | | 21.51 | 20 | 05.35 (T1) | 23.35 | |
| 6 | 10.07 | | 08.44 | | 07.07 | | | 06.14 | | | 04.26 | | 05.14 (T1) | 02.43 | |
| | 14.28 | | 16.10 | | 17.42 | | | 20.17 | | | 21.54 | 22 | 05.36 (T1) | 23.37 | |
| 7 | 10.05 | | 08.40 | | 07.03 | | | 06.11 | | | 04.22 | | 05.14 (T1) | 02.41 | |
| | 14.31 | | 16.13 | | 17.45 | | | 20.20 | | | 21.57 | 22 | 05.36 (T1) | 23.40 | |
| 8 | 10.04 | | 08.37 | | 07.00 | | | 06.07 | | | 04.19 | | 05.13 (T1) | 02.39 | |
| | 14.34 | | 16.16 | | 17.48 | | | 20.23 | | | 22.01 | 23 | 05.36 (T1) | 23.43 | |
| 9 | 10.02 | | 08.34 | | 06.56 | | | 06.03 | | | 04.15 | | 05.14 (T1) | 02.37 | |
| | 14.37 | | 16.20 | | 17.51 | | | 20.26 | | | 22.04 | 24 | 05.38 (T1) | 23.45 | |
| 10 | 10.00 | | 08.30 | | 06.52 | | | 06.00 | | | 04.12 | | 05.14 (T1) | 02.34 | |
| | 14.39 | | 16.23 | | 17.54 | | | 20.29 | | | 22.08 | 24 | 05.38 (T1) | 23.48 | |
| 11 | 09.58 | | 08.27 | | 06.49 | | | 05.56 | | | 04.08 | | 05.13 (T1) | 02.33 | |
| | 14.42 | | 16.27 | | 17.57 | | | 20.33 | | | 22.11 | 24 | 05.37 (T1) | 23.50 | |
| 12 | 09.55 | | 08.24 | | 06.45 | | | 05.52 | | | 04.05 | | 05.13 (T1) | 02.31 | |
| | 14.45 | | 16.30 | | 18.00 | | | 20.36 | | | 22.15 | 24 | 05.37 (T1) | 23.52 | |
| 13 | 09.53 | | 08.20 | | 06.42 | | | 05.49 | | | 04.01 | | 05.13 (T1) | 02.29 | |
| | 14.48 | | 16.33 | | 18.04 | | | 20.39 | | | 22.18 | 24 | 05.37 (T1) | 23.54 | |
| 14 | 09.51 | | 08.17 | | 06.38 | | | 05.45 | | | 03.58 | | 05.13 (T1) | 02.28 | |
| | 14.52 | | 16.37 | | 18.07 | | | 20.42 | | | 22.21 | 23 | 05.36 (T1) | 23.56 | |
| 15 | 09.48 | | 08.13 | | 06.34 | | | 05.42 | | | 03.54 | | 05.15 (T1) | 02.27 | |
| | 14.55 | | 16.40 | | 18.10 | | | 20.45 | | | 22.25 | 22 | 05.37 (T1) | 23.58 | |
| 16 | 09.46 | | 08.10 | | 06.31 | | | 05.38 | | | 03.51 | | 05.15 (T1) | 02.26 | |
| | 14.58 | | 16.44 | | 18.13 | | | 20.48 | | | 22.28 | 21 | 05.36 (T1) | 23.59 | |
| 17 | 09.43 | | 08.07 | | 06.27 | | | 05.34 | | | 03.48 | | 05.15 (T1) | 02.25 | |
| | 15.01 | | 16.47 | | 18.16 | | | 20.51 | | | 22.32 | 20 | 05.35 (T1) | 00.01 | |
| 18 | 09.41 | | 08.03 | | 06.24 | | 06.56 (T3) | 05.31 | | | 03.44 | | 05.16 (T1) | 02.24 | |
| | 15.04 | | 16.50 | | 18.19 | 3 | 06.59 (T3) | 20.55 | | | 22.35 | 19 | 05.35 (T1) | 00.02 | |
| 19 | 09.38 | | 08.00 | | 06.20 | | 06.52 (T3) | 05.27 | | | 03.41 | | 05.17 (T1) | 02.24 | |
| | 15.08 | | 16.54 | | 18.22 | 10 | 07.02 (T3) | 20.58 | | | 22.39 | 16 | 05.33 (T1) | 00.03 | |
| 20 | 09.35 | | 07.56 | | 06.16 | | 06.49 (T3) | 05.23 | | | 03.37 | | 05.18 (T1) | 02.23 | |
| | 15.11 | | 16.57 | | 18.25 | 15 | 07.04 (T3) | 21.01 | | | 22.42 | 15 | 05.33 (T1) | 00.03 | |
| 21 | 09.33 | | 07.53 | | 06.13 | | 06.46 (T3) | 05.20 | | | 03.34 | | 05.19 (T1) | 02.24 | |
| | 15.14 | | 17.00 | | 18.28 | 19 | 07.05 (T3) | 21.04 | | | 22.46 | 12 | 05.31 (T1) | 00.04 | |
| 22 | 09.30 | | 07.49 | | 06.09 | | 06.44 (T3) | 05.16 | | | 03.31 | | 05.21 (T1) | 02.24 | |
| | 15.18 | | 17.03 | | 18.31 | 21 | 07.05 (T3) | 21.08 | | | 22.49 | 8 | 05.29 (T1) | 00.04 | |
| 23 | 09.27 | | 07.46 | | 06.05 | | 06.44 (T3) | 05.12 | | | 03.27 | | | 02.24 | |
| | 15.21 | | 17.07 | | 18.34 | 22 | 07.06 (T3) | 21.11 | | | 22.52 | | | 00.04 | |
| 24 | 09.24 | | 07.42 | | 06.02 | | 06.43 (T3) | 05.09 | | | 03.24 | | | 02.25 | |
| | 15.25 | | 17.10 | | 18.37 | 23 | 07.06 (T3) | 21.14 | | | 22.56 | | | 00.04 | |
| 25 | 09.21 | | 07.39 | | 05.58 | | 06.42 (T3) | 05.05 | | | 03.21 | | | 02.26 | |
| | 15.28 | | 17.13 | | 18.40 | 23 | 07.05 (T3) | 21.17 | | | 22.59 | | | 00.03 | |
| 26 | 09.18 | | 07.35 | | 05.54 | | 06.43 (T3) | 05.02 | | | 03.18 | | | 02.27 | |
| | 15.31 | | 17.16 | | 18.43 | 22 | 07.05 (T3) | 21.21 | | | 23.03 | | | 00.02 | |
| 27 | 09.15 | | 07.32 | | 05.51 | | 06.42 (T3) | 04.58 | | | 03.15 | | | 02.29 | |
| | 15.35 | | 17.20 | | 18.46 | 22 | 07.04 (T3) | 21.24 | | | 23.06 | | | 00.01 | |
| 28 | 09.12 | | 07.28 | | 05.47 | | 06.43 (T3) | 04.54 | | | 03.12 | | | 02.30 | |
| | 15.38 | | 17.23 | | 18.49 | 21 | 07.04 (T3) | 21.27 | | | 23.09 | | | 00.00 | |
| 29 | 09.09 | | | | 06.44 | | 07.44 (T3) | 04.51 | | | 03.08 | | | 02.32 | |
| | 15.42 | | | | 19.52 | 18 | 08.02 (T3) | 21.30 | | | 23.13 | | | 23.59 | |
| 30 | 09.06 | | | | 06.40 | | 07.44 (T3) | 04.47 | | | 03.05 | | | 02.34 | |
| | 15.45 | | | | 19.55 | 16 | 08.00 (T3) | 21.34 | | | 23.16 | | | 23.57 | |
| 31 | 09.03 | | | | 06.36 | | 07.46 (T3) | | | | 03.02 | | | | |
| | 15.49 | | | | 19.59 | 13 | 07.59 (T3) | | | | 23.19 | | | | |
| Potential sun hours | 163 | | 235 | | 363 | | | 454 | | | 577 | | | 639 | |
| Total, worst case | | | | | | 248 | | | 6 | | | 418 | | | |
| Sun reduction | | | | | | 0,36 | | | 0,43 | | | 0,47 | | | |
| Oper. time red. | | | | | | 0,97 | | | 0,97 | | | 0,97 | | | |
| Wind dir. red. | | | | | | 0,62 | | | 0,62 | | | 0,63 | | | |
| Total reduction | | | | | | 0,21 | | | 0,26 | | | 0,29 | | | |
| Total, real | | | | | | 53 | | | 2 | | | 120 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.36 | | 04.10 | | 05.23 (T1) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 23.56 | | 22.25 | 24 | 05.47 (T1) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 02.38 | | 04.13 | | 05.23 (T1) | 05.52 | 07.21 | 07.59 | 09.38 |
| | 23.54 | | 22.21 | 24 | 05.47 (T1) | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 02.40 | | 04.16 | | 05.24 (T1) | 05.55 | 07.24 | 08.02 | 09.41 |
| | 23.52 | | 22.18 | 23 | 05.47 (T1) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 02.43 | | 04.20 | | 05.24 (T1) | 05.58 | 07.27 | 08.05 | 09.44 |
| | 23.50 | | 22.14 | 23 | 05.47 (T1) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 02.46 | | 04.23 | | 05.23 (T1) | 06.01 | 07.30 | 08.09 | 09.46 |
| | 23.48 | | 22.11 | 23 | 05.46 (T1) | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 02.48 | | 04.26 | | 05.24 (T1) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 23.45 | | 22.07 | 22 | 05.46 (T1) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 02.51 | | 04.30 | | 05.24 (T1) | 06.07 | 07.36 | 08.15 | 09.52 |
| | 23.43 | | 22.03 | 22 | 05.46 (T1) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 02.54 | | 04.33 | | 05.25 (T1) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 23.40 | | 22.00 | 20 | 05.45 (T1) | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 02.57 | | 04.36 | | 05.26 (T1) | 06.13 | 07.42 | 08.22 | 09.57 |
| | 23.38 | | 21.56 | 18 | 05.44 (T1) | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 03.00 | | 04.40 | | 05.27 (T1) | 06.16 | 07.45 | 08.26 | 09.59 |
| | 23.35 | | 21.53 | 16 | 05.43 (T1) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 03.00 | | 04.43 | | 05.29 (T1) | 06.19 07.42 (T3) | 07.48 | 08.29 | 10.01 |
| | 23.32 | | 21.49 | 12 | 05.41 (T1) | 19.57 4 07.46 (T3) | 18.08 | 15.22 | 14.08 |
| 12 | 03.03 | | 04.46 | | 05.32 (T1) | 06.22 07.38 (T3) | 07.52 | 08.32 | 10.03 |
| | 23.29 | | 21.46 | 6 | 05.38 (T1) | 19.53 12 07.50 (T3) | 18.04 | 15.19 | 14.07 |
| 13 | 03.06 | | 04.49 | | | 06.25 07.36 (T3) | 07.55 | 08.36 | 10.05 |
| | 23.27 | | 21.42 | | | 19.49 16 07.52 (T3) | 18.01 | 15.16 | 14.06 |
| 14 | 03.09 | | 04.53 | | | 06.28 07.34 (T3) | 07.58 | 08.39 | 10.07 |
| | 23.24 | | 21.38 | | | 19.46 19 07.53 (T3) | 17.57 | 15.13 | 14.05 |
| 15 | 03.12 | | 04.56 | | | 06.31 07.33 (T3) | 08.01 | 08.43 | 10.09 |
| | 23.21 | | 21.35 | | | 19.42 21 07.54 (T3) | 17.54 | 15.09 | 14.04 |
| 16 | 03.16 | | 04.59 | | | 06.34 07.32 (T3) | 08.04 | 08.46 | 10.10 |
| | 23.18 | | 21.31 | | | 19.38 22 07.54 (T3) | 17.50 | 15.06 | 14.04 |
| 17 | 03.19 | | 05.02 | | | 06.37 07.31 (T3) | 08.07 | 08.49 | 10.12 |
| | 23.14 | | 21.28 | | | 19.35 22 07.53 (T3) | 17.47 | 15.03 | 14.03 |
| 18 | 03.22 | | 05.06 | | | 06.40 07.30 (T3) | 08.10 | 08.53 | 10.13 |
| | 23.11 | | 21.24 | | | 19.31 23 07.53 (T3) | 17.43 | 15.00 | 14.03 |
| 19 | 03.26 | | 05.09 | | | 06.43 07.30 (T3) | 08.13 | 08.56 | 10.14 |
| | 23.08 | | 21.20 | | | 19.28 23 07.53 (T3) | 17.40 | 14.58 | 14.03 |
| 20 | 03.29 | | 05.12 | | | 06.46 07.30 (T3) | 08.16 | 08.59 | 10.15 |
| | 23.05 | | 21.17 | | | 19.24 22 07.52 (T3) | 17.36 | 14.55 | 14.03 |
| 21 | 03.32 | 05.32 (T1) | 05.15 | | | 06.49 07.30 (T3) | 08.20 | 09.03 | 10.16 |
| | 23.02 | 5 05.37 (T1) | 21.13 | | | 19.20 21 07.51 (T3) | 17.33 | 14.52 | 14.03 |
| 22 | 03.36 | 05.30 (T1) | 05.18 | | | 06.52 07.31 (T3) | 08.23 | 09.06 | 10.17 |
| | 22.58 | 10 05.40 (T1) | 21.10 | | | 19.17 19 07.50 (T3) | 17.29 | 14.49 | 14.04 |
| 23 | 03.39 | 05.28 (T1) | 05.21 | | | 06.55 07.32 (T3) | 08.26 | 09.09 | 10.17 |
| | 22.55 | 13 05.41 (T1) | 21.06 | | | 19.13 17 07.49 (T3) | 17.26 | 14.46 | 14.04 |
| 24 | 03.42 | 05.28 (T1) | 05.25 | | | 06.58 07.35 (T3) | 08.29 | 09.13 | 10.17 |
| | 22.52 | 15 05.43 (T1) | 21.02 | | | 19.09 12 07.47 (T3) | 17.22 | 14.43 | 14.05 |
| 25 | 03.46 | 05.27 (T1) | 05.28 | | | 07.01 07.38 (T3) | 07.32 | 09.16 | 10.17 |
| | 22.48 | 18 05.45 (T1) | 20.59 | | | 19.06 6 07.44 (T3) | 16.19 | 14.41 | 14.06 |
| 26 | 03.49 | 05.26 (T1) | 05.31 | | | 07.04 | 07.36 | 09.19 | 10.17 |
| | 22.45 | 19 05.45 (T1) | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 03.53 | 05.26 (T1) | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 22.42 | 20 05.46 (T1) | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 03.56 | 05.25 (T1) | 05.37 | | | 07.09 | 07.42 | 09.26 | 10.17 |
| | 22.38 | 22 05.47 (T1) | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 03.59 | 05.24 (T1) | 05.40 | | | 07.12 | 07.45 | 09.29 | 10.16 |
| | 22.35 | 23 05.47 (T1) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 04.03 | 05.24 (T1) | 05.43 | | | 07.15 | 07.49 | 09.32 | 10.16 |
| | 22.31 | 23 05.47 (T1) | 20.40 | | | 18.48 | 16.02 | 14.28 | 14.13 |
| 31 | 04.06 | 05.24 (T1) | 05.46 | | | | 07.52 | | 10.15 |
| | 22.28 | 24 05.48 (T1) | 20.37 | | | | 15.58 | | 14.14 |
| Potential sun hours | 619 | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | 192 | | 233 | | 259 | | | |
| Sun reduction | | 0,48 | | 0,42 | | 0,32 | | | |
| Oper. time red. | | 0,97 | | 0,97 | | 0,97 | | | |
| Wind dir. red. | | 0,63 | | 0,63 | | 0,62 | | | |
| Total reduction | | 0,29 | | 0,25 | | 0,19 | | | |
| Total, real | | 55 | | 59 | | 50 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

Project:
**Haarasuonkangas**

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** H - Asuinrakennus H (Mäkelä)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | 06.33 | 04.44 | 02.56 | 02.36 | 04.09 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.23 | 23.56 | 22.25 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.13 | 08.57 | 07.21 | 06.29 | 04.40 | 02.54 | 02.38 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.41 | 23.26 | 23.54 | 22.21 | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 10.12 | 08.53 | 07.18 | 06.25 | 04.36 | 02.51 | 02.40 | 04.16 | 05.55 | 07.24 | 08.02 | 09.41 |
| | 14.21 | 15.59 | 17.32 | 20.08 | 21.44 | 23.29 | 23.52 | 22.18 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.48 | 02.43 | 04.20 | 05.58 | 07.27 | 08.05 | 09.44 |
| | 14.23 | 16.03 | 17.35 | 20.11 | 21.47 | 23.32 | 23.50 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.09 | 08.47 | 07.10 | 06.18 | 04.29 | 02.46 | 02.45 | 04.23 | 06.01 | 07.30 | 08.09 | 09.47 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.51 | 23.35 | 23.48 | 22.11 | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 10.07 | 08.44 | 07.07 | 06.14 | 04.26 | 02.43 | 02.48 | 04.26 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.28 | 16.10 | 17.42 | 20.17 | 21.54 | 23.38 | 23.46 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.06 | 08.40 | 07.03 | 06.11 | 04.22 | 02.41 | 02.51 | 04.30 | 06.07 | 07.36 | 08.16 | 09.52 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.58 | 23.40 | 23.43 | 22.04 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.04 | 08.37 | 07.00 | 06.07 | 04.19 | 02.38 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.16 | 17.48 | 20.23 | 22.01 | 23.43 | 23.41 | 22.00 | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 10.02 | 08.34 | 06.56 | 06.03 | 04.15 | 02.36 | 02.57 | 04.36 | 06.13 | 07.42 | 08.22 | 09.57 |
| | 14.36 | 16.20 | 17.51 | 20.26 | 22.04 | 23.46 | 23.38 | 21.56 | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 10.00 | 08.30 | 06.52 | 06.00 | 04.12 | 02.34 | 03.00 | 04.40 | 06.16 | 07.45 | 08.26 | 09.59 |
| | 14.39 | 16.23 | 17.54 | 20.29 | 22.08 | 23.48 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.09 |
| 11 | 09.58 | 08.27 | 06.49 | 05.56 | 04.08 | 02.32 | 03.00 | 04.43 | 06.19 | 07.49 | 08.29 | 10.01 |
| | 14.42 | 16.27 | 17.57 | 20.33 | 22.11 | 23.51 | 23.33 | 21.49 | 19.57 | 18.08 | 15.22 | 14.08 |
| 12 | 09.56 | 08.24 | 06.45 | 05.52 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.52 | 08.32 | 10.03 |
| | 14.45 | 16.30 | 18.00 | 20.36 | 22.15 | 23.53 | 23.30 | 21.46 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.01 | 02.29 | 03.06 | 04.49 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.48 | 16.33 | 18.04 | 20.39 | 22.18 | 23.55 | 23.27 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.51 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.09 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.51 | 16.37 | 18.07 | 20.42 | 22.22 | 23.57 | 23.24 | 21.39 | 19.46 | 17.57 | 15.13 | 14.05 |
| 15 | 09.49 | 08.14 | 06.34 | 05.42 | 03.54 | 02.26 | 03.12 | 04.56 | 06.31 | 08.01 | 08.43 | 10.09 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.58 | 23.21 | 21.35 | 19.42 | 17.54 | 15.09 | 14.04 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.25 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.11 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.29 | 00.00 | 23.18 | 21.31 | 19.38 | 17.50 | 15.06 | 14.04 |
| 17 | 09.43 | 08.07 | 06.27 | 05.34 | 03.47 | 02.24 | 03.19 | 05.02 | 06.37 | 08.07 | 08.49 | 10.12 |
| | 15.01 | 16.47 | 18.16 | 20.52 | 22.32 | 00.01 | 23.15 | 21.28 | 19.35 | 17.47 | 15.03 | 14.03 |
| 18 | 09.41 | 08.03 | 06.24 | 05.31 | 03.44 | 02.24 | 03.22 | 05.06 | 06.40 | 08.10 | 08.53 | 10.13 |
| | 15.04 | 16.50 | 18.19 | 20.55 | 22.35 | 00.02 | 23.11 | 21.24 | 19.31 | 17.43 | 15.00 | 14.03 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.23 | 03.25 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.53 | 18.22 | 20.58 | 22.39 | 00.03 | 23.08 | 21.21 | 19.28 | 17.40 | 14.57 | 14.03 |
| 20 | 09.36 | 07.56 | 06.16 | 05.23 | 03.37 | 02.23 | 03.29 | 05.12 | 06.46 | 08.17 | 09.00 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.04 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.03 |
| 21 | 09.33 | 07.53 | 06.13 | 05.20 | 03.34 | 02.23 | 03.32 | 05.15 | 06.49 | 08.20 | 09.03 | 10.16 |
| | 15.14 | 17.00 | 18.28 | 21.04 | 22.46 | 00.04 | 23.02 | 21.13 | 19.20 | 17.33 | 14.52 | 14.03 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.23 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.17 |
| | 15.18 | 17.03 | 18.31 | 21.08 | 22.49 | 00.04 | 22.59 | 21.10 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.12 | 03.27 | 02.24 | 03.39 | 05.21 | 06.55 | 08.26 | 09.10 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.53 | 00.04 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.04 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.24 | 02.25 | 03.42 | 05.25 | 06.58 | 08.29 | 09.13 | 10.18 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.04 | 22.52 | 21.02 | 19.09 | 17.22 | 14.43 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.26 | 03.46 | 05.28 | 07.01 | 07.33 | 09.16 | 10.18 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.03 | 22.49 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.27 | 03.49 | 05.31 | 07.04 | 07.36 | 09.19 | 10.18 |
| | 15.31 | 17.16 | 18.43 | 21.21 | 23.03 | 00.03 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.28 | 03.52 | 05.34 | 07.06 | 07.39 | 09.23 | 10.18 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.02 | 22.42 | 20.51 | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 09.12 | 07.28 | 05.47 | 04.54 | 03.11 | 02.30 | 03.56 | 05.37 | 07.09 | 07.42 | 09.26 | 10.17 |
| | 15.38 | 17.23 | 18.49 | 21.27 | 23.10 | 00.01 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.08 | 02.32 | 03.59 | 05.40 | 07.12 | 07.46 | 09.29 | 10.17 |
| | 15.42 | | 19.52 | 21.31 | 23.13 | 23.59 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.05 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.16 |
| | 15.45 | | 19.56 | 21.34 | 23.16 | 23.58 | 22.32 | 20.41 | 18.48 | 16.02 | 14.28 | 14.12 |
| 31 | 09.03 | | 06.36 | | 03.02 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.14 |
| Potential sun hours | 163 | 235 | 363 | 454 | 577 | 640 | 619 | 513 | 394 | 303 | 192 | 126 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | April | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 08.59 | 12.37 (T7) | 07.24 | | 06.32 | 04.43 | 02.56 |
| | 14.16 | | 15.52 9 | 12.46 (T7) | 17.26 | | 20.01 | 21.37 | 23.22 |
| 2 | 10.13 | | 08.56 | | 07.21 | | 06.29 | 04.40 | 02.53 |
| | 14.18 | | 15.55 | | 17.29 | | 20.04 | 21.40 | 23.25 |
| 3 | 10.11 | | 08.53 | | 07.17 | | 06.25 | 04.36 | 02.50 |
| | 14.21 | | 15.59 | | 17.32 | | 20.07 | 21.44 | 23.28 |
| 4 | 10.10 | | 08.50 | | 07.14 | | 06.21 | 04.33 | 02.48 |
| | 14.23 | | 16.02 | | 17.35 | | 20.10 | 21.47 | 23.31 |
| 5 | 10.09 | | 08.47 | | 07.10 | 16.55 (T2) | 06.18 | 04.29 | 02.45 |
| | 14.25 | | 16.06 | | 17.38 6 | 17.01 (T2) | 20.14 | 21.50 | 23.34 |
| 6 | 10.07 | | 08.43 | | 07.06 | 16.52 (T2) | 06.14 | 04.25 | 02.43 |
| | 14.28 | | 16.09 | | 17.41 12 | 17.04 (T2) | 20.17 | 21.54 | 23.37 |
| 7 | 10.05 | | 08.40 | | 07.03 | 16.51 (T2) | 06.10 | 04.22 | 02.40 |
| | 14.30 | | 16.13 | | 17.44 17 | 17.08 (T2) | 20.20 | 21.57 | 23.40 |
| 8 | 10.03 | 12.27 (T7) | 08.37 | | 06.59 | 16.50 (T2) | 06.07 | 04.18 | 02.38 |
| | 14.33 5 | 12.32 (T7) | 16.16 | | 17.48 20 | 17.10 (T2) | 20.23 | 22.01 | 23.43 |
| 9 | 10.01 | 12.26 (T7) | 08.33 | | 06.56 | 16.49 (T2) | 06.03 | 04.15 | 02.36 |
| | 14.36 16 | 12.42 (T7) | 16.19 | | 17.51 21 | 17.10 (T2) | 20.26 | 22.04 | 23.45 |
| 10 | 09.59 | 12.26 (T7) | 08.30 | | 06.52 | 16.48 (T2) | 05.59 | 04.11 | 02.34 |
| | 14.39 18 | 12.44 (T7) | 16.23 | | 17.54 22 | 17.10 (T2) | 20.29 | 22.07 | 23.48 |
| 11 | 09.57 | 12.26 (T7) | 08.27 | | 06.48 | 16.48 (T2) | 05.56 | 04.08 | 02.32 |
| | 14.42 19 | 12.45 (T7) | 16.26 | | 17.57 22 | 17.10 (T2) | 20.32 | 22.11 | 23.50 |
| 12 | 09.55 | 12.25 (T7) | 08.23 | | 06.45 | 16.47 (T2) | 05.52 | 04.04 | 02.30 |
| | 14.45 20 | 12.45 (T7) | 16.30 | | 18.00 23 | 17.10 (T2) | 20.35 | 22.14 | 23.52 |
| 13 | 09.53 | 12.26 (T7) | 08.20 | | 06.41 | 16.47 (T2) | 05.48 | 04.01 | 02.29 |
| | 14.48 20 | 12.46 (T7) | 16.33 | | 18.03 22 | 17.09 (T2) | 20.38 | 22.18 | 23.54 |
| 14 | 09.51 | 12.25 (T7) | 08.17 | | 06.38 | 16.48 (T2) | 05.45 | 03.57 | 02.27 |
| | 14.51 22 | 12.47 (T7) | 16.36 | | 18.06 21 | 17.09 (T2) | 20.42 | 22.21 | 23.56 |
| 15 | 09.48 | 12.26 (T7) | 08.13 | | 06.34 | 16.48 (T2) | 05.41 | 03.54 | 02.26 |
| | 14.54 22 | 12.48 (T7) | 16.40 | | 18.09 20 | 17.08 (T2) | 20.45 | 22.25 | 23.58 |
| 16 | 09.46 | 12.25 (T7) | 08.10 | | 06.30 | 16.48 (T2) | 05.37 | 03.50 | 02.25 |
| | 14.57 23 | 12.48 (T7) | 16.43 | | 18.12 18 | 17.06 (T2) | 20.48 | 22.28 | 00.00 |
| 17 | 09.43 | 12.25 (T7) | 08.06 | | 06.27 | 16.49 (T2) | 05.34 | 03.47 | 02.24 |
| | 15.01 24 | 12.49 (T7) | 16.46 | | 18.15 15 | 17.04 (T2) | 20.51 | 22.32 | 00.01 |
| 18 | 09.41 | 12.25 (T7) | 08.03 | | 06.23 | 16.52 (T2) | 05.30 | 03.44 | 02.23 |
| | 15.04 25 | 12.50 (T7) | 16.50 | | 18.18 11 | 17.03 (T2) | 20.54 | 22.35 | 00.02 |
| 19 | 09.38 | 12.25 (T7) | 07.59 | | 06.20 | | 05.27 | 03.40 | 02.23 |
| | 15.07 25 | 12.50 (T7) | 16.53 | | 18.22 | | 20.58 | 22.39 | 00.03 |
| 20 | 09.35 | 12.26 (T7) | 07.56 | | 06.16 | | 05.23 | 03.37 | 02.23 |
| | 15.11 25 | 12.51 (T7) | 16.56 | | 18.25 | | 21.01 | 22.42 | 00.03 |
| 21 | 09.32 | 12.26 (T7) | 07.52 | | 06.12 | | 05.19 | 03.34 | 02.23 |
| | 15.14 25 | 12.51 (T7) | 17.00 | | 18.28 | | 21.04 | 22.45 | 00.04 |
| 22 | 09.30 | 12.26 (T7) | 07.49 | | 06.09 | | 05.16 | 03.30 | 02.23 |
| | 15.17 25 | 12.51 (T7) | 17.03 | | 18.31 | | 21.07 | 22.49 | 00.04 |
| 23 | 09.27 | 12.27 (T7) | 07.45 | | 06.05 | | 05.12 | 03.27 | 02.24 |
| | 15.21 25 | 12.52 (T7) | 17.06 | | 18.34 | | 21.10 | 22.52 | 00.04 |
| 24 | 09.24 | 12.27 (T7) | 07.42 | | 06.01 | | 05.08 | 03.24 | 02.24 |
| | 15.24 24 | 12.51 (T7) | 17.09 | | 18.37 | | 21.14 | 22.56 | 00.04 |
| 25 | 09.21 | 12.28 (T7) | 07.38 | | 05.58 | | 05.05 | 03.20 | 02.25 |
| | 15.28 24 | 12.52 (T7) | 17.13 | | 18.40 | | 21.17 | 22.59 | 00.03 |
| 26 | 09.18 | 12.29 (T7) | 07.35 | | 05.54 | | 05.01 | 03.17 | 02.26 |
| | 15.31 23 | 12.52 (T7) | 17.16 | | 18.43 | | 21.20 | 23.03 | 00.02 |
| 27 | 09.15 | 12.29 (T7) | 07.31 | | 05.50 | | 04.58 | 03.14 | 02.28 |
| | 15.34 22 | 12.51 (T7) | 17.19 | | 18.46 | | 21.24 | 23.06 | 00.01 |
| 28 | 09.12 | 12.30 (T7) | 07.28 | | 05.47 | | 04.54 | 03.11 | 02.29 |
| | 15.38 21 | 12.51 (T7) | 17.22 | | 18.49 | | 21.27 | 23.09 | 00.00 |
| 29 | 09.09 | 12.31 (T7) | | | 06.43 | | 04.50 | 03.08 | 02.31 |
| | 15.41 19 | 12.50 (T7) | | | 19.52 | | 21.30 | 23.13 | 23.59 |
| 30 | 09.06 | 12.33 (T7) | | | 06.39 | | 04.47 | 03.05 | 02.33 |
| | 15.45 17 | 12.50 (T7) | | | 19.55 | | 21.34 | 23.16 | 23.57 |
| 31 | 09.03 | 12.34 (T7) | | | 06.36 | | | 03.02 | |
| | 15.48 14 | 12.48 (T7) | | | 19.58 | | | 23.19 | |
| Potential sun hours | 163 | | 235 | | 363 | | 454 | 577 | 640 |
| Total, worst case | | 503 | | 9 | | 250 | | | |
| Sun reduction | | 0,11 | | 0,31 | | 0,36 | | | |
| Oper. time red. | | 0,97 | | 0,97 | | 0,97 | | | |
| Wind dir. red. | | 0,66 | | 0,66 | | 0,61 | | | |
| Total reduction | | 0,07 | | 0,20 | | 0,22 | | | |
| Total, real | | 37 | | 2 | | 54 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | | October | | | November | | | December | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.35 | | 04.09 | | 05.49 | | | 07.18 | | 17.27 (T2) | 07.55 | | | 09.35 | | 12.08 (T7) |
| | 23.56 | | 22.24 | | 20.33 | | | 18.44 | 22 | 17.49 (T2) | 15.54 | | | 14.25 | 19 | 12.27 (T7) |
| 2 | 02.37 | | 04.12 | | 05.52 | | | 07.21 | | 17.26 (T2) | 07.58 | | | 09.38 | | 12.09 (T7) |
| | 23.54 | | 22.21 | | 20.29 | | | 18.40 | 23 | 17.49 (T2) | 15.51 | | | 14.23 | 18 | 12.27 (T7) |
| 3 | 02.40 | | 04.16 | | 05.55 | | | 07.24 | | 17.26 (T2) | 08.02 | | | 09.41 | | 12.10 (T7) |
| | 23.52 | | 22.17 | | 20.26 | | | 18.36 | 22 | 17.48 (T2) | 15.48 | | | 14.21 | 16 | 12.26 (T7) |
| 4 | 02.42 | | 04.19 | | 05.58 | | | 07.27 | | 17.26 (T2) | 08.05 | | | 09.43 | | 12.11 (T7) |
| | 23.50 | | 22.14 | | 20.22 | | | 18.33 | 22 | 17.48 (T2) | 15.44 | | | 14.19 | 6 | 12.17 (T7) |
| 5 | 02.45 | | 04.23 | | 06.01 | | | 07.30 | | 17.26 (T2) | 08.08 | | | 09.46 | | |
| | 23.48 | | 22.10 | | 20.18 | | | 18.29 | 21 | 17.47 (T2) | 15.41 | | | 14.17 | | |
| 6 | 02.48 | | 04.26 | | 06.04 | | | 07.33 | | 17.27 (T2) | 08.12 | | | 09.49 | | |
| | 23.45 | | 22.07 | | 20.15 | | | 18.26 | 18 | 17.45 (T2) | 15.38 | | | 14.15 | | |
| 7 | 02.50 | | 04.29 | | 06.07 | | | 07.36 | | 17.27 (T2) | 08.15 | | | 09.52 | | |
| | 23.43 | | 22.03 | | 20.11 | | | 18.22 | 14 | 17.41 (T2) | 15.34 | | | 14.14 | | |
| 8 | 02.53 | | 04.33 | | 06.10 | | | 07.39 | | 17.30 (T2) | 08.19 | | | 09.54 | | |
| | 23.40 | | 22.00 | | 20.07 | | | 18.18 | 8 | 17.38 (T2) | 15.31 | | | 14.12 | | |
| 9 | 02.56 | | 04.36 | | 06.13 | | | 07.42 | | 17.33 (T2) | 08.22 | | | 09.56 | | |
| | 23.38 | | 21.56 | | 20.04 | | | 18.15 | 1 | 17.34 (T2) | 15.28 | | | 14.10 | | |
| 10 | 02.59 | | 04.39 | | 06.16 | | | 07.45 | | | 08.25 | | 12.07 (T7) | 09.59 | | |
| | 23.35 | | 21.53 | | 20.00 | | | 18.11 | | | 15.25 | 10 | 12.17 (T7) | 14.09 | | |
| 11 | 03.02 | | 04.42 | | 06.19 | | | 07.48 | | | 08.29 | | 12.05 (T7) | 10.01 | | |
| | 23.32 | | 21.49 | | 19.56 | | | 18.08 | | | 15.22 | 14 | 12.19 (T7) | 14.08 | | |
| 12 | 03.02 | | 04.46 | | 06.22 | | | 07.51 | | | 08.32 | | 12.04 (T7) | 10.03 | | |
| | 23.29 | | 21.45 | | 19.53 | | | 18.04 | | | 15.18 | 17 | 12.21 (T7) | 14.07 | | |
| 13 | 03.05 | | 04.49 | | 06.25 | | | 07.54 | | | 08.35 | | 12.03 (T7) | 10.05 | | |
| | 23.26 | | 21.42 | | 19.49 | | | 18.00 | | | 15.15 | 19 | 12.22 (T7) | 14.06 | | |
| 14 | 03.09 | | 04.52 | | 06.28 | | | 07.57 | | | 08.39 | | 12.03 (T7) | 10.07 | | |
| | 23.23 | | 21.38 | | 19.45 | | | 17.57 | | | 15.12 | 21 | 12.24 (T7) | 14.05 | | |
| 15 | 03.12 | | 04.56 | | 06.31 | | | 08.00 | | | 08.42 | | 12.02 (T7) | 10.09 | | |
| | 23.20 | | 21.35 | | 19.42 | | | 17.53 | | | 15.09 | 22 | 12.24 (T7) | 14.04 | | |
| 16 | 03.15 | | 04.59 | | 06.34 | | | 08.04 | | | 08.46 | | 12.02 (T7) | 10.10 | | |
| | 23.17 | | 21.31 | | 19.38 | | | 17.50 | | | 15.06 | 23 | 12.25 (T7) | 14.03 | | |
| 17 | 03.18 | | 05.02 | | 06.37 | | | 08.07 | | | 08.49 | | 12.02 (T7) | 10.12 | | |
| | 23.14 | | 21.27 | | 19.34 | | | 17.46 | | | 15.03 | 24 | 12.26 (T7) | 14.03 | | |
| 18 | 03.22 | | 05.05 | | 06.40 | | | 08.10 | | | 08.52 | | 12.01 (T7) | 10.13 | | |
| | 23.11 | | 21.24 | | 19.31 | | | 17.43 | | | 15.00 | 24 | 12.25 (T7) | 14.03 | | |
| 19 | 03.25 | | 05.08 | | 06.42 | | | 08.13 | | | 08.56 | | 12.01 (T7) | 10.14 | | |
| | 23.08 | | 21.20 | | 19.27 | | | 17.39 | | | 14.57 | 25 | 12.26 (T7) | 14.02 | | |
| 20 | 03.28 | | 05.12 | | 06.45 | | | 08.16 | | | 08.59 | | 12.01 (T7) | 10.15 | | |
| | 23.05 | | 21.17 | | 19.24 | | | 17.36 | | | 14.54 | 25 | 12.26 (T7) | 14.03 | | |
| 21 | 03.32 | | 05.15 | | 06.48 | | | 08.19 | | | 09.03 | | 12.01 (T7) | 10.16 | | |
| | 23.01 | | 21.13 | | 19.20 | | | 17.32 | | | 14.51 | 25 | 12.26 (T7) | 14.03 | | |
| 22 | 03.35 | | 05.18 | | 06.51 | | | 08.22 | | | 09.06 | | 12.02 (T7) | 10.16 | | |
| | 22.58 | | 21.09 | | 19.16 | | | 17.29 | | | 14.48 | 25 | 12.27 (T7) | 14.03 | | |
| 23 | 03.38 | | 05.21 | | 06.54 | | | 08.26 | | | 09.09 | | 12.03 (T7) | 10.17 | | |
| | 22.55 | | 21.06 | | 19.13 | | | 17.25 | | | 14.46 | 24 | 12.27 (T7) | 14.04 | | |
| 24 | 03.42 | | 05.24 | | 06.57 | | | 08.29 | | | 09.13 | | 12.03 (T7) | 10.17 | | |
| | 22.52 | | 21.02 | | 19.09 | | | 17.22 | | | 14.43 | 24 | 12.27 (T7) | 14.04 | | |
| 25 | 03.45 | | 05.27 | | 07.00 | | 17.36 (T2) | 07.32 | | | 09.16 | | 12.04 (T7) | 10.17 | | |
| | 22.48 | | 20.58 | | 19.05 | 9 | 17.45 (T2) | 16.18 | | | 14.40 | 23 | 12.27 (T7) | 14.05 | | |
| 26 | 03.49 | | 05.30 | | 07.03 | | 17.33 (T2) | 07.35 | | | 09.19 | | 12.04 (T7) | 10.17 | | |
| | 22.45 | | 20.55 | | 19.02 | 14 | 17.47 (T2) | 16.15 | | | 14.38 | 24 | 12.28 (T7) | 14.06 | | |
| 27 | 03.52 | | 05.33 | | 07.06 | | 17.31 (T2) | 07.39 | | | 09.22 | | 12.04 (T7) | 10.17 | | |
| | 22.41 | | 20.51 | | 18.58 | 17 | 17.48 (T2) | 16.11 | | | 14.35 | 23 | 12.27 (T7) | 14.08 | | |
| 28 | 03.55 | | 05.37 | | 07.09 | | 17.29 (T2) | 07.42 | | | 09.25 | | 12.06 (T7) | 10.17 | | |
| | 22.38 | | 20.47 | | 18.54 | 20 | 17.49 (T2) | 16.08 | | | 14.33 | 22 | 12.28 (T7) | 14.09 | | |
| 29 | 03.59 | | 05.40 | | 07.12 | | 17.28 (T2) | 07.45 | | | 09.29 | | 12.06 (T7) | 10.16 | | |
| | 22.35 | | 20.44 | | 18.51 | 21 | 17.49 (T2) | 16.05 | | | 14.30 | 21 | 12.27 (T7) | 14.10 | | |
| 30 | 04.02 | | 05.43 | | 07.15 | | 17.27 (T2) | 07.48 | | | 09.32 | | 12.07 (T7) | 10.16 | | |
| | 22.31 | | 20.40 | | 18.47 | 22 | 17.49 (T2) | 16.01 | | | 14.28 | 20 | 12.27 (T7) | 14.12 | | |
| 31 | 04.06 | | 05.46 | | | | | 07.52 | | | | | | 10.15 | | |
| | 22.28 | | 20.37 | | | | | 15.58 | | | | | | 14.14 | | |
| Potential sun hours | 619 | | 513 | | 394 | | | 303 | | | 192 | | | 126 | | |
| Total, worst case | | | | | 103 | | | | 151 | | | 455 | | | 59 | |
| Sun reduction | | | | | 0,32 | | | | 0,28 | | | 0,19 | | | 0,04 | |
| Oper. time red. | | | | | 0,97 | | | | 0,97 | | | 0,97 | | | 0,97 | |
| Wind dir. red. | | | | | 0,61 | | | | 0,61 | | | 0,66 | | | 0,66 | |
| Total reduction | | | | | 0,19 | | | | 0,17 | | | 0,12 | | | 0,03 | |
| Total, real | | | | | 20 | | | | 26 | | | 56 | | | 2 | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** J - Lomarakennus J (Hautakaarto)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.40 | 23.24 | 23.52 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.17 | 06.25 | 04.37 | 02.53 | 02.42 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.27 | 23.50 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.09 | 08.49 | 07.14 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.05 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.30 | 23.48 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.47 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.10 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.48 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.53 | 23.35 | 23.43 | 22.06 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.15 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.53 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.01 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.49 | 05.56 | 04.09 | 02.35 | 03.01 | 04.43 | 06.19 | 07.48 | 08.28 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.48 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.04 | 04.47 | 06.22 | 07.51 | 08.31 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.28 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.41 | 05.49 | 04.02 | 02.31 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.54 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.42 | 10.07 |
| | 14.56 | 16.40 | 18.10 | 20.45 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.45 | 08.09 | 06.31 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.57 | 23.16 | 21.31 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.07 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.01 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.32 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.13 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.57 | 08.29 | 09.12 | 10.16 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.01 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.16 |
| | 15.29 | 17.13 | 18.40 | 21.17 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.16 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 00.00 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.16 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.59 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.32 | 03.57 | 05.37 | 07.09 | 07.42 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.08 | 23.58 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.44 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.31 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** K - Asuinrakennus K (Takalo)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.32 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.33 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.20 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.39 | 23.23 | 23.51 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.52 | 07.17 | 06.25 | 04.37 | 02.53 | 02.43 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.26 | 23.49 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.08 | 08.49 | 07.13 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.04 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.29 | 23.47 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.48 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.09 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.05 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.47 |
| | 14.30 | 16.10 | 17.42 | 20.16 | 21.53 | 23.35 | 23.43 | 22.06 | 20.14 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.39 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.14 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.02 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.52 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.40 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.02 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.06 | 23.45 | 23.33 | 21.52 | 20.00 | 18.11 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.48 | 05.56 | 04.09 | 02.35 | 03.02 | 04.43 | 06.19 | 07.48 | 08.28 | 09.59 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.47 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.05 | 04.47 | 06.22 | 07.51 | 08.31 | 10.01 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.27 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.19 | 06.41 | 05.49 | 04.02 | 02.32 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.03 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.53 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.41 | 10.07 |
| | 14.56 | 16.40 | 18.09 | 20.44 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.44 | 08.09 | 06.30 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.08 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.56 | 23.16 | 21.30 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.06 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.30 | 23.58 | 23.13 | 21.27 | 19.34 | 17.47 | 15.04 | 14.05 |
| 18 | 09.39 | 08.02 | 06.23 | 05.31 | 03.45 | 02.27 | 03.24 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.06 | 21.20 | 19.27 | 17.40 | 14.58 | 14.05 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.00 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.31 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.12 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.51 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.03 | 18.31 | 21.07 | 22.47 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.28 | 03.43 | 05.25 | 06.57 | 08.29 | 09.11 | 10.15 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.00 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.29 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.15 |
| | 15.29 | 17.13 | 18.40 | 21.16 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.15 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 23.59 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.15 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.58 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.33 | 03.57 | 05.37 | 07.09 | 07.41 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.07 | 23.57 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.43 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.30 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** L - Lomarakennus L (Haukijärvi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | | June | | July | | August | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.25 | 06.33 | 04.45 | | 03.02 | | 21.08 (T38) | 02.39 | 21.19 (T38) | 04.11 | 21.23 (T38) | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.19 | 15.53 | 17.27 | 20.02 | 21.37 | | 23.21 | 23 | 21.31 (T38) | 23.54 | 21.33 (T38) | 22.24 | 21.32 (T38) | 20.33 | 18.44 | 15.56 | 14.28 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | | 02.56 | | 21.09 (T38) | 02.41 | 21.18 (T38) | 04.14 | 21.27 (T38) | 05.53 | 07.22 | 07.58 | 09.37 |
| | 14.21 | 15.57 | 17.30 | 20.05 | 21.40 | | 23.24 | 21 | 21.30 (T38) | 23.52 | 21.33 (T38) | 22.20 | 21.29 (T38) | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.18 | 06.26 | 04.38 | | 02.53 | | 21.10 (T38) | 02.43 | 21.18 (T38) | 04.18 | | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.23 | 16.00 | 17.33 | 20.08 | 21.43 | | 23.27 | 21 | 21.31 (T38) | 23.50 | 21.34 (T38) | 22.17 | | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 04.34 | | 02.51 | | 21.10 (T38) | 02.46 | 21.18 (T38) | 04.21 | | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.04 | 17.36 | 20.11 | 21.47 | | 23.30 | 20 | 21.30 (T38) | 23.48 | 21.35 (T38) | 22.13 | | 20.22 | 18.34 | 15.46 | 14.21 |
| 5 | 10.08 | 08.47 | 07.10 | 06.19 | 04.31 | | 02.48 | | 21.11 (T38) | 02.48 | 21.17 (T38) | 04.24 | | 06.02 | 07.31 | 08.08 | 09.45 |
| | 14.28 | 16.07 | 17.39 | 20.14 | 21.50 | | 23.33 | 19 | 21.30 (T38) | 23.46 | 21.35 (T38) | 22.10 | | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.07 | 06.15 | 04.27 | | 02.46 | | 21.11 (T38) | 02.51 | 21.18 (T38) | 04.28 | | 06.05 | 07.34 | 08.12 | 09.48 |
| | 14.30 | 16.11 | 17.42 | 20.17 | 21.54 | | 23.36 | 18 | 21.29 (T38) | 23.44 | 21.36 (T38) | 22.06 | | 20.15 | 18.26 | 15.39 | 14.18 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | | 02.44 | | 21.12 (T38) | 02.54 | 21.18 (T38) | 04.31 | | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.33 | 16.14 | 17.45 | 20.20 | 21.57 | | 23.38 | 17 | 21.29 (T38) | 23.41 | 21.37 (T38) | 22.03 | | 20.11 | 18.23 | 15.36 | 14.16 |
| 8 | 10.02 | 08.37 | 07.00 | 06.08 | 04.20 | | 02.41 | | 21.12 (T38) | 02.56 | 21.17 (T38) | 04.34 | | 06.11 | 07.40 | 08.18 | 09.53 |
| | 14.36 | 16.17 | 17.48 | 20.23 | 22.00 | | 23.41 | 17 | 21.29 (T38) | 23.39 | 21.37 (T38) | 21.59 | | 20.08 | 18.19 | 15.33 | 14.14 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 04.16 | | 02.39 | | 21.13 (T38) | 02.59 | 21.17 (T38) | 04.37 | | 06.14 | 07.43 | 08.22 | 09.55 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | | 23.43 | 16 | 21.29 (T38) | 23.36 | 21.37 (T38) | 21.56 | | 20.04 | 18.16 | 15.29 | 14.13 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | | 02.37 | | 21.14 (T38) | 03.02 | 21.16 (T38) | 04.41 | | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.29 | 22.07 | | 23.46 | 15 | 21.29 (T38) | 23.33 | 21.38 (T38) | 21.52 | | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.10 | 21.15 (T38) | 02.35 | | 21.14 (T38) | 03.02 | 21.16 (T38) | 04.44 | | 06.20 | 07.49 | 08.29 | 10.00 |
| | 14.44 | 16.28 | 17.58 | 20.33 | 22.10 | 6 21.21 (T38) | 23.48 | 15 | 21.29 (T38) | 23.31 | 21.38 (T38) | 21.49 | | 19.57 | 18.09 | 15.23 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.06 | 21.12 (T38) | 02.34 | | 21.15 (T38) | 03.05 | 21.16 (T38) | 04.47 | | 06.23 | 07.52 | 08.32 | 10.02 |
| | 14.47 | 16.31 | 18.01 | 20.36 | 22.14 | 12 21.24 (T38) | 23.50 | 13 | 21.28 (T38) | 23.28 | 21.39 (T38) | 21.45 | | 19.53 | 18.05 | 15.20 | 14.09 |
| 13 | 09.52 | 08.20 | 06.42 | 05.50 | 04.03 | 21.10 (T38) | 02.32 | | 21.15 (T38) | 03.08 | 21.16 (T38) | 04.51 | | 06.26 | 07.55 | 08.35 | 10.04 |
| | 14.50 | 16.34 | 18.04 | 20.39 | 22.17 | 16 21.26 (T38) | 23.52 | 13 | 21.28 (T38) | 23.25 | 21.39 (T38) | 21.42 | | 19.50 | 18.01 | 15.17 | 14.08 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 21.09 (T38) | 02.31 | | 21.16 (T38) | 03.11 | 21.16 (T38) | 04.54 | | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.38 | 18.07 | 20.42 | 22.21 | 18 21.27 (T38) | 23.54 | 12 | 21.28 (T38) | 23.22 | 21.39 (T38) | 21.38 | | 19.46 | 17.58 | 15.14 | 14.07 |
| 15 | 09.47 | 08.13 | 06.35 | 05.42 | 03.56 | 21.09 (T38) | 02.30 | | 21.17 (T38) | 03.14 | 21.15 (T38) | 04.57 | | 06.32 | 08.01 | 08.42 | 10.07 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.24 | 19 21.28 (T38) | 23.56 | 11 | 21.28 (T38) | 23.19 | 21.39 (T38) | 21.35 | | 19.42 | 17.54 | 15.11 | 14.06 |
| 16 | 09.45 | 08.10 | 06.31 | 05.39 | 03.52 | 21.08 (T38) | 02.29 | | 21.18 (T38) | 03.18 | 21.16 (T38) | 05.00 | | 06.34 | 08.04 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 21 21.29 (T38) | 23.57 | 10 | 21.28 (T38) | 23.16 | 21.41 (T38) | 21.31 | | 19.39 | 17.51 | 15.08 | 14.06 |
| 17 | 09.43 | 08.06 | 06.27 | 05.35 | 03.49 | 21.07 (T38) | 02.28 | | 21.18 (T38) | 03.21 | 21.16 (T38) | 05.03 | | 06.37 | 08.07 | 08.49 | 10.10 |
| | 15.03 | 16.48 | 18.16 | 20.51 | 22.31 | 22 21.29 (T38) | 23.58 | 10 | 21.28 (T38) | 23.13 | 21.40 (T38) | 21.27 | | 19.35 | 17.47 | 15.05 | 14.06 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.46 | 21.07 (T38) | 02.27 | | 21.18 (T38) | 03.24 | 21.15 (T38) | 05.07 | | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.06 | 16.51 | 18.19 | 20.55 | 22.34 | 23 21.30 (T38) | 23.59 | 9 | 21.27 (T38) | 23.10 | 21.40 (T38) | 21.24 | | 19.31 | 17.44 | 15.02 | 14.05 |
| 19 | 09.37 | 08.00 | 06.20 | 05.28 | 03.42 | 21.06 (T38) | 02.27 | | 21.19 (T38) | 03.27 | 21.16 (T38) | 05.10 | | 06.43 | 08.13 | 08.55 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 24 21.30 (T38) | 00.00 | 8 | 21.27 (T38) | 23.07 | 21.41 (T38) | 21.20 | | 19.28 | 17.40 | 14.59 | 14.05 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.39 | 21.07 (T38) | 02.27 | | 21.19 (T38) | 03.31 | 21.16 (T38) | 05.13 | | 06.46 | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.58 | 18.25 | 21.01 | 22.41 | 24 21.31 (T38) | 00.01 | 8 | 21.27 (T38) | 23.04 | 21.41 (T38) | 21.17 | | 19.24 | 17.37 | 14.56 | 14.05 |
| 21 | 09.32 | 07.53 | 06.13 | 05.21 | 03.36 | 21.06 (T38) | 02.27 | | 21.20 (T38) | 03.34 | 21.16 (T38) | 05.16 | | 06.49 | 08.20 | 09.02 | 10.15 |
| | 15.16 | 17.01 | 18.28 | 21.04 | 22.45 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 23.01 | 21.41 (T38) | 21.13 | | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.17 | 03.32 | 21.06 (T38) | 02.27 | | 21.20 (T38) | 03.37 | 21.16 (T38) | 05.19 | | 06.52 | 08.23 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 22.57 | 21.41 (T38) | 21.09 | | 19.17 | 17.30 | 14.50 | 14.06 |
| 23 | 09.26 | 07.46 | 06.06 | 05.13 | 03.29 | 21.06 (T38) | 02.28 | | 21.20 (T38) | 03.41 | 21.17 (T38) | 05.22 | | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.23 | 17.07 | 18.34 | 21.11 | 22.51 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 22.54 | 21.41 (T38) | 21.06 | | 19.13 | 17.26 | 14.48 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.10 | 03.26 | 21.06 (T38) | 02.28 | | 21.20 (T38) | 03.44 | 21.17 (T38) | 05.25 | | 06.58 | 08.29 | 09.12 | 10.16 |
| | 15.26 | 17.11 | 18.37 | 21.14 | 22.55 | 25 21.31 (T38) | 00.01 | 9 | 21.29 (T38) | 22.51 | 21.41 (T38) | 21.02 | | 19.10 | 17.23 | 14.45 | 14.07 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.23 | 21.06 (T38) | 02.29 | | 21.20 (T38) | 03.47 | 21.17 (T38) | 05.28 | | 07.01 | 07.32 | 09.15 | 10.16 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.58 | 25 21.31 (T38) | 00.01 | 9 | 21.29 (T38) | 22.48 | 21.41 (T38) | 20.59 | | 19.06 | 16.19 | 14.42 | 14.08 |
| 26 | 09.18 | 07.35 | 05.55 | 05.03 | 03.20 | 21.07 (T38) | 02.30 | | 21.20 (T38) | 03.51 | 21.17 (T38) | 05.32 | | 07.04 | 07.36 | 09.18 | 10.16 |
| | 15.33 | 17.17 | 18.44 | 21.20 | 23.01 | 24 21.31 (T38) | 00.00 | 10 | 21.30 (T38) | 22.44 | 21.40 (T38) | 20.55 | | 19.02 | 16.16 | 14.40 | 14.09 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.17 | 21.07 (T38) | 02.32 | | 21.20 (T38) | 03.54 | 21.18 (T38) | 05.35 | | 07.07 | 07.39 | 09.22 | 10.16 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 25 21.32 (T38) | 23.59 | 11 | 21.31 (T38) | 22.41 | 21.40 (T38) | 20.51 | | 18.59 | 16.13 | 14.37 | 14.10 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 21.07 (T38) | 02.33 | | 21.19 (T38) | 03.57 | 21.19 (T38) | 05.38 | | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.40 | 17.23 | 18.50 | 21.27 | 23.08 | 25 21.32 (T38) | 23.58 | 11 | 21.30 (T38) | 22.38 | 21.39 (T38) | 20.48 | | 18.55 | 16.09 | 14.35 | 14.12 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 21.08 (T38) | 02.35 | | 21.19 (T38) | 04.01 | 21.19 (T38) | 05.41 | | 07.13 | 07.45 | 09.28 | 10.15 |
| | 15.43 | | 19.53 | 21.30 | 23.11 | 23 21.31 (T38) | 23.57 | 12 | 21.31 (T38) | 22.34 | 21.38 (T38) | 20.44 | | 18.52 | 16.06 | 14.32 | 14.13 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 21.08 (T38) | 02.37 | | 21.19 (T38) | 04.04 | 21.20 (T38) | 05.44 | | 07.16 | 07.49 | 09.31 | 10.14 |
| | 15.46 | | 19.56 | 21.33 | 23.15 | 23 21.31 (T38) | 23.55 | 14 | 21.33 (T38) | 22.31 | 21.37 (T38) | 20.40 | | 18.48 | 16.02 | 14.30 | 14.15 |
| 31 | 09.02 | | 06.37 | | 03.05 | 21.08 (T38) | | | | 04.08 | 21.22 (T38) | 05.47 | | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | 23 21.31 (T38) | | | | 22.27 | 21.36 (T38) | 20.37 | | | 15.59 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | | 637 | | 617 | | 512 | | 394 | 303 | 193 | 128 | |
| Total, worst case | | | | | 453 | | 396 | | 655 | | 11 | | | | | | |
| Sun reduction | | | | | 0,47 | | 0,50 | | 0,48 | | 0,42 | | | | | | |
| Oper. time red. | | | | | 0,97 | | 0,97 | | 0,97 | | 0,97 | | | | | | |
| Wind dir. red. | | | | | 0,64 | | 0,64 | | 0,64 | | 0,64 | | | | | | |
| Total reduction | | | | | 0,29 | | 0,31 | | 0,30 | | 0,26 | | | | | | |
| Total, real | | | | | 133 | | 123 | | 194 | | 3 | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** M - Lomarakennus M (Haukilahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 14.48 (T31) | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 14.14 (T31) | 09.35 |
| | 14.18 | 15.53 11 | 14.59 (T31) | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 24 | 14.38 (T31) | 14.27 |
| 2 | 10.12 | 08.56 | 14.47 (T31) | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 14.14 (T31) | 09.37 |
| | 14.20 | 15.57 17 | 15.04 (T31) | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 25 | 14.39 (T31) | 14.25 |
| 3 | 10.11 | 08.53 | 14.46 (T31) | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 14.14 (T31) | 09.40 |
| | 14.22 | 16.00 20 | 15.06 (T31) | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 25 | 14.39 (T31) | 14.23 |
| 4 | 10.10 | 08.50 | 14.45 (T31) | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 14.15 (T31) | 09.43 |
| | 14.25 | 16.03 21 | 15.06 (T31) | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.34 | 15.45 23 | 14.38 (T31) | 14.21 |
| 5 | 10.08 | 08.47 | 14.45 (T31) | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 14.15 (T31) | 09.46 |
| | 14.27 | 16.07 22 | 15.07 (T31) | 17.39 | 20.14 | 21.51 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 23 | 14.38 (T31) | 14.19 |
| 6 | 10.07 | 08.44 | 14.44 (T31) | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 14.15 (T31) | 09.49 |
| | 14.30 | 16.10 24 | 15.08 (T31) | 17.42 | 20.17 | 21.54 | 23.37 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 23 | 14.38 (T31) | 14.17 |
| 7 | 10.05 | 08.40 | 14.44 (T31) | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 14.16 (T31) | 09.51 |
| | 14.32 | 16.14 24 | 15.08 (T31) | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.12 | 18.23 | 15.36 21 | 14.37 (T31) | 14.15 |
| 8 | 10.03 | 08.37 | 14.44 (T31) | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 14.16 (T31) | 09.54 |
| | 14.35 | 16.17 24 | 15.08 (T31) | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 20 | 14.36 (T31) | 14.14 |
| 9 | 10.01 | 08.34 | 14.44 (T31) | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 14.17 (T31) | 09.56 |
| | 14.38 | 16.21 24 | 15.08 (T31) | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 17 | 14.34 (T31) | 14.12 |
| 10 | 09.59 | 08.30 | 14.45 (T31) | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.26 | 14.19 (T31) | 09.58 |
| | 14.41 | 16.24 24 | 15.09 (T31) | 17.55 | 20.30 | 22.08 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 12 | 14.31 (T31) | 14.11 |
| 11 | 09.57 | 08.27 | 14.45 (T31) | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 14.21 (T31) | 10.01 |
| | 14.43 | 16.27 24 | 15.09 (T31) | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 5 | 14.26 (T31) | 14.09 |
| 12 | 09.55 | 08.24 | 14.46 (T31) | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | | 10.03 |
| | 14.46 | 16.31 22 | 15.08 (T31) | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | | 14.08 |
| 13 | 09.53 | 08.20 | 14.46 (T31) | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | | 10.05 |
| | 14.49 | 16.34 21 | 15.07 (T31) | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | | 14.07 |
| 14 | 09.50 | 08.17 | 14.47 (T31) | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | | 10.07 |
| | 14.53 | 16.37 19 | 15.06 (T31) | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | | 14.06 |
| 15 | 09.48 | 08.14 | 14.48 (T31) | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | | 10.08 |
| | 14.56 | 16.41 17 | 15.05 (T31) | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | | 14.06 |
| 16 | 09.46 | 08.10 | 14.50 (T31) | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | | 10.10 |
| | 14.59 | 16.44 13 | 15.03 (T31) | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | | 14.05 |
| 17 | 09.43 | 08.07 | 14.54 (T31) | 06.27 | 05.35 | 03.49 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | | 10.11 |
| | 15.02 | 16.47 5 | 14.59 (T31) | 18.16 | 20.52 | 22.32 | 00.00 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | | 14.05 |
| 18 | 09.40 | 08.03 | | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.53 | | 10.12 |
| | 15.05 | 16.51 | | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | | 14.05 |
| 19 | 09.38 | 08.00 | | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | | 10.14 |
| | 15.09 | 16.54 | | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | | 14.04 |
| 20 | 09.35 | 07.56 | | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | | 10.15 |
| | 15.12 | 16.57 | | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.56 | | 14.04 |
| 21 | 09.32 | 07.53 | | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | | 10.15 |
| | 15.15 | 17.01 | | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.21 | 17.33 | 14.53 | | 14.05 |
| 22 | 09.30 | 07.49 | | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | | 10.16 |
| | 15.19 | 17.04 | | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | | 14.05 |
| 23 | 09.27 | 07.46 | | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | | 10.16 |
| | 15.22 | 17.07 | | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | | 14.06 |
| 24 | 09.24 | 07.42 | | 06.02 | 05.10 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.13 | | 10.17 |
| | 15.25 | 17.10 | | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | | 14.06 |
| 25 | 09.21 | 07.39 | | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.33 14.23 (T31) | 09.16 | | 10.17 |
| | 15.29 | 17.14 | | 18.41 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 8 14.31 (T31) | 14.42 | | 14.07 |
| 26 | 09.18 | 07.35 | | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 14.20 (T31) | 09.19 | | 10.17 |
| | 15.32 | 17.17 | | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 14 14.34 (T31) | 14.39 | | 14.08 |
| 27 | 09.15 | 07.32 | | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 14.18 (T31) | 09.22 | | 10.17 |
| | 15.36 | 17.20 | | 18.47 | 21.24 | 23.06 | 00.00 | 22.41 | 20.52 | 18.59 | 16.12 17 14.35 (T31) | 14.37 | | 14.09 |
| 28 | 09.12 | 07.28 | | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 14.16 (T31) | 09.25 | | 10.16 |
| | 15.39 | 17.23 | | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 20 14.36 (T31) | 14.34 | | 14.11 |
| 29 | 09.09 | | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.46 14.15 (T31) | 09.28 | | 10.16 |
| | 15.43 | | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 22 14.37 (T31) | 14.32 | | 14.12 |
| 30 | 09.06 | | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 14.15 (T31) | 09.32 | | 10.15 |
| | 15.46 | | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 22 14.37 (T31) | 14.29 | | 14.14 |
| 31 | 09.03 14.50 (T31) | | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 14.15 (T31) | | | 10.14 |
| | 15.50 6 14.56 (T31) | | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.59 23 14.38 (T31) | | | 14.16 |
| Potential sun hours | 164 | 235 | | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | | 128 |
| Total, worst case | 6 | 332 | | | | | | | | | 126 | 218 | | |
| Sun reduction | 0,11 | 0,31 | | | | | | | | | 0,28 | 0,19 | | |
| Oper. time red. | 0,97 | 0,97 | | | | | | | | | 0,97 | 0,97 | | |
| Wind dir. red. | 0,64 | 0,64 | | | | | | | | | 0,64 | 0,64 | | |
| Total reduction | 0,07 | 0,19 | | | | | | | | | 0,18 | 0,12 | | |
| Total, real | 0 | 64 | | | | | | | | | 22 | 26 | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** N - Lomarakennus N (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.26 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 **Shadow receptor:** O - Lomarakennus O (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.51 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

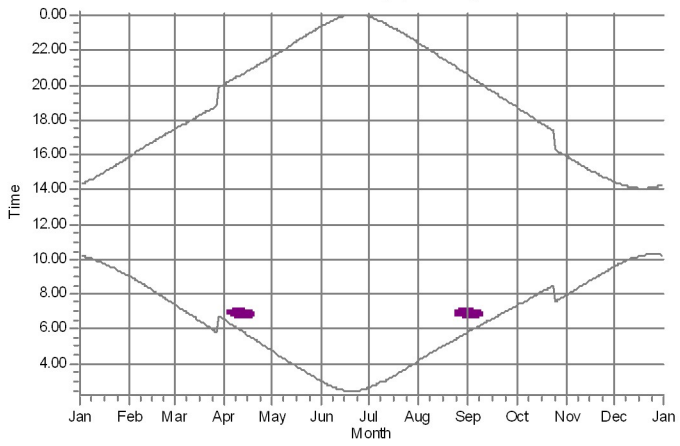
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 10.51/3.5.584

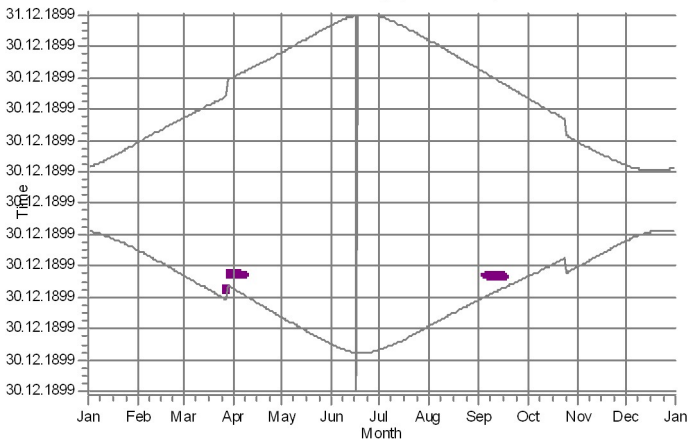
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

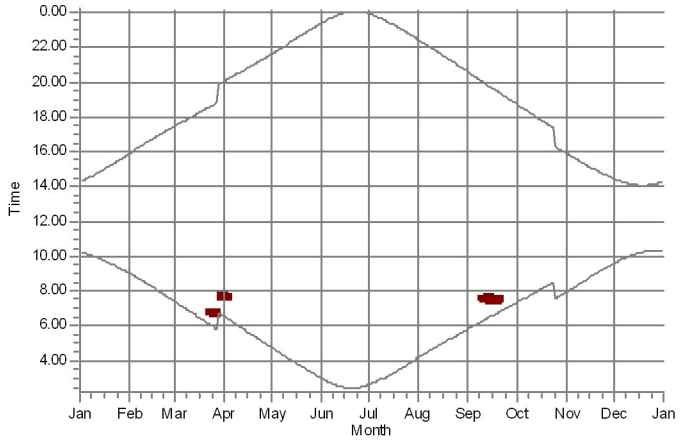
A: Lomarakennus A (Syvälahti)



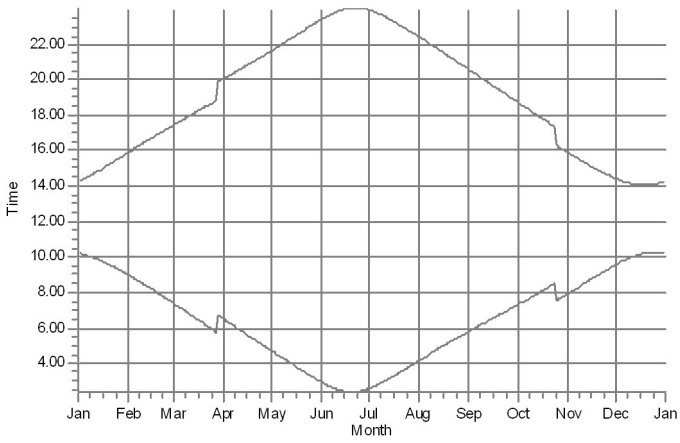

B: Asuinrakennus B (Syväänlahti)



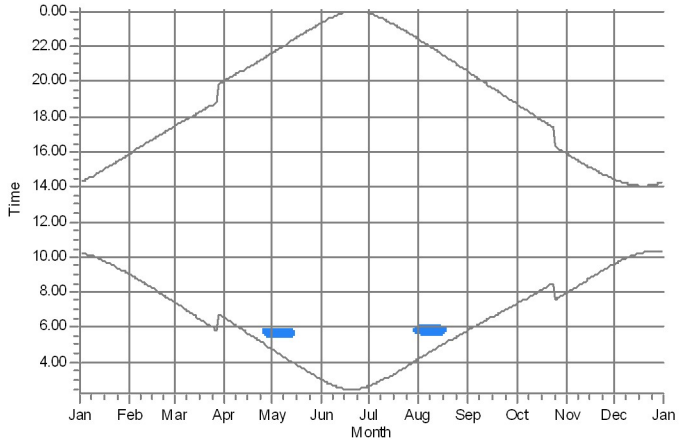

C: Lomarakennus C (Mutalahti)



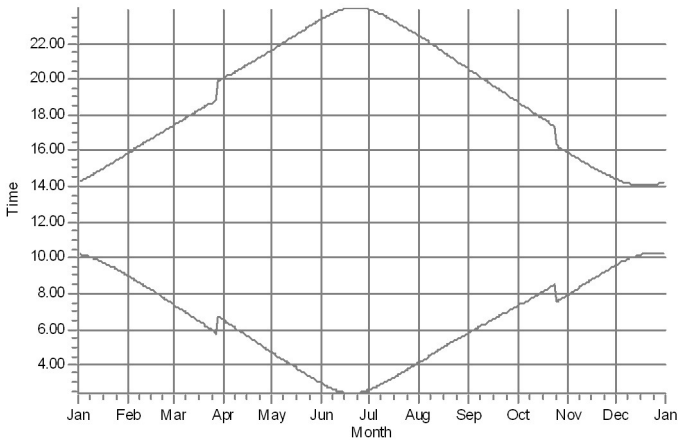

D: Lomarakennus D (Mutaniemi)




E: Asuinrakennus E (Alanko)




F: Asuinrakennus F (Joensuu)




WTGs

T16: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663)

T19: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660)

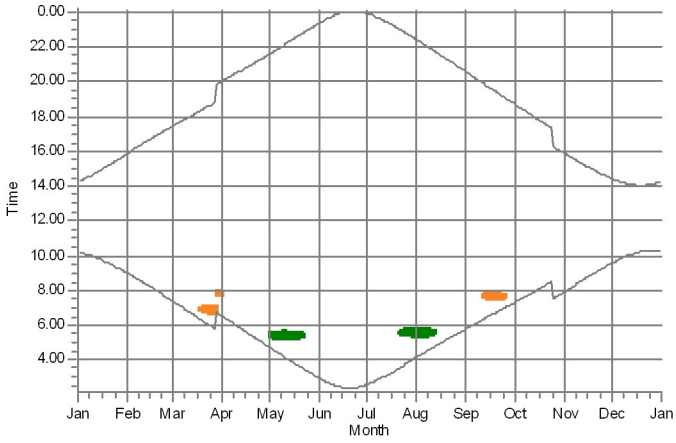
T9: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670)

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Calculated:
9.5.2023 10.51/3.5.584

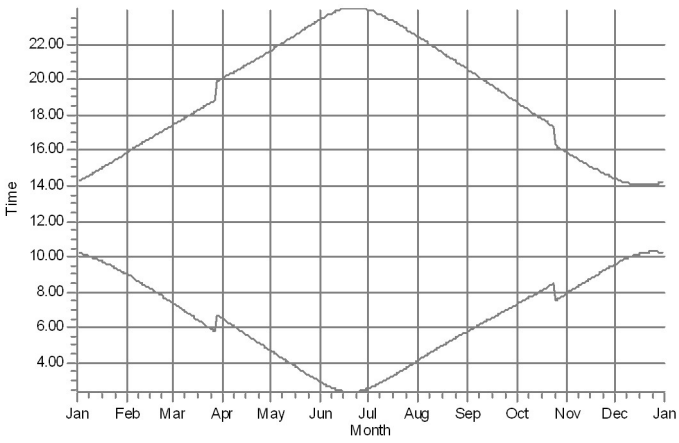
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

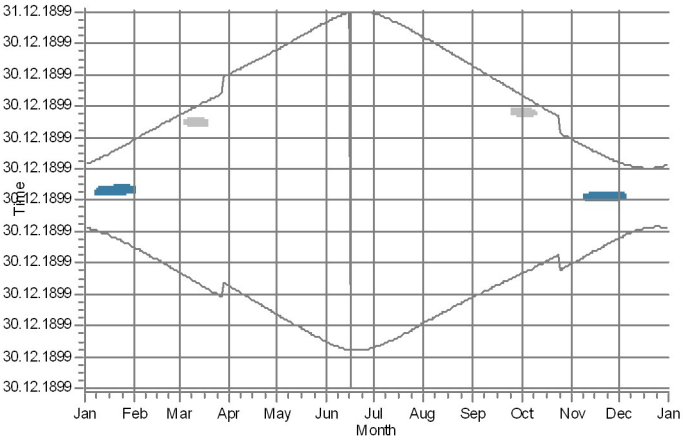
G: Asuinrakennus G (Heiniaho)



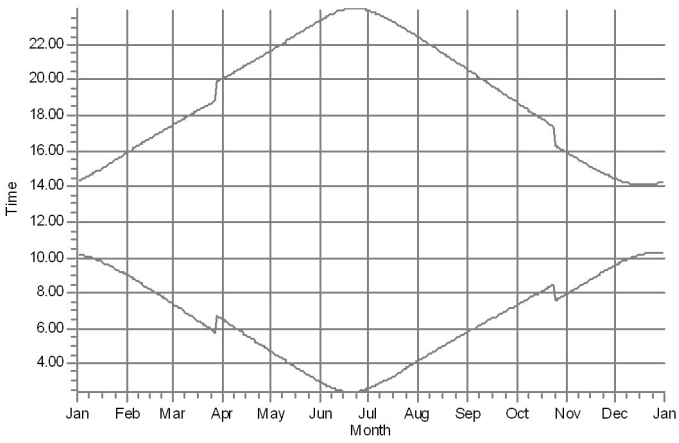

H: Asuinrakennus H (Mäkelä)



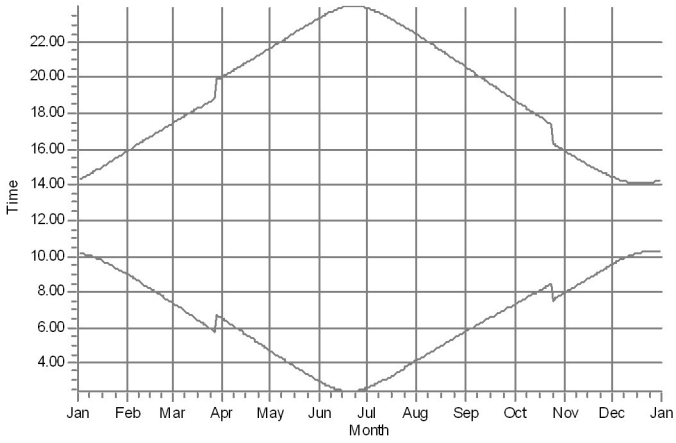

I: Lomarakennus I



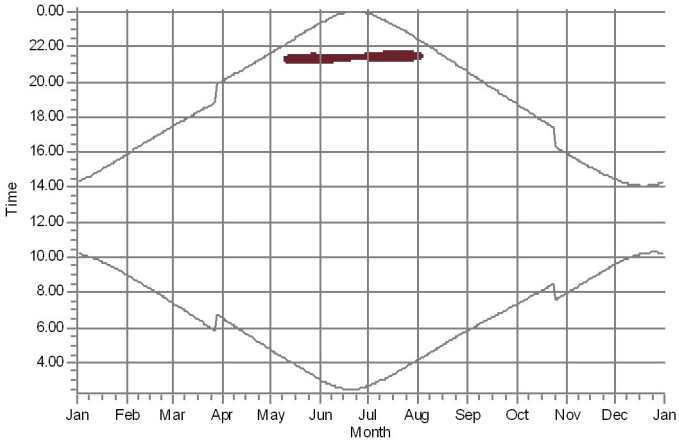

J: Lomarakennus J (Hautakaarto)




K: Asuinrakennus K (Takalo)




L: Lomarakennus L (Haukijärvi)




WTGs

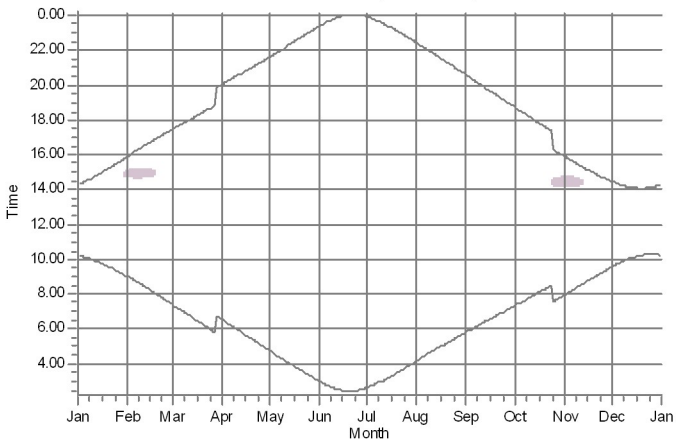
T1: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678)
T2: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677)
T3: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681)
T38: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (646)
T7: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682)

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Calculated:
9.5.2023 10.51/3.5.584

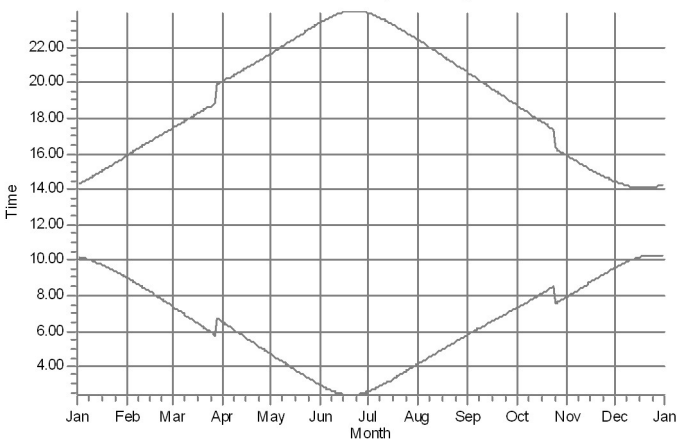
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058

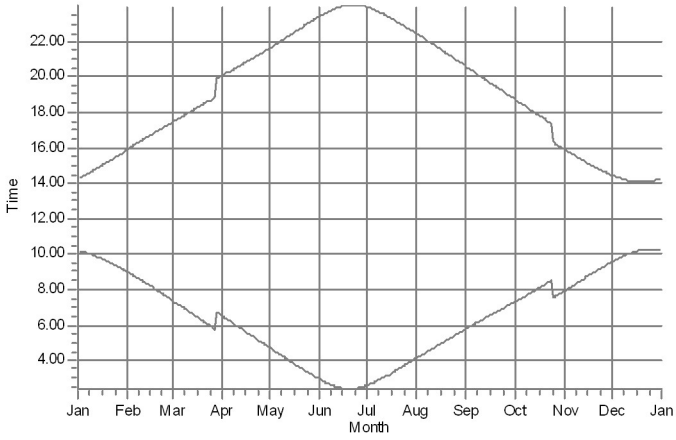
M: Lomarakennus M (Haukilahti)




N: Lomarakennus N (Kuusela)




O: Lomarakennus O (Kuusela)



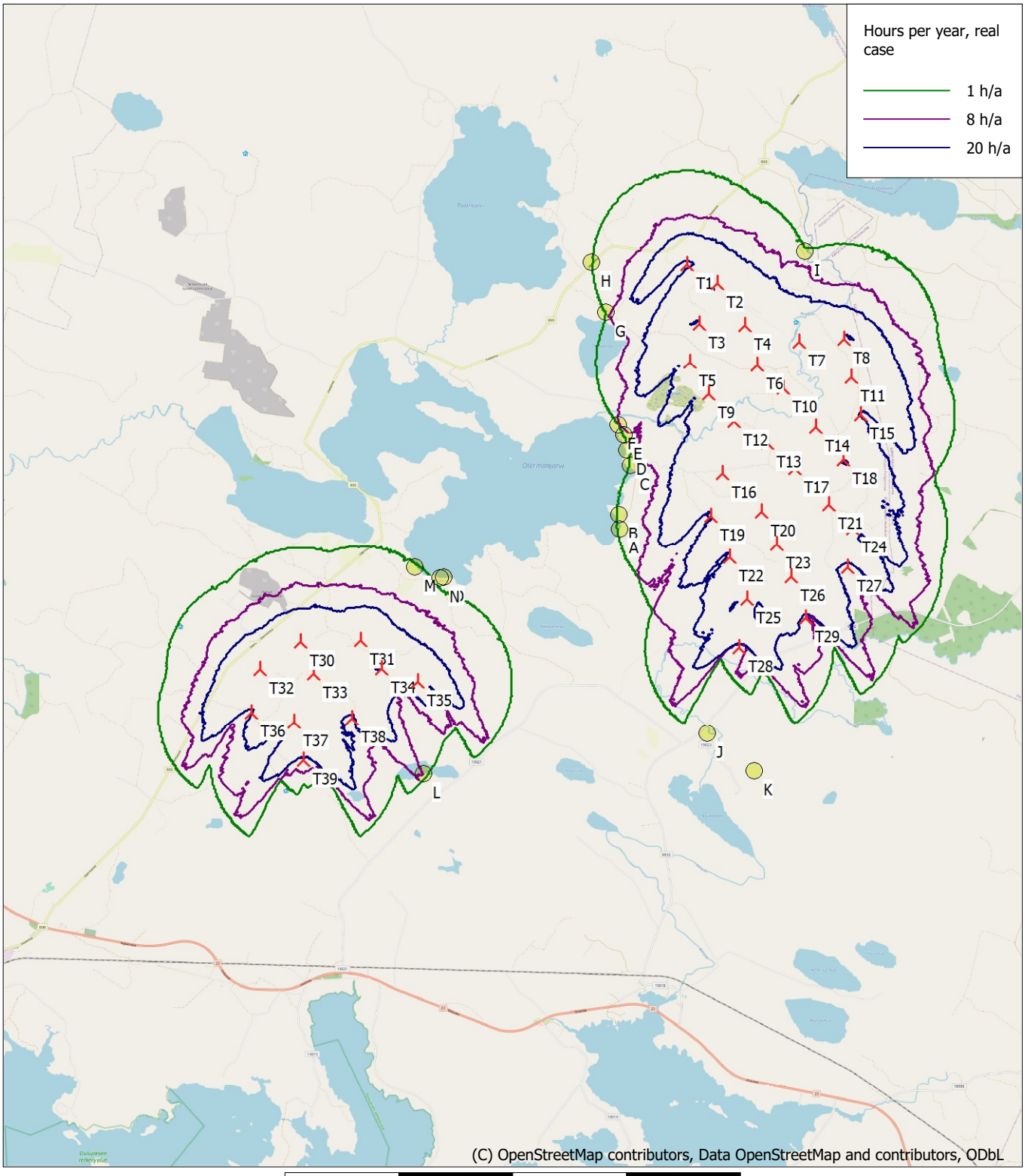

WTGs

T31: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (652)

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Calculated:
9.5.2023 10.51/3.5.584

# SHADOW - Map

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058




0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 504 420 North: 7 167 810

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (2)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

## Liite 6. Varjostusmallinnuksen tulokset ”Real Case, No Forest” - Hankevaihtoehto 2

Project:
**Haarasuonkangas**

Licensed user:
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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

## Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

| | |
|---|---|
| Minimum sun height over horizon for influence | 3 ° |
| Day step for calculation | 1 days |
| Time step for calculation | 1 minutes |

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA_N64,50_E027,335 (12)

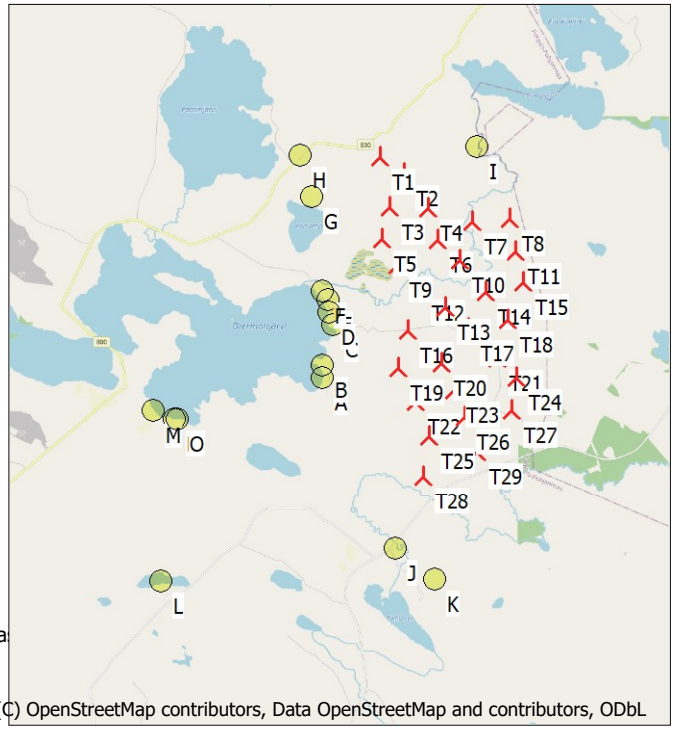
Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankanga
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:200 000

New WTG  Shadow receptor

## WTGs

| | East | North | Z [m] | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Shadow data Calculation distance [m] | RPM [RPM] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 508 282 | 7 174 861 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T10 | 510 426 | 7 172 148 | 146,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T11 | 511 902 | 7 172 395 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T12 | 509 346 | 7 171 412 | 143,2 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T13 | 510 056 | 7 170 927 | 146,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T14 | 511 130 | 7 171 298 | 148,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T15 | 512 122 | 7 171 560 | 159,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T16 | 509 073 | 7 170 275 | 147,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T17 | 510 668 | 7 170 368 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T18 | 511 731 | 7 170 576 | 165,0 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T19 | 508 820 | 7 169 317 | 148,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T2 | 508 948 | 7 174 439 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T20 | 509 941 | 7 169 425 | 149,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T21 | 511 434 | 7 169 585 | 157,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T22 | 509 256 | 7 168 427 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T23 | 510 283 | 7 168 708 | 149,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T24 | 511 959 | 7 169 067 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T25 | 509 625 | 7 167 494 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T26 | 510 589 | 7 167 991 | 147,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T27 | 511 839 | 7 168 207 | 148,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T28 | 509 456 | 7 166 427 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T29 | 510 920 | 7 167 074 | 142,1 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T3 | 508 557 | 7 173 555 | 151,9 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T4 | 509 564 | 7 173 532 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T5 | 508 354 | 7 172 700 | 144,8 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T6 | 509 849 | 7 172 666 | 152,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T7 | 510 753 | 7 173 171 | 147,6 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T8 | 511 738 | 7 173 247 | 154,9 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T9 | 508 756 | 7 172 027 | 142,5 | Generic RD200 7200 200.0 !O! h... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

## Shadow receptor-Input

| No. | Name | East | North | Z [m] | Width [m] | Height [m] | Elevation a.g.l. [m] | Slope of window [°] | Direction mode | Eye height (ZVI) a.g.l. [m] |
|---|---|---|---|---|---|---|---|---|---|---|
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |

## Calculation Results

Shadow receptor

| | | **Shadow, expected values** |
|---|---|---|
| No. | Name | Shadow hours per year [h/year] |
| A | Lomarakennus A (Syvälahti) | 2:19 |
| B | Asuinrakennus B (Syväänlahti) | 1:59 |
| C | Lomarakennus C (Mutalahti) | 1:52 |
| D | Lomarakennus D (Mutaniemi) | 0:00 |
| E | Asuinrakennus E (Alanko) | 3:13 |
| F | Asuinrakennus F (Joensuu) | 0:00 |
| G | Asuinrakennus G (Heiniaho) | 5:39 |
| H | Asuinrakennus H (Mäkelä) | 0:00 |
| I | Lomarakennus I | 3:16 |
| J | Lomarakennus J (Hautakaarto) | 0:00 |
| K | Asuinrakennus K (Takalo) | 0:00 |
| L | Lomarakennus L (Haukijärvi) | 0:00 |
| M | Lomarakennus M (Haukilahti) | 0:00 |
| N | Lomarakennus N (Kuusela) | 0:00 |
| O | Lomarakennus O (Kuusela) | 0:00 |

Total amount of flickering on the shadow receptors caused by each WTG

| No. | Name | Expected [h/year] |
|---|---|---|
| T1 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (709) | 3:54 |
| T10 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (702) | 0:00 |
| T11 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (704) | 0:00 |
| T12 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (699) | 0:00 |
| T13 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (697) | 0:00 |
| T14 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (698) | 0:00 |
| T15 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (700) | 0:00 |
| T16 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (694) | 1:52 |
| T17 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (695) | 0:00 |
| T18 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (696) | 0:00 |
| T19 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (691) | 4:18 |
| T2 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (708) | 1:37 |
| T20 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (693) | 0:00 |
| T21 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (692) | 0:00 |
| T22 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (688) | 0:00 |
| T23 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (689) | 0:00 |
| T24 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (690) | 0:00 |
| T25 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (685) | 0:00 |
| T26 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (686) | 0:00 |
| T27 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (687) | 0:00 |
| T28 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (683) | 0:00 |

To be continued on next page...

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# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

...continued from previous page

| No. | Name | Expected [h/year] |
|---|---|---|
| T29 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (684) | 0:00 |
| T3 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (710) | 1:44 |
| T4 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (707) | 0:00 |
| T5 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (705) | 0:00 |
| T6 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (703) | 0:00 |
| T7 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (711) | 1:35 |
| T8 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (706) | 0:00 |
| T9 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (701) | 3:13 |

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** A - Lomarakennus A (Syvälahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | May | June | July | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | 04.44 | 03.00 | 02.37 | 04.10 | | 05.49 | 06.42 (T19) | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | | 21.37 | 23.21 | 23.55 | 22.24 | | 20.33 23 | 07.05 (T19) | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | 04.40 | 02.55 | 02.39 | 04.13 | | 05.52 | 06.42 (T19) | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | | 21.40 | 23.25 | 23.53 | 22.21 | | 20.29 23 | 07.05 (T19) | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | 04.37 | 02.52 | 02.42 | 04.17 | | 05.55 | 06.42 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | | 21.43 | 23.28 | 23.51 | 22.17 | | 20.26 22 | 07.04 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 06.54 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | | 05.58 | 06.41 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 6 | 07.00 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | | 20.22 22 | 07.03 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 06.51 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | | 06.01 | 06.42 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 12 | 07.03 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | | 20.18 20 | 07.02 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 | 06.47 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | | 06.04 | 06.43 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 17 | 07.04 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | | 20.15 17 | 07.00 (T19) | 18.26 | 15.38 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 06.46 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | | 06.07 | 06.46 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 19 | 07.05 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | | 20.11 12 | 06.58 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 06.44 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | | 06.10 | 06.49 (T19) | 07.39 | 08.18 | 09.53 |
| | 14.34 | 16.17 | 17.48 | 20.23 22 | 07.06 (T19) | 22.00 | 23.42 | 23.39 | 21.59 | | 20.08 7 | 06.56 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 06.44 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | | 06.13 | | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 22 | 07.06 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | | 20.04 | | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 06.43 (T19) | 04.12 | 02.36 | 03.01 | 04.40 | | 06.16 | | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 23 | 07.06 (T19) | 22.07 | 23.47 | 23.34 | 21.52 | | 20.00 | | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 06.43 (T19) | 04.09 | 02.34 | 03.01 | 04.43 | | 06.19 | | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 23 | 07.06 (T19) | 22.11 | 23.49 | 23.31 | 21.49 | | 19.57 | | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 06.42 (T19) | 04.05 | 02.32 | 03.04 | 04.47 | | 06.22 | | 07.51 | 08.32 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 24 | 07.06 (T19) | 22.14 | 23.51 | 23.29 | 21.45 | | 19.53 | | 18.05 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.42 | 05.49 | 06.42 (T19) | 04.02 | 02.30 | 03.07 | 04.50 | | 06.25 | | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 24 | 07.06 (T19) | 22.17 | 23.53 | 23.26 | 21.42 | | 19.49 | | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 06.42 (T19) | 03.58 | 02.29 | 03.10 | 04.53 | | 06.28 | | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 22 | 07.04 (T19) | 22.21 | 23.55 | 23.23 | 21.38 | | 19.46 | | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 06.43 (T19) | 03.55 | 02.28 | 03.13 | 04.56 | | 06.31 | | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 21 | 07.04 (T19) | 22.24 | 23.57 | 23.20 | 21.35 | | 19.42 | | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 06.43 (T19) | 03.51 | 02.27 | 03.16 | 04.59 | | 06.34 | | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 19 | 07.02 (T19) | 22.28 | 23.58 | 23.17 | 21.31 | | 19.38 | | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 06.44 (T19) | 03.48 | 02.26 | 03.20 | 05.03 | | 06.37 | | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 17 | 07.01 (T19) | 22.31 | 23.59 | 23.14 | 21.27 | | 19.35 | | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 06.46 (T19) | 03.45 | 02.25 | 03.23 | 05.06 | | 06.40 | | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 13 | 06.59 (T19) | 22.35 | 00.00 | 23.11 | 21.24 | | 19.31 | | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 06.48 (T19) | 03.41 | 02.25 | 03.26 | 05.09 | | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 8 | 06.56 (T19) | 22.38 | 00.01 | 23.07 | 21.20 | | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | | 03.31 | 02.25 | 03.36 | 05.19 | | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.04 | 18.31 | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | | 19.17 | | 17.29 | 14.49 | 14.05 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | | 22.52 | 00.02 | 22.54 | 21.06 | | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.51 (T19) | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 9 | 07.00 (T19) | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 06.48 (T19) | 07.01 | | 07.32 | 09.15 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 14 | 07.02 (T19) | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 06.47 (T19) | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 17 | 07.04 (T19) | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 04.58 | | 03.15 | 02.30 | 03.53 | 05.34 | 06.46 (T19) | 07.06 | | 07.39 | 09.22 | 10.16 |
| | 15.35 | 17.20 | 18.46 | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 19 | 07.05 (T19) | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 06.45 (T19) | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 21 | 07.06 (T19) | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 06.43 (T19) | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 22 | 07.05 (T19) | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | | 03.06 | 02.35 | 04.03 | 05.43 | 06.42 (T19) | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.33 | | 23.15 | 23.56 | 22.31 | 20.40 23 | 07.05 (T19) | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.02 | | 06.36 | | | 03.03 | | 04.07 | 05.46 | 06.42 (T19) | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | | 23.18 | | 22.27 | 20.37 23 | 07.05 (T19) | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | | 576 | 638 | 618 | 512 | | 394 | | 303 | 193 | 127 |
| Total, worst case | | | | 292 | | | | | 148 | | 146 | | | | |
| Sun reduction | | | | 0,43 | | | | | 0,42 | | 0,32 | | | | |
| Oper. time red. | | | | 0,97 | | | | | 0,97 | | 0,97 | | | | |
| Wind dir. red. | | | | 0,62 | | | | | 0,62 | | 0,62 | | | | |
| Total reduction | | | | 0,25 | | | | | 0,25 | | 0,19 | | | | |
| Total, real | | | | 74 | | | | | 37 | | 28 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

Project:
**Haarasuonkangas**

Licensed user:
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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** B - Asuinrakennus B (Syväänlahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | | April | | May | June | July | August | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | | 06.33 | 07.17 (T19) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | | 20.01 | 23 07.40 (T19) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | | 06.29 | 07.17 (T19) | 04.40 | 02.55 | 02.39 | 04.13 | 05.52 | | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | | 20.05 | 24 07.41 (T19) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | | 06.25 | 07.17 (T19) | 04.37 | 02.52 | 02.42 | 04.17 | 05.55 | 07.23 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | | 20.08 | 23 07.40 (T19) | 21.43 | 23.28 | 23.51 | 22.17 | 20.26 | 3 07.26 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | | 06.22 | 07.17 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.17 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | | 20.11 | 22 07.39 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 12 07.29 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | | 06.18 | 07.17 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | 06.01 | 07.15 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | | 20.14 | 21 07.38 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 16 07.31 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | | 06.14 | 07.18 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.14 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | | 20.17 | 18 07.36 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18 07.32 (T19) | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | | 06.11 | 07.19 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.13 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | | 20.20 | 16 07.35 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 20 07.33 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | | 06.07 | 07.20 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | 06.10 | 07.12 (T19) | 07.39 | 08.18 | 09.54 |
| | 14.34 | 16.17 | 17.48 | | 20.23 | 12 07.32 (T19) | 22.00 | 23.42 | 23.39 | 22.00 | 20.08 | 22 07.34 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | | 06.03 | 07.24 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | 06.13 | 07.11 (T19) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | | 20.26 | 4 07.28 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 23 07.34 (T19) | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | | 06.00 | | 04.12 | 02.36 | 03.01 | 04.40 | 06.16 | 07.10 (T19) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 23 07.33 (T19) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | | 05.56 | | 04.09 | 02.34 | 03.01 | 04.43 | 06.19 | 07.09 (T19) | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | | 20.32 | | 22.11 | 23.49 | 23.31 | 21.49 | 19.57 | 24 07.33 (T19) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | | 05.53 | | 04.05 | 02.32 | 03.04 | 04.47 | 06.22 | 07.09 (T19) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | | 20.36 | | 22.14 | 23.51 | 23.29 | 21.45 | 19.53 | 23 07.32 (T19) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.10 (T19) | 07.55 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | | 20.39 | | 22.18 | 23.53 | 23.26 | 21.42 | 19.49 | 22 07.32 (T19) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.10 (T19) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 21 07.31 (T19) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | | 05.42 | | 03.55 | 02.28 | 03.13 | 04.56 | 06.31 | 07.11 (T19) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 19 07.30 (T19) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | | 05.38 | | 03.51 | 02.27 | 03.16 | 04.59 | 06.34 | 07.12 (T19) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | | 20.48 | | 22.28 | 23.58 | 23.17 | 21.31 | 19.38 | 16 07.28 (T19) | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | | 05.34 | | 03.48 | 02.26 | 03.20 | 05.03 | 06.37 | 07.14 (T19) | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 11 07.25 (T19) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | | 05.31 | | 03.45 | 02.25 | 03.23 | 05.06 | 06.40 | 07.17 (T19) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 4 07.21 (T19) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | | 20.58 | | 22.38 | 00.01 | 23.07 | 21.20 | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | 19.17 | | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | | 21.10 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 06.27 (T19) | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 10 06.37 (T19) | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 06.23 (T19) | 04.58 | | 03.15 | 02.30 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 15 06.38 (T19) | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.21 (T19) | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 19 06.40 (T19) | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.20 (T19) | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 20 07.40 (T19) | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 07.18 (T19) | 04.48 | | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 22 07.40 (T19) | 21.33 | | 23.15 | 23.56 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.18 (T19) | | | 03.03 | | 04.07 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 23 07.41 (T19) | | | 23.18 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | | 453 | | 576 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | 109 | | 163 | | | | | | 277 | | | | |
| Sun reduction | | | 0,36 | | 0,43 | | | | | | 0,32 | | | | |
| Oper. time red. | | | 0,97 | | 0,97 | | | | | | 0,97 | | | | |
| Wind dir. red. | | | 0,62 | | 0,62 | | | | | | 0,62 | | | | |
| Total reduction | | | 0,22 | | 0,26 | | | | | | 0,19 | | | | |
| Total, real | | | 24 | | 42 | | | | | | 54 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

Project:
**Haarasuonkangas**

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** C - Lomarakennus C (Mutalahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.32 (T16) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.01 | 20 07.52 (T16) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.33 (T16) | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 18 07.51 (T16) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.34 (T16) | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 15 07.49 (T16) | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 07.35 (T16) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 11 07.46 (T16) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | 04.30 | 02.47 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 07.31 (T16) | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | 22.00 | 23.42 | 23.40 | 22.00 | 20.08 10 07.41 (T16) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | | 04.16 | 02.37 | 02.58 | 04.37 | 06.13 07.28 (T16) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 15 07.43 (T16) | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 07.25 (T16) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 18 07.43 (T16) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 07.24 (T16) | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 20 07.44 (T16) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.46 | 06.22 07.23 (T16) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 22 07.45 (T16) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 07.23 (T16) | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 22 07.45 (T16) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 07.22 (T16) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 23 07.45 (T16) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 07.22 (T16) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 23 07.45 (T16) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 07.22 (T16) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 22 07.44 (T16) | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 07.21 (T16) | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 22 07.43 (T16) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 07.21 (T16) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 21 07.42 (T16) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 07.22 (T16) | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 19 07.41 (T16) | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 07.23 (T16) | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 16 07.39 (T16) | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 07.26 (T16) | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 11 07.37 (T16) | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 06.41 (T16) | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 07.29 (T16) | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 10 06.51 (T16) | 21.07 | | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 5 07.34 (T16) | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 06.38 (T16) | 05.13 | | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 15 06.53 (T16) | 21.11 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 06.35 (T16) | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 19 06.54 (T16) | 21.14 | | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 06.33 (T16) | 05.05 | | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 21 06.54 (T16) | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 06.33 (T16) | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 22 06.55 (T16) | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 06.32 (T16) | 04.58 | | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 23 06.55 (T16) | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 06.31 (T16) | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 23 06.54 (T16) | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 07.31 (T16) | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 24 07.55 (T16) | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 07.31 (T16) | 04.47 | | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 23 07.54 (T16) | 21.34 | | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 07.32 (T16) | | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 21 07.53 (T16) | | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 638 | 618 | 512 | 394 | 303 | 193 | 127 |
| Total, worst case | | | 201 | 64 | | | | | 269 | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | 0,32 | | | |
| Oper. time red. | | | 0,97 | 0,97 | | | | | 0,97 | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | 0,62 | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | 0,19 | | | |
| Total, real | | | 43 | 17 | | | | | 52 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** D - Lomarakennus D (Mutaniemi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 04.16 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.34 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.32 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** E - Asuinrakennus E (Alanko)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | | May | | | June | July | | | August | | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | | 04.44 | | 05.28 (T9) | 03.00 | 02.37 | | | 04.10 | | 05.41 (T9) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | | | 21.37 | 22 | 05.50 (T9) | 23.22 | 23.55 | | | 22.24 | 16 | 05.57 (T9) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | | 04.40 | | 05.28 (T9) | 02.54 | 02.39 | | | 04.13 | | 05.39 (T9) | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | | | 21.40 | 23 | 05.51 (T9) | 23.25 | 23.53 | | | 22.21 | 19 | 05.58 (T9) | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | | 04.37 | | 05.27 (T9) | 02.52 | 02.41 | | | 04.17 | | 05.38 (T9) | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | | | 21.44 | 24 | 05.51 (T9) | 23.28 | 23.51 | | | 22.17 | 21 | 05.59 (T9) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | | | 04.33 | | 05.27 (T9) | 02.49 | 02.44 | | | 04.20 | | 05.38 (T9) | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | | | 21.47 | 24 | 05.51 (T9) | 23.31 | 23.49 | | | 22.14 | 21 | 05.59 (T9) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | | 04.30 | | 05.27 (T9) | 02.46 | 02.46 | | | 04.23 | | 05.38 (T9) | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | | 21.50 | 24 | 05.51 (T9) | 23.34 | 23.47 | | | 22.10 | 22 | 06.00 (T9) | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | | 04.26 | | 05.27 (T9) | 02.44 | 02.49 | | | 04.27 | | 05.36 (T9) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | | 21.54 | 24 | 05.51 (T9) | 23.37 | 23.45 | | | 22.07 | 24 | 06.00 (T9) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | | 04.23 | | 05.28 (T9) | 02.42 | 02.52 | | | 04.30 | | 05.36 (T9) | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | | 21.57 | 22 | 05.50 (T9) | 23.40 | 23.42 | | | 22.03 | 24 | 06.00 (T9) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | | | 04.19 | | 05.28 (T9) | 02.39 | 02.54 | | | 04.33 | | 05.36 (T9) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | | 22.01 | 22 | 05.50 (T9) | 23.42 | 23.40 | | | 22.00 | 24 | 06.00 (T9) | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | | | 04.15 | | 05.28 (T9) | 02.37 | 02.57 | | | 04.37 | | 05.36 (T9) | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | | 22.04 | 21 | 05.49 (T9) | 23.45 | 23.37 | | | 21.56 | 24 | 06.00 (T9) | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | | 04.12 | | 05.29 (T9) | 02.35 | 03.00 | | | 04.40 | | 05.36 (T9) | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | | 22.07 | 19 | 05.48 (T9) | 23.47 | 23.35 | | | 21.53 | 24 | 06.00 (T9) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | | 04.08 | | 05.29 (T9) | 02.33 | 03.00 | | | 04.43 | | 05.36 (T9) | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | | 22.11 | 18 | 05.47 (T9) | 23.50 | 23.32 | | | 21.49 | 23 | 05.59 (T9) | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | | 04.05 | | 05.30 (T9) | 02.31 | 03.03 | | | 04.46 | | 05.36 (T9) | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | | 22.14 | 16 | 05.46 (T9) | 23.52 | 23.29 | | | 21.45 | 22 | 05.58 (T9) | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | | 04.02 | | 05.31 (T9) | 02.30 | 03.07 | | | 04.50 | | 05.37 (T9) | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | | 22.18 | 13 | 05.44 (T9) | 23.54 | 23.26 | | | 21.42 | 21 | 05.58 (T9) | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | | 03.58 | | 05.33 (T9) | 02.29 | 03.10 | | | 04.53 | | 05.38 (T9) | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | | 22.21 | 9 | 05.42 (T9) | 23.56 | 23.23 | | | 21.38 | 19 | 05.57 (T9) | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | | 03.55 | | | 02.27 | 03.13 | | | 04.56 | | 05.41 (T9) | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | | 22.25 | | | 23.57 | 23.20 | | | 21.35 | 15 | 05.56 (T9) | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | | | 03.51 | | | 02.26 | 03.16 | | | 04.59 | | 05.44 (T9) | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | | 22.28 | | | 23.59 | 23.17 | | | 21.31 | 11 | 05.55 (T9) | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | | 03.48 | | | 02.25 | 03.19 | | | 05.03 | | 05.46 (T9) | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | | 22.31 | | | 00.00 | 23.14 | | | 21.27 | 6 | 05.52 (T9) | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | | 03.44 | | | 02.25 | 03.23 | | | 05.06 | | | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | | | 22.35 | | | 00.01 | 23.11 | | | 21.24 | | | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | | | 03.41 | | | 02.24 | 03.26 | | | 05.09 | | | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | | 22.38 | | | 00.02 | 23.08 | | | 21.20 | | | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | | 03.38 | | | 02.24 | 03.29 | | | 05.12 | | | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | | 22.42 | | | 00.03 | 23.05 | | | 21.17 | | | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | | 03.34 | | | 02.24 | 03.33 | | | 05.15 | | | 06.49 | 08.19 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | | 22.45 | | | 00.03 | 23.01 | | | 21.13 | | | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | | | 03.31 | | | 02.25 | 03.36 | | | 05.18 | | | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | | 22.49 | | | 00.03 | 22.58 | | | 21.09 | | | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | | 03.28 | | | 02.25 | 03.39 | | | 05.22 | | | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | | | 22.52 | | | 00.03 | 22.55 | | | 21.06 | | | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | | 03.25 | | | 02.26 | 03.43 | | | 05.25 | | | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | | 22.55 | | | 00.03 | 22.51 | | | 21.02 | | | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | | 03.21 | | | 02.27 | 03.46 | | | 05.28 | | | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | | 22.59 | | | 00.02 | 22.48 | | | 20.59 | | | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 05.39 (T9) | 03.18 | | | 02.28 | 03.49 | | | 05.31 | | | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 7 | 05.46 (T9) | 23.02 | | | 00.02 | 22.45 | | | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | | 05.36 (T9) | 03.15 | | | 02.29 | 03.53 | | | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 12 | 05.48 (T9) | 23.06 | | | 00.01 | 22.41 | | | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 05.33 (T9) | 03.12 | | | 02.31 | 03.56 | | | 05.37 | | | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 16 | 05.49 (T9) | 23.09 | | | 00.00 | 22.38 | | | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 05.29 (T9) | 03.09 | | | 02.33 | 04.00 | | 05.45 (T9) | 05.40 | | | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 20 | 05.49 (T9) | 23.12 | | | 23.58 | 22.35 | 6 | 05.51 (T9) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | | 05.28 (T9) | 03.06 | | | 02.34 | 04.03 | | 05.43 (T9) | 05.43 | | | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 22 | 05.50 (T9) | 23.15 | | | 23.57 | 22.31 | 11 | 05.54 (T9) | 20.40 | | | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | | | 03.03 | | | | 04.06 | | 05.42 (T9) | 05.46 | | | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | | | 23.19 | | | | 22.28 | 14 | 05.56 (T9) | 20.37 | | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | | | 577 | | | 639 | 618 | | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | 77 | | | 281 | | | | 31 | | | 336 | | | | | |
| Sun reduction | | | | | 0,43 | | | 0,47 | | | | 0,48 | | | 0,42 | | | | | |
| Oper. time red. | | | | | 0,97 | | | 0,97 | | | | 0,97 | | | 0,97 | | | | | |
| Wind dir. red. | | | | | 0,62 | | | 0,62 | | | | 0,62 | | | 0,62 | | | | | |
| Total reduction | | | | | 0,26 | | | 0,29 | | | | 0,29 | | | 0,25 | | | | | |
| Total, real | | | | | 20 | | | 80 | | | | 9 | | | 84 | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** F - Asuinrakennus F (Joensuu)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.24 | 06.33 | 04.44 | 03.00 | 02.36 | 04.10 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.09 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.40 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.19 | 02.39 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | 04.15 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.08 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.50 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.56 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.25 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.32 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.03 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.03 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.24 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.49 | 05.31 | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.02 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.17 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 00.00 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | | April | | | May | | | June | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 09.00 | | 07.25 | | | 06.33 | | 07.49 (T3) | 04.44 | | 05.23 (T1) | 03.00 | |
| | 14.17 | | 15.52 | | 17.26 | | | 20.02 | 6 | 07.55 (T3) | 21.37 | 8 | 05.31 (T1) | 23.22 | |
| 2 | 10.13 | | 08.57 | | 07.21 | | | 06.29 | | | 04.40 | | 05.20 (T1) | 02.54 | |
| | 14.19 | | 15.56 | | 17.29 | | | 20.05 | | | 21.40 | 13 | 05.33 (T1) | 23.25 | |
| 3 | 10.12 | | 08.53 | | 07.17 | | | 06.25 | | | 04.37 | | 05.18 (T1) | 02.51 | |
| | 14.21 | | 15.59 | | 17.32 | | | 20.08 | | | 21.44 | 16 | 05.34 (T1) | 23.29 | |
| 4 | 10.10 | | 08.50 | | 07.14 | | | 06.22 | | | 04.33 | | 05.17 (T1) | 02.48 | |
| | 14.23 | | 16.03 | | 17.35 | | | 20.11 | | | 21.47 | 18 | 05.35 (T1) | 23.32 | |
| 5 | 10.09 | | 08.47 | | 07.10 | | | 06.18 | | | 04.29 | | 05.15 (T1) | 02.46 | |
| | 14.26 | | 16.06 | | 17.39 | | | 20.14 | | | 21.51 | 20 | 05.35 (T1) | 23.35 | |
| 6 | 10.07 | | 08.44 | | 07.07 | | | 06.14 | | | 04.26 | | 05.14 (T1) | 02.43 | |
| | 14.28 | | 16.10 | | 17.42 | | | 20.17 | | | 21.54 | 22 | 05.36 (T1) | 23.37 | |
| 7 | 10.05 | | 08.40 | | 07.03 | | | 06.11 | | | 04.22 | | 05.14 (T1) | 02.41 | |
| | 14.31 | | 16.13 | | 17.45 | | | 20.20 | | | 21.57 | 22 | 05.36 (T1) | 23.40 | |
| 8 | 10.04 | | 08.37 | | 07.00 | | | 06.07 | | | 04.19 | | 05.13 (T1) | 02.39 | |
| | 14.34 | | 16.16 | | 17.48 | | | 20.23 | | | 22.01 | 23 | 05.36 (T1) | 23.43 | |
| 9 | 10.02 | | 08.34 | | 06.56 | | | 06.03 | | | 04.15 | | 05.14 (T1) | 02.37 | |
| | 14.37 | | 16.20 | | 17.51 | | | 20.26 | | | 22.04 | 24 | 05.38 (T1) | 23.45 | |
| 10 | 10.00 | | 08.30 | | 06.52 | | | 06.00 | | | 04.12 | | 05.14 (T1) | 02.34 | |
| | 14.39 | | 16.23 | | 17.54 | | | 20.29 | | | 22.08 | 24 | 05.38 (T1) | 23.48 | |
| 11 | 09.58 | | 08.27 | | 06.49 | | | 05.56 | | | 04.08 | | 05.13 (T1) | 02.33 | |
| | 14.42 | | 16.27 | | 17.57 | | | 20.33 | | | 22.11 | 24 | 05.37 (T1) | 23.50 | |
| 12 | 09.55 | | 08.24 | | 06.45 | | | 05.52 | | | 04.05 | | 05.13 (T1) | 02.31 | |
| | 14.45 | | 16.30 | | 18.00 | | | 20.36 | | | 22.15 | 24 | 05.37 (T1) | 23.52 | |
| 13 | 09.53 | | 08.20 | | 06.42 | | | 05.49 | | | 04.01 | | 05.13 (T1) | 02.29 | |
| | 14.48 | | 16.33 | | 18.04 | | | 20.39 | | | 22.18 | 24 | 05.37 (T1) | 23.54 | |
| 14 | 09.51 | | 08.17 | | 06.38 | | | 05.45 | | | 03.58 | | 05.13 (T1) | 02.28 | |
| | 14.52 | | 16.37 | | 18.07 | | | 20.42 | | | 22.21 | 23 | 05.36 (T1) | 23.56 | |
| 15 | 09.48 | | 08.13 | | 06.34 | | | 05.42 | | | 03.54 | | 05.15 (T1) | 02.27 | |
| | 14.55 | | 16.40 | | 18.10 | | | 20.45 | | | 22.25 | 22 | 05.37 (T1) | 23.58 | |
| 16 | 09.46 | | 08.10 | | 06.31 | | | 05.38 | | | 03.51 | | 05.15 (T1) | 02.26 | |
| | 14.58 | | 16.44 | | 18.13 | | | 20.48 | | | 22.28 | 21 | 05.36 (T1) | 23.59 | |
| 17 | 09.43 | | 08.07 | | 06.27 | | | 05.34 | | | 03.48 | | 05.15 (T1) | 02.25 | |
| | 15.01 | | 16.47 | | 18.16 | | | 20.51 | | | 22.32 | 20 | 05.35 (T1) | 00.01 | |
| 18 | 09.41 | | 08.03 | | 06.24 | | 06.56 (T3) | 05.31 | | | 03.44 | | 05.16 (T1) | 02.24 | |
| | 15.04 | | 16.50 | | 18.19 | 3 | 06.59 (T3) | 20.55 | | | 22.35 | 19 | 05.35 (T1) | 00.02 | |
| 19 | 09.38 | | 08.00 | | 06.20 | | 06.52 (T3) | 05.27 | | | 03.41 | | 05.17 (T1) | 02.24 | |
| | 15.08 | | 16.54 | | 18.22 | 10 | 07.02 (T3) | 20.58 | | | 22.39 | 16 | 05.33 (T1) | 00.03 | |
| 20 | 09.35 | | 07.56 | | 06.16 | | 06.49 (T3) | 05.23 | | | 03.37 | | 05.18 (T1) | 02.23 | |
| | 15.11 | | 16.57 | | 18.25 | 15 | 07.04 (T3) | 21.01 | | | 22.42 | 15 | 05.33 (T1) | 00.03 | |
| 21 | 09.33 | | 07.53 | | 06.13 | | 06.46 (T3) | 05.20 | | | 03.34 | | 05.19 (T1) | 02.24 | |
| | 15.14 | | 17.00 | | 18.28 | 19 | 07.05 (T3) | 21.04 | | | 22.46 | 12 | 05.31 (T1) | 00.04 | |
| 22 | 09.30 | | 07.49 | | 06.09 | | 06.44 (T3) | 05.16 | | | 03.31 | | 05.21 (T1) | 02.24 | |
| | 15.18 | | 17.03 | | 18.31 | 21 | 07.05 (T3) | 21.08 | | | 22.49 | 8 | 05.29 (T1) | 00.04 | |
| 23 | 09.27 | | 07.46 | | 06.05 | | 06.44 (T3) | 05.12 | | | 03.27 | | | 02.24 | |
| | 15.21 | | 17.07 | | 18.34 | 22 | 07.06 (T3) | 21.11 | | | 22.52 | | | 00.04 | |
| 24 | 09.24 | | 07.42 | | 06.02 | | 06.43 (T3) | 05.09 | | | 03.24 | | | 02.25 | |
| | 15.25 | | 17.10 | | 18.37 | 23 | 07.06 (T3) | 21.14 | | | 22.56 | | | 00.04 | |
| 25 | 09.21 | | 07.39 | | 05.58 | | 06.42 (T3) | 05.05 | | | 03.21 | | | 02.26 | |
| | 15.28 | | 17.13 | | 18.40 | 23 | 07.05 (T3) | 21.17 | | | 22.59 | | | 00.03 | |
| 26 | 09.18 | | 07.35 | | 05.54 | | 06.43 (T3) | 05.02 | | | 03.18 | | | 02.27 | |
| | 15.31 | | 17.16 | | 18.43 | 22 | 07.05 (T3) | 21.21 | | | 23.03 | | | 00.02 | |
| 27 | 09.15 | | 07.32 | | 05.51 | | 06.42 (T3) | 04.58 | | | 03.15 | | | 02.29 | |
| | 15.35 | | 17.20 | | 18.46 | 22 | 07.04 (T3) | 21.24 | | | 23.06 | | | 00.01 | |
| 28 | 09.12 | | 07.28 | | 05.47 | | 06.43 (T3) | 04.54 | | | 03.12 | | | 02.30 | |
| | 15.38 | | 17.23 | | 18.49 | 21 | 07.04 (T3) | 21.27 | | | 23.09 | | | 00.00 | |
| 29 | 09.09 | | | | 06.44 | | 07.44 (T3) | 04.51 | | | 03.08 | | | 02.32 | |
| | 15.42 | | | | 19.52 | 18 | 08.02 (T3) | 21.30 | | | 23.13 | | | 23.59 | |
| 30 | 09.06 | | | | 06.40 | | 07.44 (T3) | 04.47 | | | 03.05 | | | 02.34 | |
| | 15.45 | | | | 19.55 | 16 | 08.00 (T3) | 21.34 | | | 23.16 | | | 23.57 | |
| 31 | 09.03 | | | | 06.36 | | 07.46 (T3) | | | | 03.02 | | | | |
| | 15.49 | | | | 19.59 | 13 | 07.59 (T3) | | | | 23.19 | | | | |
| Potential sun hours | 163 | | 235 | | 363 | | | 454 | | | 577 | | | 639 | |
| Total, worst case | | | | | | 248 | | | 6 | | | 418 | | | |
| Sun reduction | | | | | | 0,36 | | | 0,43 | | | 0,47 | | | |
| Oper. time red. | | | | | | 0,97 | | | 0,97 | | | 0,97 | | | |
| Wind dir. red. | | | | | | 0,62 | | | 0,62 | | | 0,63 | | | |
| Total reduction | | | | | | 0,21 | | | 0,26 | | | 0,29 | | | |
| Total, real | | | | | | 53 | | | 2 | | | 120 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.36 | | 04.10 | | 05.23 (T1) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 23.56 | | 22.25 | 24 | 05.47 (T1) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 02.38 | | 04.13 | | 05.23 (T1) | 05.52 | 07.21 | 07.59 | 09.38 |
| | 23.54 | | 22.21 | 24 | 05.47 (T1) | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 02.40 | | 04.16 | | 05.24 (T1) | 05.55 | 07.24 | 08.02 | 09.41 |
| | 23.52 | | 22.18 | 23 | 05.47 (T1) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 02.43 | | 04.20 | | 05.24 (T1) | 05.58 | 07.27 | 08.05 | 09.44 |
| | 23.50 | | 22.14 | 23 | 05.47 (T1) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 02.46 | | 04.23 | | 05.23 (T1) | 06.01 | 07.30 | 08.09 | 09.46 |
| | 23.48 | | 22.11 | 23 | 05.46 (T1) | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 02.48 | | 04.26 | | 05.24 (T1) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 23.45 | | 22.07 | 22 | 05.46 (T1) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 02.51 | | 04.30 | | 05.24 (T1) | 06.07 | 07.36 | 08.15 | 09.52 |
| | 23.43 | | 22.03 | 22 | 05.46 (T1) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 02.54 | | 04.33 | | 05.25 (T1) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 23.40 | | 22.00 | 20 | 05.45 (T1) | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 02.57 | | 04.36 | | 05.26 (T1) | 06.13 | 07.42 | 08.22 | 09.57 |
| | 23.38 | | 21.56 | 18 | 05.44 (T1) | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 03.00 | | 04.40 | | 05.27 (T1) | 06.16 | 07.45 | 08.26 | 09.59 |
| | 23.35 | | 21.53 | 16 | 05.43 (T1) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 03.00 | | 04.43 | | 05.29 (T1) | 06.19 | 07.42 (T3) | 07.48 | 08.29 | 10.01 |
| | 23.32 | | 21.49 | 12 | 05.41 (T1) | 19.57 | 4 | 07.46 (T3) | 18.08 | 15.22 | 14.08 |
| 12 | 03.03 | | 04.46 | | 05.32 (T1) | 06.22 | 07.38 (T3) | 07.52 | 08.32 | 10.03 |
| | 23.29 | | 21.46 | 6 | 05.38 (T1) | 19.53 | 12 | 07.50 (T3) | 18.04 | 15.19 | 14.07 |
| 13 | 03.06 | | 04.49 | | | 06.25 | 07.36 (T3) | 07.55 | 08.36 | 10.05 |
| | 23.27 | | 21.42 | | | 19.49 | 16 | 07.52 (T3) | 18.01 | 15.16 | 14.06 |
| 14 | 03.09 | | 04.53 | | | 06.28 | 07.34 (T3) | 07.58 | 08.39 | 10.07 |
| | 23.24 | | 21.38 | | | 19.46 | 19 | 07.53 (T3) | 17.57 | 15.13 | 14.05 |
| 15 | 03.12 | | 04.56 | | | 06.31 | 07.33 (T3) | 08.01 | 08.43 | 10.09 |
| | 23.21 | | 21.35 | | | 19.42 | 21 | 07.54 (T3) | 17.54 | 15.09 | 14.04 |
| 16 | 03.16 | | 04.59 | | | 06.34 | 07.32 (T3) | 08.04 | 08.46 | 10.10 |
| | 23.18 | | 21.31 | | | 19.38 | 22 | 07.54 (T3) | 17.50 | 15.06 | 14.04 |
| 17 | 03.19 | | 05.02 | | | 06.37 | 07.31 (T3) | 08.07 | 08.49 | 10.12 |
| | 23.14 | | 21.28 | | | 19.35 | 22 | 07.53 (T3) | 17.47 | 15.03 | 14.03 |
| 18 | 03.22 | | 05.06 | | | 06.40 | 07.30 (T3) | 08.10 | 08.53 | 10.13 |
| | 23.11 | | 21.24 | | | 19.31 | 23 | 07.53 (T3) | 17.43 | 15.00 | 14.03 |
| 19 | 03.26 | | 05.09 | | | 06.43 | 07.30 (T3) | 08.13 | 08.56 | 10.14 |
| | 23.08 | | 21.20 | | | 19.28 | 23 | 07.53 (T3) | 17.40 | 14.58 | 14.03 |
| 20 | 03.29 | | 05.12 | | | 06.46 | 07.30 (T3) | 08.16 | 08.59 | 10.15 |
| | 23.05 | | 21.17 | | | 19.24 | 22 | 07.52 (T3) | 17.36 | 14.55 | 14.03 |
| 21 | 03.32 | 05.32 (T1) | 05.15 | | | 06.49 | 07.30 (T3) | 08.20 | 09.03 | 10.16 |
| | 23.02 | 5 | 05.37 (T1) | 21.13 | | 19.20 | 21 | 07.51 (T3) | 17.33 | 14.52 | 14.03 |
| 22 | 03.36 | 05.30 (T1) | 05.18 | | | 06.52 | 07.31 (T3) | 08.23 | 09.06 | 10.17 |
| | 22.58 | 10 | 05.40 (T1) | 21.10 | | 19.17 | 19 | 07.50 (T3) | 17.29 | 14.49 | 14.04 |
| 23 | 03.39 | 05.28 (T1) | 05.21 | | | 06.55 | 07.32 (T3) | 08.26 | 09.09 | 10.17 |
| | 22.55 | 13 | 05.41 (T1) | 21.06 | | 19.13 | 17 | 07.49 (T3) | 17.26 | 14.46 | 14.04 |
| 24 | 03.42 | 05.28 (T1) | 05.25 | | | 06.58 | 07.35 (T3) | 08.29 | 09.13 | 10.17 |
| | 22.52 | 15 | 05.43 (T1) | 21.02 | | 19.09 | 12 | 07.47 (T3) | 17.22 | 14.43 | 14.05 |
| 25 | 03.46 | 05.27 (T1) | 05.28 | | | 07.01 | 07.38 (T3) | 07.32 | 09.16 | 10.17 |
| | 22.48 | 18 | 05.45 (T1) | 20.59 | | 19.06 | 6 | 07.44 (T3) | 16.19 | 14.41 | 14.06 |
| 26 | 03.49 | 05.26 (T1) | 05.31 | | | 07.04 | | 07.36 | 09.19 | 10.17 |
| | 22.45 | 19 | 05.45 (T1) | 20.55 | | 19.02 | | 16.15 | 14.38 | 14.07 |
| 27 | 03.53 | 05.26 (T1) | 05.34 | | | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 22.42 | 20 | 05.46 (T1) | 20.51 | | 18.58 | | 16.12 | 14.36 | 14.08 |
| 28 | 03.56 | 05.25 (T1) | 05.37 | | | 07.09 | | 07.42 | 09.26 | 10.17 |
| | 22.38 | 22 | 05.47 (T1) | 20.48 | | 18.55 | | 16.08 | 14.33 | 14.09 |
| 29 | 03.59 | 05.24 (T1) | 05.40 | | | 07.12 | | 07.45 | 09.29 | 10.16 |
| | 22.35 | 23 | 05.47 (T1) | 20.44 | | 18.51 | | 16.05 | 14.31 | 14.11 |
| 30 | 04.03 | 05.24 (T1) | 05.43 | | | 07.15 | | 07.49 | 09.32 | 10.16 |
| | 22.31 | 23 | 05.47 (T1) | 20.40 | | 18.48 | | 16.02 | 14.28 | 14.13 |
| 31 | 04.06 | 05.24 (T1) | 05.46 | | | | | 07.52 | | 10.15 |
| | 22.28 | 24 | 05.48 (T1) | 20.37 | | | | 15.58 | | 14.14 |
| Potential sun hours | 619 | | 513 | | | 394 | | 303 | 193 | 127 |
| Total, worst case | | 192 | | 233 | | 259 | | | | |
| Sun reduction | | 0,48 | | 0,42 | | 0,32 | | | | |
| Oper. time red. | | 0,97 | | 0,97 | | 0,97 | | | | |
| Wind dir. red. | | 0,63 | | 0,63 | | 0,62 | | | | |
| Total reduction | | 0,29 | | 0,25 | | 0,19 | | | | |
| Total, real | | 55 | | 59 | | 50 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** H - Asuinrakennus H (Mäkelä)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | 06.33 | 04.44 | 02.56 | 02.36 | 04.09 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.23 | 23.56 | 22.25 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.13 | 08.57 | 07.21 | 06.29 | 04.40 | 02.54 | 02.38 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.41 | 23.26 | 23.54 | 22.21 | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 10.12 | 08.53 | 07.18 | 06.25 | 04.36 | 02.51 | 02.40 | 04.16 | 05.55 | 07.24 | 08.02 | 09.41 |
| | 14.21 | 15.59 | 17.32 | 20.08 | 21.44 | 23.29 | 23.52 | 22.18 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.48 | 02.43 | 04.20 | 05.58 | 07.27 | 08.05 | 09.44 |
| | 14.23 | 16.03 | 17.35 | 20.11 | 21.47 | 23.32 | 23.50 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.09 | 08.47 | 07.10 | 06.18 | 04.29 | 02.46 | 02.45 | 04.23 | 06.01 | 07.30 | 08.09 | 09.47 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.51 | 23.35 | 23.48 | 22.11 | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 10.07 | 08.44 | 07.07 | 06.14 | 04.26 | 02.43 | 02.48 | 04.26 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.28 | 16.10 | 17.42 | 20.17 | 21.54 | 23.38 | 23.46 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.06 | 08.40 | 07.03 | 06.11 | 04.22 | 02.41 | 02.51 | 04.30 | 06.07 | 07.36 | 08.16 | 09.52 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.58 | 23.40 | 23.43 | 22.04 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.04 | 08.37 | 07.00 | 06.07 | 04.19 | 02.38 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.16 | 17.48 | 20.23 | 22.01 | 23.43 | 23.41 | 22.00 | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 10.02 | 08.34 | 06.56 | 06.03 | 04.15 | 02.36 | 02.57 | 04.36 | 06.13 | 07.42 | 08.22 | 09.57 |
| | 14.36 | 16.20 | 17.51 | 20.26 | 22.04 | 23.46 | 23.38 | 21.56 | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 10.00 | 08.30 | 06.52 | 06.00 | 04.12 | 02.34 | 03.00 | 04.40 | 06.16 | 07.45 | 08.26 | 09.59 |
| | 14.39 | 16.23 | 17.54 | 20.29 | 22.08 | 23.48 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.09 |
| 11 | 09.58 | 08.27 | 06.49 | 05.56 | 04.08 | 02.32 | 03.00 | 04.43 | 06.19 | 07.49 | 08.29 | 10.01 |
| | 14.42 | 16.27 | 17.57 | 20.33 | 22.11 | 23.51 | 23.33 | 21.49 | 19.57 | 18.08 | 15.22 | 14.08 |
| 12 | 09.56 | 08.24 | 06.45 | 05.52 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.52 | 08.32 | 10.03 |
| | 14.45 | 16.30 | 18.00 | 20.36 | 22.15 | 23.53 | 23.30 | 21.46 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.01 | 02.29 | 03.06 | 04.49 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.48 | 16.33 | 18.04 | 20.39 | 22.18 | 23.55 | 23.27 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.51 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.09 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.51 | 16.37 | 18.07 | 20.42 | 22.22 | 23.57 | 23.24 | 21.39 | 19.46 | 17.57 | 15.13 | 14.05 |
| 15 | 09.49 | 08.14 | 06.34 | 05.42 | 03.54 | 02.26 | 03.12 | 04.56 | 06.31 | 08.01 | 08.43 | 10.09 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.58 | 23.21 | 21.35 | 19.42 | 17.54 | 15.09 | 14.04 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.25 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.11 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.29 | 00.00 | 23.18 | 21.31 | 19.38 | 17.50 | 15.06 | 14.04 |
| 17 | 09.43 | 08.07 | 06.27 | 05.34 | 03.47 | 02.24 | 03.19 | 05.02 | 06.37 | 08.07 | 08.49 | 10.12 |
| | 15.01 | 16.47 | 18.16 | 20.52 | 22.32 | 00.01 | 23.15 | 21.28 | 19.35 | 17.47 | 15.03 | 14.03 |
| 18 | 09.41 | 08.03 | 06.24 | 05.31 | 03.44 | 02.24 | 03.22 | 05.06 | 06.40 | 08.10 | 08.53 | 10.13 |
| | 15.04 | 16.50 | 18.19 | 20.55 | 22.35 | 00.02 | 23.11 | 21.24 | 19.31 | 17.43 | 15.00 | 14.03 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.23 | 03.25 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.53 | 18.22 | 20.58 | 22.39 | 00.03 | 23.08 | 21.21 | 19.28 | 17.40 | 14.57 | 14.03 |
| 20 | 09.36 | 07.56 | 06.16 | 05.23 | 03.37 | 02.23 | 03.29 | 05.12 | 06.46 | 08.17 | 09.00 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.04 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.03 |
| 21 | 09.33 | 07.53 | 06.13 | 05.20 | 03.34 | 02.23 | 03.32 | 05.15 | 06.49 | 08.20 | 09.03 | 10.16 |
| | 15.14 | 17.00 | 18.28 | 21.04 | 22.46 | 00.04 | 23.02 | 21.13 | 19.20 | 17.33 | 14.52 | 14.03 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.23 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.17 |
| | 15.18 | 17.03 | 18.31 | 21.08 | 22.49 | 00.04 | 22.59 | 21.10 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.12 | 03.27 | 02.24 | 03.39 | 05.21 | 06.55 | 08.26 | 09.10 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.53 | 00.04 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.04 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.24 | 02.25 | 03.42 | 05.25 | 06.58 | 08.29 | 09.13 | 10.18 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.04 | 22.52 | 21.02 | 19.09 | 17.22 | 14.43 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.26 | 03.46 | 05.28 | 07.01 | 07.33 | 09.16 | 10.18 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.03 | 22.49 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.27 | 03.49 | 05.31 | 07.04 | 07.36 | 09.19 | 10.18 |
| | 15.31 | 17.16 | 18.43 | 21.21 | 23.03 | 00.03 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.28 | 03.52 | 05.34 | 07.06 | 07.39 | 09.23 | 10.18 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.02 | 22.42 | 20.51 | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 09.12 | 07.28 | 05.47 | 04.54 | 03.11 | 02.30 | 03.56 | 05.37 | 07.09 | 07.42 | 09.26 | 10.17 |
| | 15.38 | 17.23 | 18.49 | 21.27 | 23.10 | 00.01 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.08 | 02.32 | 03.59 | 05.40 | 07.12 | 07.46 | 09.29 | 10.17 |
| | 15.42 | | 19.52 | 21.31 | 23.13 | 23.59 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.05 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.16 |
| | 15.45 | | 19.56 | 21.34 | 23.16 | 23.58 | 22.32 | 20.41 | 18.48 | 16.02 | 14.28 | 14.12 |
| 31 | 09.03 | | 06.36 | | 03.02 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.14 |
| Potential sun hours | 163 | 235 | 363 | 454 | 577 | 640 | 619 | 513 | 394 | 303 | 192 | 126 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | April | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 08.59 | 12.37 (T7) | 07.24 | | 06.32 | 04.43 | 02.56 |
| | 14.16 | | 15.52 9 | 12.46 (T7) | 17.26 | | 20.01 | 21.37 | 23.22 |
| 2 | 10.13 | | 08.56 | | 07.21 | | 06.29 | 04.40 | 02.53 |
| | 14.18 | | 15.55 | | 17.29 | | 20.04 | 21.40 | 23.25 |
| 3 | 10.11 | | 08.53 | | 07.17 | | 06.25 | 04.36 | 02.50 |
| | 14.21 | | 15.59 | | 17.32 | | 20.07 | 21.44 | 23.28 |
| 4 | 10.10 | | 08.50 | | 07.14 | | 06.21 | 04.33 | 02.48 |
| | 14.23 | | 16.02 | | 17.35 | | 20.10 | 21.47 | 23.31 |
| 5 | 10.09 | | 08.47 | | 07.10 | 16.55 (T2) | 06.18 | 04.29 | 02.45 |
| | 14.25 | | 16.06 | | 17.38 6 | 17.01 (T2) | 20.14 | 21.50 | 23.34 |
| 6 | 10.07 | | 08.43 | | 07.06 | 16.52 (T2) | 06.14 | 04.25 | 02.43 |
| | 14.28 | | 16.09 | | 17.41 12 | 17.04 (T2) | 20.17 | 21.54 | 23.37 |
| 7 | 10.05 | | 08.40 | | 07.03 | 16.51 (T2) | 06.10 | 04.22 | 02.40 |
| | 14.30 | | 16.13 | | 17.44 17 | 17.08 (T2) | 20.20 | 21.57 | 23.40 |
| 8 | 10.03 | 12.27 (T7) | 08.37 | | 06.59 | 16.50 (T2) | 06.07 | 04.18 | 02.38 |
| | 14.33 5 | 12.32 (T7) | 16.16 | | 17.48 20 | 17.10 (T2) | 20.23 | 22.01 | 23.43 |
| 9 | 10.01 | 12.26 (T7) | 08.33 | | 06.56 | 16.49 (T2) | 06.03 | 04.15 | 02.36 |
| | 14.36 16 | 12.42 (T7) | 16.19 | | 17.51 21 | 17.10 (T2) | 20.26 | 22.04 | 23.45 |
| 10 | 09.59 | 12.26 (T7) | 08.30 | | 06.52 | 16.48 (T2) | 05.59 | 04.11 | 02.34 |
| | 14.39 18 | 12.44 (T7) | 16.23 | | 17.54 22 | 17.10 (T2) | 20.29 | 22.07 | 23.48 |
| 11 | 09.57 | 12.26 (T7) | 08.27 | | 06.48 | 16.48 (T2) | 05.56 | 04.08 | 02.32 |
| | 14.42 19 | 12.45 (T7) | 16.26 | | 17.57 22 | 17.10 (T2) | 20.32 | 22.11 | 23.50 |
| 12 | 09.55 | 12.25 (T7) | 08.23 | | 06.45 | 16.47 (T2) | 05.52 | 04.04 | 02.30 |
| | 14.45 20 | 12.45 (T7) | 16.30 | | 18.00 23 | 17.10 (T2) | 20.35 | 22.14 | 23.52 |
| 13 | 09.53 | 12.26 (T7) | 08.20 | | 06.41 | 16.47 (T2) | 05.48 | 04.01 | 02.29 |
| | 14.48 20 | 12.46 (T7) | 16.33 | | 18.03 22 | 17.09 (T2) | 20.38 | 22.18 | 23.54 |
| 14 | 09.51 | 12.25 (T7) | 08.17 | | 06.38 | 16.48 (T2) | 05.45 | 03.57 | 02.27 |
| | 14.51 22 | 12.47 (T7) | 16.36 | | 18.06 21 | 17.09 (T2) | 20.42 | 22.21 | 23.56 |
| 15 | 09.48 | 12.26 (T7) | 08.13 | | 06.34 | 16.48 (T2) | 05.41 | 03.54 | 02.26 |
| | 14.54 22 | 12.48 (T7) | 16.40 | | 18.09 20 | 17.08 (T2) | 20.45 | 22.25 | 23.58 |
| 16 | 09.46 | 12.25 (T7) | 08.10 | | 06.30 | 16.48 (T2) | 05.37 | 03.50 | 02.25 |
| | 14.57 23 | 12.48 (T7) | 16.43 | | 18.12 18 | 17.06 (T2) | 20.48 | 22.28 | 00.00 |
| 17 | 09.43 | 12.25 (T7) | 08.06 | | 06.27 | 16.49 (T2) | 05.34 | 03.47 | 02.24 |
| | 15.01 24 | 12.49 (T7) | 16.46 | | 18.15 15 | 17.04 (T2) | 20.51 | 22.32 | 00.01 |
| 18 | 09.41 | 12.25 (T7) | 08.03 | | 06.23 | 16.52 (T2) | 05.30 | 03.44 | 02.23 |
| | 15.04 25 | 12.50 (T7) | 16.50 | | 18.18 11 | 17.03 (T2) | 20.54 | 22.35 | 00.02 |
| 19 | 09.38 | 12.25 (T7) | 07.59 | | 06.20 | | 05.27 | 03.40 | 02.23 |
| | 15.07 25 | 12.50 (T7) | 16.53 | | 18.22 | | 20.58 | 22.39 | 00.03 |
| 20 | 09.35 | 12.26 (T7) | 07.56 | | 06.16 | | 05.23 | 03.37 | 02.23 |
| | 15.11 25 | 12.51 (T7) | 16.56 | | 18.25 | | 21.01 | 22.42 | 00.03 |
| 21 | 09.32 | 12.26 (T7) | 07.52 | | 06.12 | | 05.19 | 03.34 | 02.23 |
| | 15.14 25 | 12.51 (T7) | 17.00 | | 18.28 | | 21.04 | 22.45 | 00.04 |
| 22 | 09.30 | 12.26 (T7) | 07.49 | | 06.09 | | 05.16 | 03.30 | 02.23 |
| | 15.17 25 | 12.51 (T7) | 17.03 | | 18.31 | | 21.07 | 22.49 | 00.04 |
| 23 | 09.27 | 12.27 (T7) | 07.45 | | 06.05 | | 05.12 | 03.27 | 02.24 |
| | 15.21 25 | 12.52 (T7) | 17.06 | | 18.34 | | 21.10 | 22.52 | 00.04 |
| 24 | 09.24 | 12.27 (T7) | 07.42 | | 06.01 | | 05.08 | 03.24 | 02.24 |
| | 15.24 24 | 12.51 (T7) | 17.09 | | 18.37 | | 21.14 | 22.56 | 00.04 |
| 25 | 09.21 | 12.28 (T7) | 07.38 | | 05.58 | | 05.05 | 03.20 | 02.25 |
| | 15.28 24 | 12.52 (T7) | 17.13 | | 18.40 | | 21.17 | 22.59 | 00.03 |
| 26 | 09.18 | 12.29 (T7) | 07.35 | | 05.54 | | 05.01 | 03.17 | 02.26 |
| | 15.31 23 | 12.52 (T7) | 17.16 | | 18.43 | | 21.20 | 23.03 | 00.02 |
| 27 | 09.15 | 12.29 (T7) | 07.31 | | 05.50 | | 04.58 | 03.14 | 02.28 |
| | 15.34 22 | 12.51 (T7) | 17.19 | | 18.46 | | 21.24 | 23.06 | 00.01 |
| 28 | 09.12 | 12.30 (T7) | 07.28 | | 05.47 | | 04.54 | 03.11 | 02.29 |
| | 15.38 21 | 12.51 (T7) | 17.22 | | 18.49 | | 21.27 | 23.09 | 00.00 |
| 29 | 09.09 | 12.31 (T7) | | | 06.43 | | 04.50 | 03.08 | 02.31 |
| | 15.41 19 | 12.50 (T7) | | | 19.52 | | 21.30 | 23.13 | 23.59 |
| 30 | 09.06 | 12.33 (T7) | | | 06.39 | | 04.47 | 03.05 | 02.33 |
| | 15.45 17 | 12.50 (T7) | | | 19.55 | | 21.34 | 23.16 | 23.57 |
| 31 | 09.03 | 12.34 (T7) | | | 06.36 | | | 03.02 | |
| | 15.48 14 | 12.48 (T7) | | | 19.58 | | | 23.19 | |
| Potential sun hours | 163 | | 235 | | 363 | | 454 | 577 | 640 |
| Total, worst case | | 503 | | 9 | | 250 | | | |
| Sun reduction | | 0,11 | | 0,31 | | 0,36 | | | |
| Oper. time red. | | 0,97 | | 0,97 | | 0,97 | | | |
| Wind dir. red. | | 0,66 | | 0,66 | | 0,61 | | | |
| Total reduction | | 0,07 | | 0,20 | | 0,22 | | | |
| Total, real | | 37 | | 2 | | 54 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | | October | | | November | | | December | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.35 | | 04.09 | | 05.49 | | | 07.18 | | 17.27 (T2) | 07.55 | | | 09.35 | | 12.08 (T7) |
| | 23.56 | | 22.24 | | 20.33 | | | 18.44 | 22 | 17.49 (T2) | 15.54 | | | 14.25 | 19 | 12.27 (T7) |
| 2 | 02.37 | | 04.12 | | 05.52 | | | 07.21 | | 17.26 (T2) | 07.58 | | | 09.38 | | 12.09 (T7) |
| | 23.54 | | 22.21 | | 20.29 | | | 18.40 | 23 | 17.49 (T2) | 15.51 | | | 14.23 | 18 | 12.27 (T7) |
| 3 | 02.40 | | 04.16 | | 05.55 | | | 07.24 | | 17.26 (T2) | 08.02 | | | 09.41 | | 12.10 (T7) |
| | 23.52 | | 22.17 | | 20.26 | | | 18.36 | 22 | 17.48 (T2) | 15.48 | | | 14.21 | 16 | 12.26 (T7) |
| 4 | 02.42 | | 04.19 | | 05.58 | | | 07.27 | | 17.26 (T2) | 08.05 | | | 09.43 | | 12.11 (T7) |
| | 23.50 | | 22.14 | | 20.22 | | | 18.33 | 22 | 17.48 (T2) | 15.44 | | | 14.19 | 6 | 12.17 (T7) |
| 5 | 02.45 | | 04.23 | | 06.01 | | | 07.30 | | 17.26 (T2) | 08.08 | | | 09.46 | | |
| | 23.48 | | 22.10 | | 20.18 | | | 18.29 | 21 | 17.47 (T2) | 15.41 | | | 14.17 | | |
| 6 | 02.48 | | 04.26 | | 06.04 | | | 07.33 | | 17.27 (T2) | 08.12 | | | 09.49 | | |
| | 23.45 | | 22.07 | | 20.15 | | | 18.26 | 18 | 17.45 (T2) | 15.38 | | | 14.15 | | |
| 7 | 02.50 | | 04.29 | | 06.07 | | | 07.36 | | 17.27 (T2) | 08.15 | | | 09.52 | | |
| | 23.43 | | 22.03 | | 20.11 | | | 18.22 | 14 | 17.41 (T2) | 15.34 | | | 14.14 | | |
| 8 | 02.53 | | 04.33 | | 06.10 | | | 07.39 | | 17.30 (T2) | 08.19 | | | 09.54 | | |
| | 23.40 | | 22.00 | | 20.07 | | | 18.18 | 8 | 17.38 (T2) | 15.31 | | | 14.12 | | |
| 9 | 02.56 | | 04.36 | | 06.13 | | | 07.42 | | 17.33 (T2) | 08.22 | | | 09.56 | | |
| | 23.38 | | 21.56 | | 20.04 | | | 18.15 | 1 | 17.34 (T2) | 15.28 | | | 14.10 | | |
| 10 | 02.59 | | 04.39 | | 06.16 | | | 07.45 | | | 08.25 | | 12.07 (T7) | 09.59 | | |
| | 23.35 | | 21.53 | | 20.00 | | | 18.11 | | | 15.25 | 10 | 12.17 (T7) | 14.09 | | |
| 11 | 03.02 | | 04.42 | | 06.19 | | | 07.48 | | | 08.29 | | 12.05 (T7) | 10.01 | | |
| | 23.32 | | 21.49 | | 19.56 | | | 18.08 | | | 15.22 | 14 | 12.19 (T7) | 14.08 | | |
| 12 | 03.02 | | 04.46 | | 06.22 | | | 07.51 | | | 08.32 | | 12.04 (T7) | 10.03 | | |
| | 23.29 | | 21.45 | | 19.53 | | | 18.04 | | | 15.18 | 17 | 12.21 (T7) | 14.07 | | |
| 13 | 03.05 | | 04.49 | | 06.25 | | | 07.54 | | | 08.35 | | 12.03 (T7) | 10.05 | | |
| | 23.26 | | 21.42 | | 19.49 | | | 18.00 | | | 15.15 | 19 | 12.22 (T7) | 14.06 | | |
| 14 | 03.09 | | 04.52 | | 06.28 | | | 07.57 | | | 08.39 | | 12.03 (T7) | 10.07 | | |
| | 23.23 | | 21.38 | | 19.45 | | | 17.57 | | | 15.12 | 21 | 12.24 (T7) | 14.05 | | |
| 15 | 03.12 | | 04.56 | | 06.31 | | | 08.00 | | | 08.42 | | 12.02 (T7) | 10.09 | | |
| | 23.20 | | 21.35 | | 19.42 | | | 17.53 | | | 15.09 | 22 | 12.24 (T7) | 14.04 | | |
| 16 | 03.15 | | 04.59 | | 06.34 | | | 08.04 | | | 08.46 | | 12.02 (T7) | 10.10 | | |
| | 23.17 | | 21.31 | | 19.38 | | | 17.50 | | | 15.06 | 23 | 12.25 (T7) | 14.03 | | |
| 17 | 03.18 | | 05.02 | | 06.37 | | | 08.07 | | | 08.49 | | 12.02 (T7) | 10.12 | | |
| | 23.14 | | 21.27 | | 19.34 | | | 17.46 | | | 15.03 | 24 | 12.26 (T7) | 14.03 | | |
| 18 | 03.22 | | 05.05 | | 06.40 | | | 08.10 | | | 08.52 | | 12.01 (T7) | 10.13 | | |
| | 23.11 | | 21.24 | | 19.31 | | | 17.43 | | | 15.00 | 24 | 12.25 (T7) | 14.03 | | |
| 19 | 03.25 | | 05.08 | | 06.42 | | | 08.13 | | | 08.56 | | 12.01 (T7) | 10.14 | | |
| | 23.08 | | 21.20 | | 19.27 | | | 17.39 | | | 14.57 | 25 | 12.26 (T7) | 14.02 | | |
| 20 | 03.28 | | 05.12 | | 06.45 | | | 08.16 | | | 08.59 | | 12.01 (T7) | 10.15 | | |
| | 23.05 | | 21.17 | | 19.24 | | | 17.36 | | | 14.54 | 25 | 12.26 (T7) | 14.03 | | |
| 21 | 03.32 | | 05.15 | | 06.48 | | | 08.19 | | | 09.03 | | 12.01 (T7) | 10.16 | | |
| | 23.01 | | 21.13 | | 19.20 | | | 17.32 | | | 14.51 | 25 | 12.26 (T7) | 14.03 | | |
| 22 | 03.35 | | 05.18 | | 06.51 | | | 08.22 | | | 09.06 | | 12.02 (T7) | 10.16 | | |
| | 22.58 | | 21.09 | | 19.16 | | | 17.29 | | | 14.48 | 25 | 12.27 (T7) | 14.03 | | |
| 23 | 03.38 | | 05.21 | | 06.54 | | | 08.26 | | | 09.09 | | 12.03 (T7) | 10.17 | | |
| | 22.55 | | 21.06 | | 19.13 | | | 17.25 | | | 14.46 | 24 | 12.27 (T7) | 14.04 | | |
| 24 | 03.42 | | 05.24 | | 06.57 | | | 08.29 | | | 09.13 | | 12.03 (T7) | 10.17 | | |
| | 22.52 | | 21.02 | | 19.09 | | | 17.22 | | | 14.43 | 24 | 12.27 (T7) | 14.04 | | |
| 25 | 03.45 | | 05.27 | | 07.00 | | 17.36 (T2) | 07.32 | | | 09.16 | | 12.04 (T7) | 10.17 | | |
| | 22.48 | | 20.58 | | 19.05 | 9 | 17.45 (T2) | 16.18 | | | 14.40 | 23 | 12.27 (T7) | 14.05 | | |
| 26 | 03.49 | | 05.30 | | 07.03 | | 17.33 (T2) | 07.35 | | | 09.19 | | 12.04 (T7) | 10.17 | | |
| | 22.45 | | 20.55 | | 19.02 | 14 | 17.47 (T2) | 16.15 | | | 14.38 | 24 | 12.28 (T7) | 14.06 | | |
| 27 | 03.52 | | 05.33 | | 07.06 | | 17.31 (T2) | 07.39 | | | 09.22 | | 12.04 (T7) | 10.17 | | |
| | 22.41 | | 20.51 | | 18.58 | 17 | 17.48 (T2) | 16.11 | | | 14.35 | 23 | 12.27 (T7) | 14.08 | | |
| 28 | 03.55 | | 05.37 | | 07.09 | | 17.29 (T2) | 07.42 | | | 09.25 | | 12.06 (T7) | 10.17 | | |
| | 22.38 | | 20.47 | | 18.54 | 20 | 17.49 (T2) | 16.08 | | | 14.33 | 22 | 12.28 (T7) | 14.09 | | |
| 29 | 03.59 | | 05.40 | | 07.12 | | 17.28 (T2) | 07.45 | | | 09.29 | | 12.06 (T7) | 10.16 | | |
| | 22.35 | | 20.44 | | 18.51 | 21 | 17.49 (T2) | 16.05 | | | 14.30 | 21 | 12.27 (T7) | 14.10 | | |
| 30 | 04.02 | | 05.43 | | 07.15 | | 17.27 (T2) | 07.48 | | | 09.32 | | 12.07 (T7) | 10.16 | | |
| | 22.31 | | 20.40 | | 18.47 | 22 | 17.49 (T2) | 16.01 | | | 14.28 | 20 | 12.27 (T7) | 14.12 | | |
| 31 | 04.06 | | 05.46 | | | | | 07.52 | | | | | | 10.15 | | |
| | 22.28 | | 20.37 | | | | | 15.58 | | | | | | 14.14 | | |
| Potential sun hours | 619 | | 513 | | 394 | | | 303 | | | 192 | | | 126 | | |
| Total, worst case | | | | | 103 | | | 151 | | | 455 | | | 59 | | |
| Sun reduction | | | | | 0,32 | | | 0,28 | | | 0,19 | | | 0,04 | | |
| Oper. time red. | | | | | 0,97 | | | 0,97 | | | 0,97 | | | 0,97 | | |
| Wind dir. red. | | | | | 0,61 | | | 0,61 | | | 0,66 | | | 0,66 | | |
| Total reduction | | | | | 0,19 | | | 0,17 | | | 0,12 | | | 0,03 | | |
| Total, real | | | | | 20 | | | 26 | | | 56 | | | 2 | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** J - Lomarakennus J (Hautakaarto)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.40 | 23.24 | 23.52 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.17 | 06.25 | 04.37 | 02.53 | 02.42 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.27 | 23.50 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.09 | 08.49 | 07.14 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.05 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.30 | 23.48 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.47 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.10 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.48 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.53 | 23.35 | 23.43 | 22.06 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.15 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.53 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.01 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.49 | 05.56 | 04.09 | 02.35 | 03.01 | 04.43 | 06.19 | 07.48 | 08.28 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.48 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.04 | 04.47 | 06.22 | 07.51 | 08.31 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.28 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.41 | 05.49 | 04.02 | 02.31 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.54 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.42 | 10.07 |
| | 14.56 | 16.40 | 18.10 | 20.45 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.45 | 08.09 | 06.31 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.57 | 23.16 | 21.31 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.07 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.01 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.32 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.13 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.57 | 08.29 | 09.12 | 10.16 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.01 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.16 |
| | 15.29 | 17.13 | 18.40 | 21.17 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.16 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 00.00 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.16 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.59 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.32 | 03.57 | 05.37 | 07.09 | 07.42 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.08 | 23.58 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.44 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.31 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** K - Asuinrakennus K (Takalo)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.32 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.33 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.20 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.39 | 23.23 | 23.51 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.52 | 07.17 | 06.25 | 04.37 | 02.53 | 02.43 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.26 | 23.49 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.08 | 08.49 | 07.13 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.04 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.29 | 23.47 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.48 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.09 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.05 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.47 |
| | 14.30 | 16.10 | 17.42 | 20.16 | 21.53 | 23.35 | 23.43 | 22.06 | 20.14 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.39 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.14 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.02 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.52 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.40 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.02 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.06 | 23.45 | 23.33 | 21.52 | 20.00 | 18.11 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.48 | 05.56 | 04.09 | 02.35 | 03.02 | 04.43 | 06.19 | 07.48 | 08.28 | 09.59 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.47 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.05 | 04.47 | 06.22 | 07.51 | 08.31 | 10.01 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.27 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.19 | 06.41 | 05.49 | 04.02 | 02.32 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.03 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.53 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.41 | 10.07 |
| | 14.56 | 16.40 | 18.09 | 20.44 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.44 | 08.09 | 06.30 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.08 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.56 | 23.16 | 21.30 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.06 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.30 | 23.58 | 23.13 | 21.27 | 19.34 | 17.47 | 15.04 | 14.05 |
| 18 | 09.39 | 08.02 | 06.23 | 05.31 | 03.45 | 02.27 | 03.24 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.06 | 21.20 | 19.27 | 17.40 | 14.58 | 14.05 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.00 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.31 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.12 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.51 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.03 | 18.31 | 21.07 | 22.47 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.28 | 03.43 | 05.25 | 06.57 | 08.29 | 09.11 | 10.15 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.00 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.29 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.15 |
| | 15.29 | 17.13 | 18.40 | 21.16 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.15 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 23.59 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.15 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.58 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.33 | 03.57 | 05.37 | 07.09 | 07.41 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.07 | 23.57 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.43 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.30 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** L - Lomarakennus L (Haukijärvi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.25 | 06.33 | 04.45 | 03.02 | 02.39 | 04.11 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.19 | 15.53 | 17.27 | 20.02 | 21.37 | 23.21 | 23.54 | 22.24 | 20.33 | 18.44 | 15.56 | 14.28 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.56 | 02.41 | 04.14 | 05.53 | 07.22 | 07.58 | 09.37 |
| | 14.21 | 15.57 | 17.30 | 20.05 | 21.40 | 23.24 | 23.52 | 22.20 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.18 | 06.26 | 04.38 | 02.53 | 02.43 | 04.18 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.23 | 16.00 | 17.33 | 20.08 | 21.43 | 23.27 | 23.50 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 04.34 | 02.51 | 02.46 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.04 | 17.36 | 20.11 | 21.47 | 23.30 | 23.48 | 22.13 | 20.22 | 18.34 | 15.46 | 14.21 |
| 5 | 10.08 | 08.47 | 07.10 | 06.19 | 04.31 | 02.48 | 02.48 | 04.24 | 06.02 | 07.31 | 08.08 | 09.45 |
| | 14.28 | 16.07 | 17.39 | 20.14 | 21.50 | 23.33 | 23.46 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.07 | 06.15 | 04.27 | 02.46 | 02.51 | 04.28 | 06.05 | 07.34 | 08.12 | 09.48 |
| | 14.30 | 16.11 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.06 | 20.15 | 18.26 | 15.39 | 14.18 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.44 | 02.54 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.33 | 16.14 | 17.45 | 20.20 | 21.57 | 23.38 | 23.41 | 22.03 | 20.11 | 18.23 | 15.36 | 14.16 |
| 8 | 10.02 | 08.37 | 07.00 | 06.08 | 04.20 | 02.41 | 02.56 | 04.34 | 06.11 | 07.40 | 08.18 | 09.53 |
| | 14.36 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.39 | 21.59 | 20.08 | 18.19 | 15.33 | 14.14 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 04.16 | 02.39 | 02.59 | 04.37 | 06.14 | 07.43 | 08.22 | 09.55 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.43 | 23.36 | 21.56 | 20.04 | 18.16 | 15.29 | 14.13 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.37 | 03.02 | 04.41 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.10 | 02.35 | 03.02 | 04.44 | 06.20 | 07.49 | 08.29 | 10.00 |
| | 14.44 | 16.28 | 17.58 | 20.33 | 22.10 | 23.48 | 23.31 | 21.49 | 19.57 | 18.09 | 15.23 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.06 | 02.34 | 03.05 | 04.47 | 06.23 | 07.52 | 08.32 | 10.02 |
| | 14.47 | 16.31 | 18.01 | 20.36 | 22.14 | 23.50 | 23.28 | 21.45 | 19.53 | 18.05 | 15.20 | 14.09 |
| 13 | 09.52 | 08.20 | 06.42 | 05.50 | 04.03 | 02.32 | 03.08 | 04.51 | 06.26 | 07.55 | 08.35 | 10.04 |
| | 14.50 | 16.34 | 18.04 | 20.39 | 22.17 | 23.52 | 23.25 | 21.42 | 19.50 | 18.01 | 15.17 | 14.08 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.31 | 03.11 | 04.54 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.38 | 18.07 | 20.42 | 22.21 | 23.54 | 23.22 | 21.38 | 19.46 | 17.58 | 15.14 | 14.07 |
| 15 | 09.47 | 08.13 | 06.35 | 05.42 | 03.56 | 02.30 | 03.14 | 04.57 | 06.32 | 08.01 | 08.42 | 10.07 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.24 | 23.56 | 23.19 | 21.35 | 19.42 | 17.54 | 15.11 | 14.06 |
| 16 | 09.45 | 08.10 | 06.31 | 05.39 | 03.52 | 02.29 | 03.18 | 05.00 | 06.34 | 08.04 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.57 | 23.16 | 21.31 | 19.39 | 17.51 | 15.08 | 14.06 |
| 17 | 09.43 | 08.06 | 06.27 | 05.35 | 03.49 | 02.28 | 03.21 | 05.03 | 06.37 | 08.07 | 08.49 | 10.10 |
| | 15.03 | 16.48 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.05 | 14.06 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.46 | 02.27 | 03.24 | 05.07 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.06 | 16.51 | 18.19 | 20.55 | 22.34 | 23.59 | 23.10 | 21.24 | 19.31 | 17.44 | 15.02 | 14.05 |
| 19 | 09.37 | 08.00 | 06.20 | 05.28 | 03.42 | 02.27 | 03.27 | 05.10 | 06.43 | 08.13 | 08.55 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.00 | 23.07 | 21.20 | 19.28 | 17.40 | 14.59 | 14.05 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.39 | 02.27 | 03.31 | 05.13 | 06.46 | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.58 | 18.25 | 21.01 | 22.41 | 00.01 | 23.04 | 21.17 | 19.24 | 17.37 | 14.56 | 14.05 |
| 21 | 09.32 | 07.53 | 06.13 | 05.21 | 03.36 | 02.27 | 03.34 | 05.16 | 06.49 | 08.20 | 09.02 | 10.15 |
| | 15.16 | 17.01 | 18.28 | 21.04 | 22.45 | 00.01 | 23.01 | 21.13 | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.17 | 03.32 | 02.27 | 03.37 | 05.19 | 06.52 | 08.23 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.17 | 17.30 | 14.50 | 14.06 |
| 23 | 09.26 | 07.46 | 06.06 | 05.13 | 03.29 | 02.28 | 03.41 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.23 | 17.07 | 18.34 | 21.11 | 22.51 | 00.01 | 22.54 | 21.06 | 19.13 | 17.26 | 14.48 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.10 | 03.26 | 02.28 | 03.44 | 05.25 | 06.58 | 08.29 | 09.12 | 10.16 |
| | 15.26 | 17.11 | 18.37 | 21.14 | 22.55 | 00.01 | 22.51 | 21.02 | 19.10 | 17.23 | 14.45 | 14.07 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.23 | 02.29 | 03.47 | 05.28 | 07.01 | 07.32 | 09.15 | 10.16 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.58 | 00.01 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.08 |
| 26 | 09.18 | 07.35 | 05.55 | 05.03 | 03.20 | 02.30 | 03.51 | 05.32 | 07.04 | 07.36 | 09.18 | 10.16 |
| | 15.33 | 17.17 | 18.44 | 21.20 | 23.01 | 00.00 | 22.44 | 20.55 | 19.02 | 16.16 | 14.40 | 14.09 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.17 | 02.32 | 03.54 | 05.35 | 07.07 | 07.39 | 09.22 | 10.16 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 23.59 | 22.41 | 20.51 | 18.59 | 16.13 | 14.37 | 14.10 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.33 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.40 | 17.23 | 18.50 | 21.27 | 23.08 | 23.58 | 22.38 | 20.48 | 18.55 | 16.09 | 14.35 | 14.12 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.35 | 04.01 | 05.41 | 07.13 | 07.45 | 09.28 | 10.15 |
| | 15.43 | | 19.53 | 21.30 | 23.11 | 23.57 | 22.34 | 20.44 | 18.52 | 16.06 | 14.32 | 14.13 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.37 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.14 |
| | 15.46 | | 19.56 | 21.33 | 23.15 | 23.55 | 22.31 | 20.40 | 18.48 | 16.02 | 14.30 | 14.15 |
| 31 | 09.02 | | 06.37 | | 03.05 | | 04.08 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.27 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** M - Lomarakennus M (Haukilahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.35 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.57 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.34 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.51 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.12 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.26 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.08 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.07 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.14 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.49 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.32 | 00.00 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.53 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.15 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.56 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.10 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.13 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.33 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.41 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.06 | 00.00 | 22.41 | 20.52 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.46 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** N - Lomarakennus N (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.26 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 **Shadow receptor:** O - Lomarakennus O (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 522 | 412 | 474 | 534 | 566 | 820 | 1 090 | 1 047 | 879 | 802 | 699 | 632 | 8 477 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.51 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

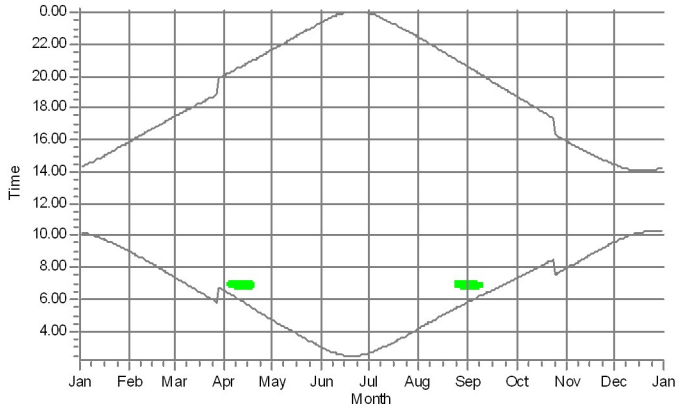
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 15.00/3.5.584

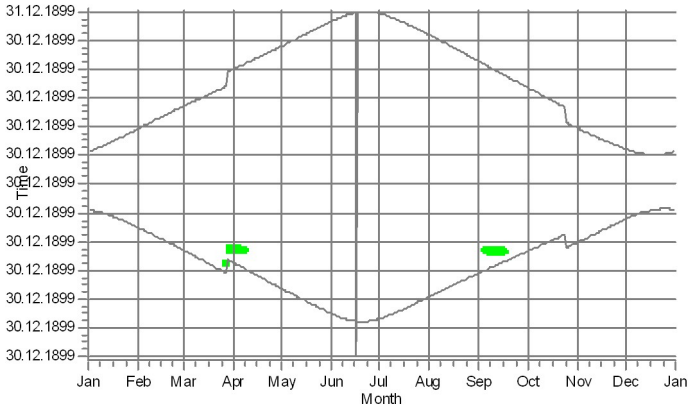
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

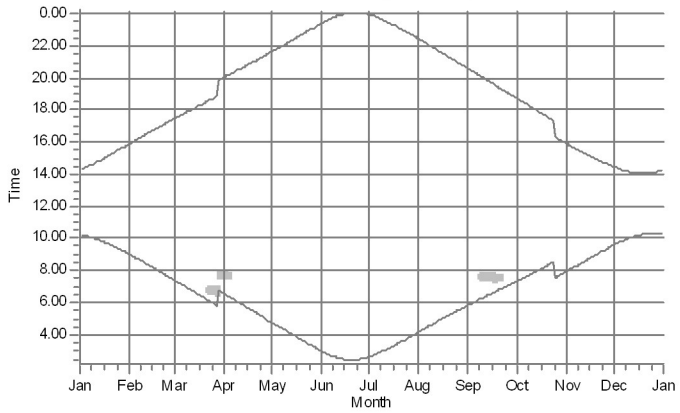
A: Lomarakennus A (Syvälahti)



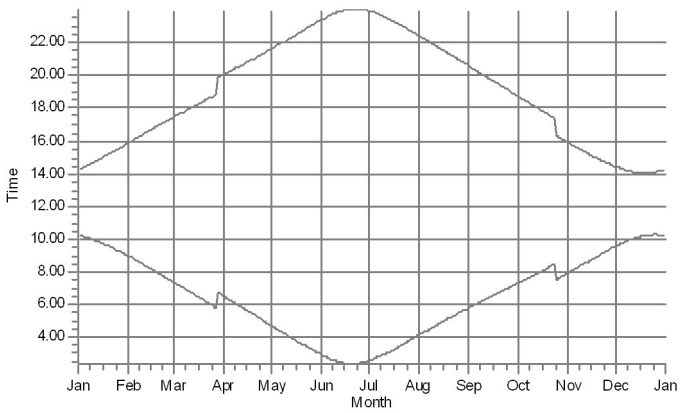

B: Asuinrakennus B (Syväänlahti)



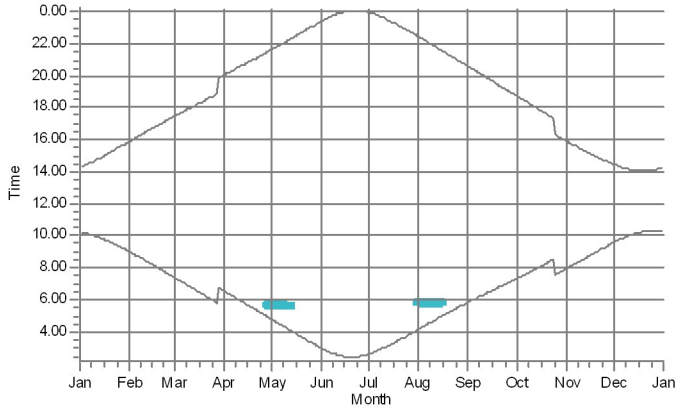

C: Lomarakennus C (Mutalahti)



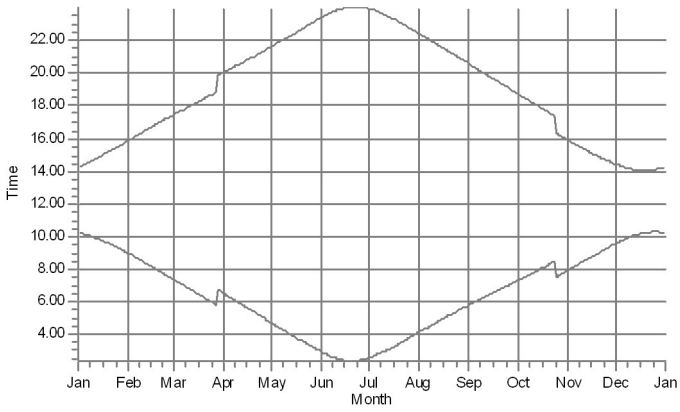

D: Lomarakennus D (Mutaniemi)




E: Asuinrakennus E (Alanko)




F: Asuinrakennus F (Joensuu)




WTGs

T19: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (691)

T16: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (694)

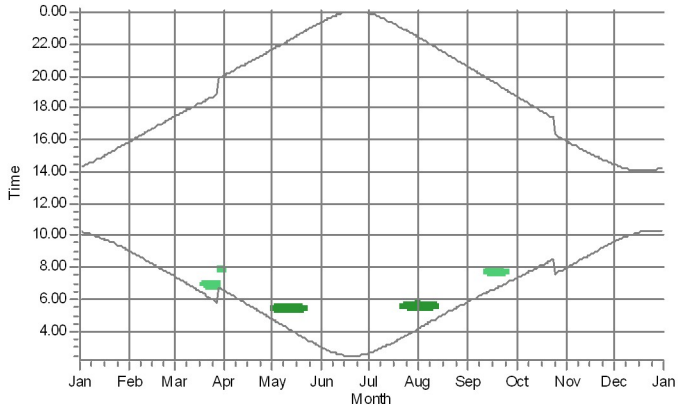
T9: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (701)

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Calculated:
9.5.2023 15.00/3.5.584

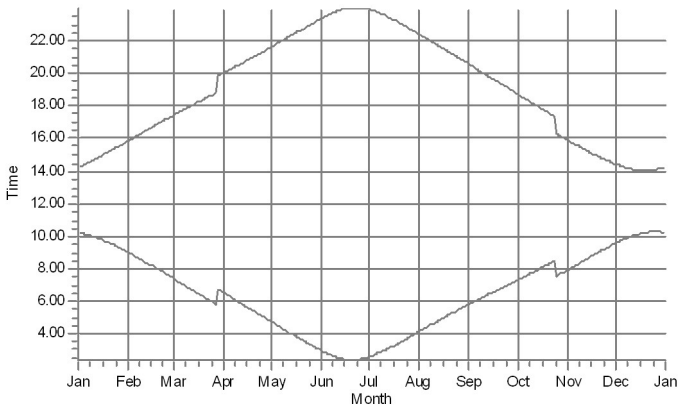
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

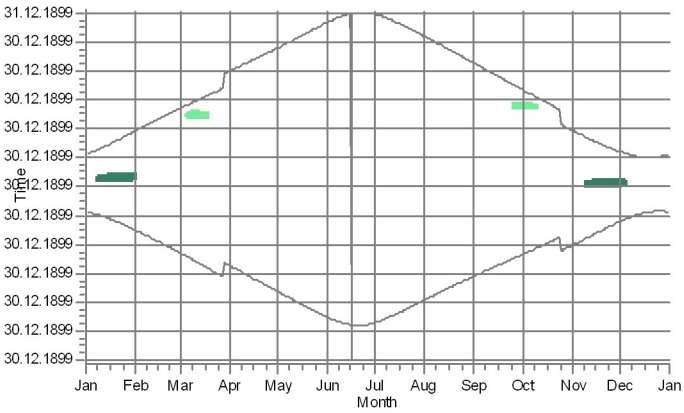
G: Asuinrakennus G (Heiniaho)



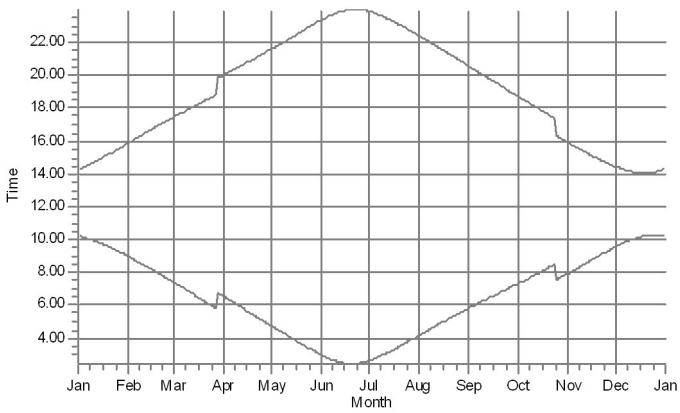

H: Asuinrakennus H (Mäkelä)



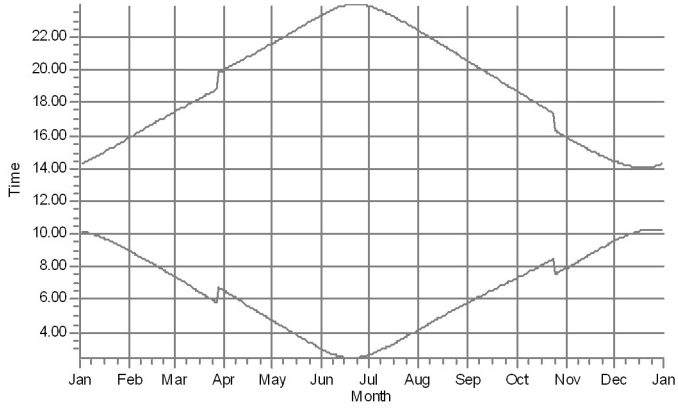

I: Lomarakennus I



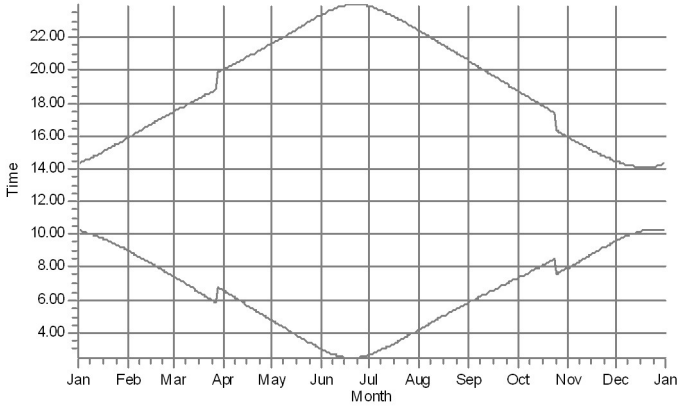

J: Lomarakennus J (Hautakaarto)




K: Asuinrakennus K (Takalo)




L: Lomarakennus L (Haukijärvi)




WTGs

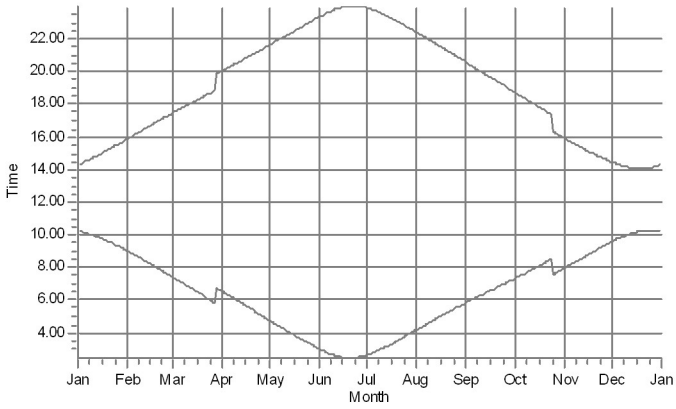
T2: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (708)
T1: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (709)
T3: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (710)
T7: Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (711)

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9.5.2023 15.00/3.5.584

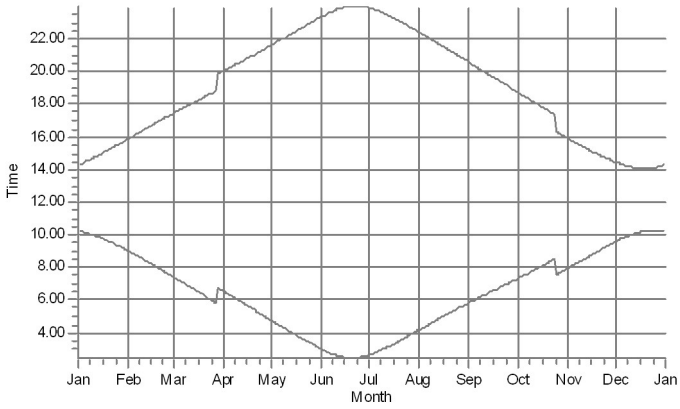
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058

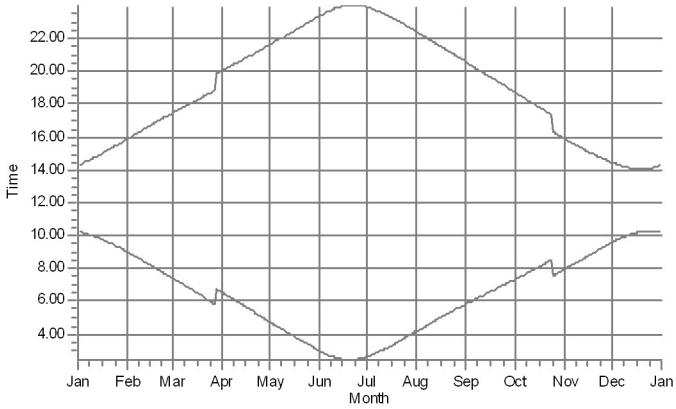
M: Lomarakennus M (Haukilahti)




N: Lomarakennus N (Kuusela)




O: Lomarakennus O (Kuusela)

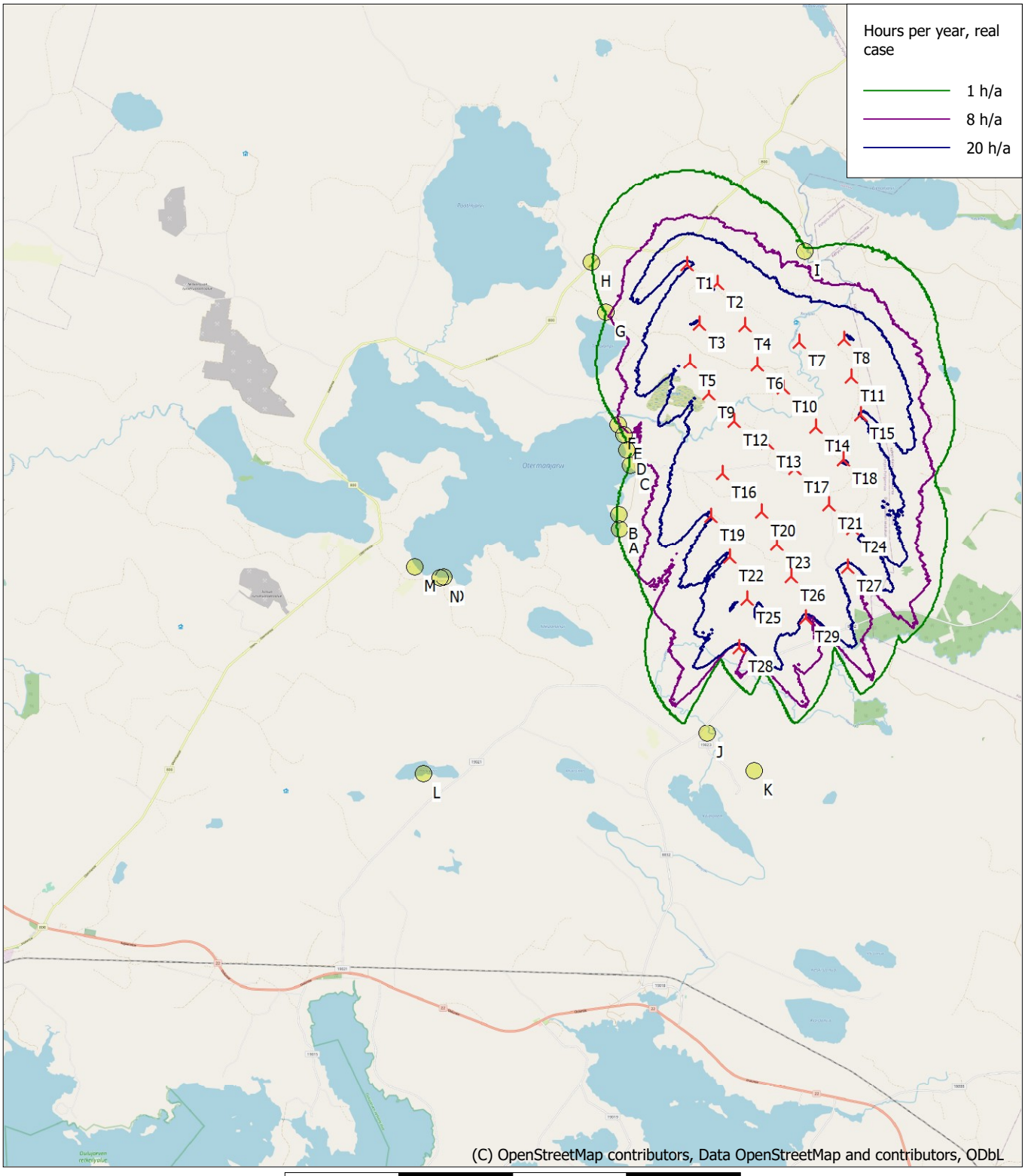



WTGs

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Calculated:
9.5.2023 15.00/3.5.584

# SHADOW - Map

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058




0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 504 420 North: 7 167 810

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (2)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

## Liite 7. Melun yhteismallinnuksen tulokset VE1

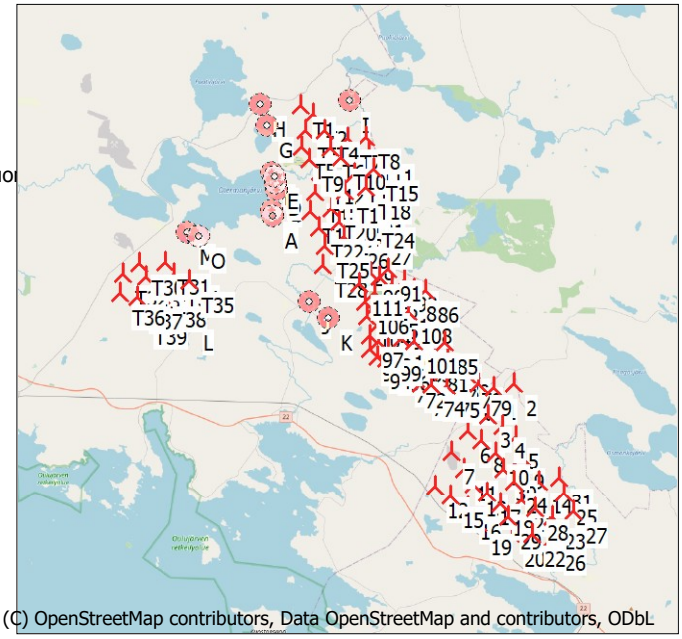
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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuo
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




## WTGs

| | East | North | Z [m] | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated [kW] | Noise data Rotor diameter [m] | Hub height [m] | Creator | Name | Wind speed [m/s] | LwA,ref [dB(A)] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 100 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 101 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 102 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 103 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 104 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 105 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 106 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 107 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 108 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 109 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 110 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 111 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 112 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 71 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 72 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 73 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 74 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 75 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 76 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 77 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 78 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 79 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | Wind speed | LwA,ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 80 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 81 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 82 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 83 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 84 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 85 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 86 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 87 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 88 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 89 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 90 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 91 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 92 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 93 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 94 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 95 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 96 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 97 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 98 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 99 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T30 | 499 777 | 7 166 541 | 137,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T31 | 501 112 | 7 166 571 | 140,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T32 | 498 884 | 7 165 924 | 140,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T33 | 500 060 | 7 165 826 | 146,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T34 | 501 577 | 7 165 939 | 141,7 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T35 | 502 368 | 7 165 645 | 147,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T36 | 498 706 | 7 164 985 | 147,2 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T37 | 499 643 | 7 164 765 | 154,4 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T38 | 500 913 | 7 164 850 | 150,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T39 | 499 856 | 7 163 927 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |

# Calculation Results

## Sound level

| Noise sensitive area | | | | | | Demands | Sound level | |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z [m] | Immission height [m] | Noise [dB(A)] | From WTGs [dB(A)] | Distance to noise demand [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 40,0 | 37,4 | 648 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 40,0 | 37,5 | 633 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 40,0 | 38,7 | 362 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 40,0 | 38,5 | 405 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 40,0 | 38,5 | 394 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 40,0 | 38,2 | 459 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 40,0 | 37,4 | 563 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 40,0 | 35,3 | 972 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 40,0 | 38,7 | 318 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 40,0 | 36,0 | 939 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 40,0 | 36,5 | 959 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 40,0 | 37,8 | 708 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 40,0 | 36,1 | 823 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 40,0 | 35,6 | 944 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 40,0 | 35,5 | 990 |

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9.5.2023 18.49/3.5.584

# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14841 | 15043 | 15555 | 15832 | 16100 | 16350 | 18351 | 19383 | 16989 | 10816 | 9530 | 16500 | 18226 | 17629 | 17567 |
| 10 | 17232 | 17467 | 18116 | 18417 | 18710 | 18968 | 21130 | 22204 | 20165 | 12731 | 11401 | 17677 | 20098 | 19514 | 19459 |
| 100 | 9485 | 9710 | 10340 | 10640 | 10935 | 11193 | 13393 | 14485 | 12936 | 5336 | 4079 | 11272 | 12734 | 12136 | 12075 |
| 101 | 10019 | 10237 | 10830 | 11124 | 11412 | 11669 | 13822 | 14903 | 13178 | 5965 | 4719 | 11917 | 13350 | 12751 | 12689 |
| 102 | 8745 | 8978 | 9643 | 9950 | 10252 | 10511 | 12757 | 13860 | 12517 | 4524 | 3269 | 10487 | 11928 | 11330 | 11269 |
| 103 | 8012 | 8247 | 8925 | 9234 | 9538 | 9798 | 12065 | 13173 | 11964 | 3832 | 2618 | 9901 | 11214 | 10615 | 10554 |
| 104 | 7332 | 7570 | 8265 | 8577 | 8885 | 9145 | 11438 | 12551 | 11493 | 3186 | 2038 | 9346 | 10539 | 9940 | 9878 |
| 105 | 7264 | 7483 | 8101 | 8402 | 8698 | 8957 | 11180 | 12280 | 11007 | 3510 | 2516 | 9784 | 10713 | 10113 | 10049 |
| 106 | 6650 | 6875 | 7521 | 7827 | 8128 | 8388 | 10648 | 11756 | 10666 | 2929 | 2062 | 9240 | 10079 | 9480 | 9416 |
| 107 | 7868 | 8076 | 8648 | 8941 | 9228 | 9484 | 11649 | 12736 | 11231 | 4206 | 3174 | 10466 | 11398 | 10799 | 10735 |
| 108 | 8760 | 8953 | 9454 | 9734 | 10006 | 10258 | 12329 | 13392 | 11552 | 5261 | 4211 | 11512 | 12413 | 11815 | 11750 |
| 109 | 7965 | 8152 | 8636 | 8913 | 9184 | 9436 | 11505 | 12570 | 10808 | 4706 | 3789 | 11020 | 11707 | 11110 | 11044 |
| 11 | 16785 | 17040 | 17781 | 18096 | 18406 | 18666 | 20940 | 22042 | 20393 | 12069 | 10755 | 16528 | 19284 | 18715 | 18664 |
| 110 | 8450 | 8631 | 9089 | 9361 | 9626 | 9875 | 11904 | 12958 | 11047 | 5208 | 4254 | 11513 | 12222 | 11625 | 11559 |
| 111 | 5792 | 5996 | 6570 | 6868 | 7160 | 7417 | 9634 | 10736 | 9635 | 2849 | 2455 | 9132 | 9499 | 8904 | 8837 |
| 112 | 6696 | 6896 | 7446 | 7737 | 8023 | 8279 | 10449 | 11539 | 10184 | 3475 | 2754 | 9806 | 10376 | 9779 | 9713 |
| 12 | 16716 | 16987 | 17809 | 18134 | 18455 | 18716 | 21074 | 22195 | 20906 | 11863 | 10596 | 15748 | 18831 | 18280 | 18234 |
| 13 | 17797 | 18053 | 18799 | 19114 | 19424 | 19684 | 21958 | 23061 | 21386 | 13066 | 11756 | 17412 | 20250 | 19684 | 19634 |
| 14 | 19986 | 20215 | 20832 | 21126 | 21413 | 21669 | 23776 | 24834 | 22562 | 15537 | 14207 | 20455 | 22912 | 22327 | 22272 |
| 15 | 17585 | 17853 | 18659 | 18982 | 19301 | 19562 | 21901 | 23018 | 21618 | 12753 | 11475 | 16689 | 19759 | 19206 | 19159 |
| 16 | 18564 | 18829 | 19614 | 19935 | 20250 | 20512 | 22827 | 23939 | 22411 | 13759 | 12470 | 17765 | 20810 | 20255 | 20207 |
| 17 | 18634 | 18887 | 19618 | 19931 | 20239 | 20499 | 22753 | 23851 | 22080 | 13928 | 12614 | 18305 | 21133 | 20565 | 20514 |
| 18 | 19479 | 19729 | 20447 | 20757 | 21062 | 21322 | 23558 | 24650 | 22793 | 14795 | 13478 | 19197 | 22016 | 21447 | 21397 |
| 19 | 19633 | 19898 | 20682 | 21002 | 21318 | 21579 | 23891 | 25002 | 23435 | 14825 | 13538 | 18758 | 21856 | 21303 | 21256 |
| 2 | 15625 | 15815 | 16273 | 16539 | 16796 | 17041 | 18961 | 19969 | 17355 | 11759 | 10494 | 17541 | 19141 | 18542 | 18479 |
| 20 | 21146 | 21401 | 22141 | 22455 | 22763 | 23023 | 25280 | 26378 | 24561 | 16409 | 15102 | 20564 | 23550 | 22989 | 22940 |
| 21 | 20039 | 20281 | 20958 | 21262 | 21560 | 21818 | 24002 | 25081 | 23038 | 15441 | 14115 | 20046 | 22735 | 22159 | 22107 |
| 22 | 21801 | 22049 | 22754 | 23063 | 23365 | 23625 | 25839 | 26925 | 24943 | 17129 | 15810 | 21464 | 24344 | 23776 | 23726 |
| 23 | 21818 | 22054 | 22702 | 23001 | 23293 | 23550 | 25691 | 26757 | 24542 | 17275 | 15946 | 21938 | 24596 | 24018 | 23964 |
| 24 | 19052 | 19290 | 19950 | 20251 | 20546 | 20804 | 22971 | 24046 | 21972 | 14503 | 13174 | 19263 | 21835 | 21255 | 21202 |
| 25 | 21363 | 21587 | 22180 | 22470 | 22751 | 23006 | 25075 | 26122 | 23715 | 16962 | 15633 | 21917 | 24349 | 23763 | 23708 |
| 26 | 22677 | 22919 | 23596 | 23900 | 24197 | 24455 | 26631 | 27707 | 25584 | 18060 | 16736 | 22518 | 25323 | 24751 | 24700 |
| 27 | 22360 | 22587 | 23193 | 23486 | 23770 | 24025 | 26109 | 27159 | 24772 | 17914 | 16584 | 22757 | 25282 | 24699 | 24644 |
| 28 | 20882 | 21122 | 21786 | 22088 | 22383 | 22641 | 24806 | 25880 | 23759 | 16307 | 14979 | 20931 | 23611 | 23035 | 22982 |
| 29 | 20297 | 20549 | 21271 | 21582 | 21888 | 22148 | 24387 | 25480 | 23617 | 15598 | 14283 | 19914 | 22795 | 22228 | 22178 |
| 3 | 15627 | 15848 | 16441 | 16733 | 17016 | 17271 | 19371 | 20431 | 18265 | 11315 | 9994 | 16648 | 18737 | 18145 | 18086 |
| 30 | 18129 | 18367 | 19031 | 19333 | 19629 | 19887 | 22062 | 23140 | 21115 | 13581 | 12252 | 18388 | 20920 | 20339 | 20285 |
| 31 | 20570 | 20789 | 21364 | 21651 | 21930 | 22183 | 24231 | 25272 | 22826 | 16227 | 14900 | 21305 | 23633 | 23044 | 22987 |
| 4 | 16498 | 16718 | 17304 | 17594 | 17876 | 18130 | 20215 | 21270 | 19032 | 12190 | 10868 | 17482 | 19610 | 19018 | 18960 |
| 5 | 17439 | 17658 | 18238 | 18527 | 18807 | 19061 | 21132 | 22182 | 19878 | 13130 | 11807 | 18378 | 20548 | 19957 | 19899 |
| 6 | 15344 | 15583 | 16254 | 16559 | 16857 | 17115 | 19313 | 20399 | 18535 | 10815 | 9484 | 15818 | 18181 | 17597 | 17542 |
| 7 | 15707 | 15962 | 16705 | 17020 | 17330 | 17591 | 19869 | 20974 | 19379 | 10999 | 9683 | 15555 | 18235 | 17663 | 17612 |
| 71 | 11839 | 12081 | 12772 | 13080 | 13384 | 13643 | 15885 | 16984 | 15421 | 7339 | 6011 | 12678 | 14743 | 14154 | 14097 |
| 72 | 11301 | 11543 | 12239 | 12549 | 12853 | 13113 | 15365 | 16466 | 14966 | 6804 | 5477 | 12203 | 14213 | 13623 | 13565 |
| 73 | 10704 | 10950 | 11665 | 11978 | 12286 | 12546 | 14822 | 15929 | 14551 | 6172 | 4843 | 11585 | 13577 | 12987 | 12930 |
| 74 | 12280 | 12516 | 13179 | 13484 | 13782 | 14041 | 16250 | 17340 | 15644 | 7848 | 6523 | 13244 | 15263 | 14672 | 14614 |
| 75 | 12868 | 13096 | 13721 | 14019 | 14310 | 14567 | 16728 | 17806 | 15930 | 8536 | 7219 | 14016 | 15961 | 15368 | 15309 |
| 76 | 13535 | 13755 | 14347 | 14639 | 14923 | 15179 | 17293 | 18359 | 16319 | 9288 | 7977 | 14820 | 16714 | 16119 | 16060 |
| 77 | 12280 | 12501 | 13102 | 13396 | 13684 | 13940 | 16076 | 17149 | 15235 | 8053 | 6751 | 13693 | 15478 | 14882 | 14822 |
| 78 | 13397 | 13605 | 14145 | 14428 | 14703 | 14955 | 17007 | 18056 | 15854 | 9330 | 8045 | 15048 | 16741 | 16143 | 16082 |
| 79 | 14038 | 14245 | 14782 | 15065 | 15338 | 15590 | 17631 | 18677 | 16417 | 9956 | 8666 | 15628 | 17372 | 16775 | 16714 |
| 8 | 16261 | 16497 | 17156 | 17458 | 17754 | 18012 | 20190 | 21270 | 19312 | 11749 | 10419 | 16730 | 19118 | 18533 | 18478 |
| 80 | 12592 | 12802 | 13353 | 13638 | 13916 | 14169 | 16242 | 17298 | 15192 | 8526 | 7246 | 14291 | 15933 | 15335 | 15274 |
| 81 | 11494 | 11712 | 12299 | 12591 | 12877 | 13132 | 15261 | 16334 | 14441 | 7356 | 6073 | 13134 | 14769 | 14171 | 14111 |
| 82 | 10603 | 10836 | 11492 | 11796 | 12095 | 12353 | 14569 | 15663 | 14086 | 6271 | 4964 | 11944 | 13697 | 13102 | 13043 |
| 83 | 10505 | 10726 | 11335 | 11631 | 11921 | 12178 | 14343 | 15425 | 13696 | 6354 | 5079 | 12198 | 13763 | 13165 | 13104 |
| 84 | 11721 | 11925 | 12453 | 12735 | 13009 | 13261 | 15316 | 16368 | 14264 | 7790 | 6543 | 13706 | 15162 | 14563 | 14501 |
| 85 | 11329 | 11526 | 12030 | 12308 | 12578 | 12828 | 14860 | 15907 | 13767 | 7517 | 6301 | 13526 | 14850 | 14251 | 14187 |
| 86 | 8996 | 9149 | 9491 | 9740 | 9980 | 10220 | 12094 | 13107 | 10806 | 6182 | 5309 | 12510 | 12977 | 12386 | 12318 |
| 87 | 8413 | 8572 | 8943 | 9199 | 9447 | 9690 | 11617 | 12646 | 10516 | 5584 | 4749 | 11915 | 12365 | 11772 | 11705 |
| 88 | 7276 | 7444 | 7863 | 8130 | 8391 | 8638 | 10656 | 11711 | 9914 | 4522 | 3830 | 10845 | 11197 | 10605 | 10537 |
| 89 | 6548 | 6718 | 7154 | 7426 | 7691 | 7941 | 10001 | 11069 | 9468 | 3979 | 3457 | 10265 | 10486 | 9895 | 9827 |
| 9 | 18381 | 18607 | 19214 | 19507 | 19792 | 20047 | 22149 | 23206 | 20958 | 13980 | 12651 | 19046 | 21376 | 20789 | 20732 |
| 90 | 6013 | 6186 | 6641 | 6917 | 7188 | 7440 | 9539 | 10616 | 9186 | 3599 | 3233 | 9832 | 9956 | 9367 | 9299 |
| 91 | 6757 | 6905 | 7253 | 7507 | 7755 | 7999 | 9956 | 10999 | 9150 | 4542 | 4063 | 10793 | 10838 | 10253 | 10184 |
| 92 | 7770 | 7923 | 8276 | 8530 | 8776 | 9018 | 10944 | 11975 | 9920 | 5187 | 4480 | 11509 | 11786 | 11197 | 11129 |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 8694 | 8953 | 9734 | 10056 | 10375 | 10636 | 12990 | 14113 | 13174 | 4047 | 2717 | 9588 | 11445 | 10855 | 10798 |
| 94 | 9275 | 9533 | 10304 | 10625 | 10942 | 11203 | 13544 | 14665 | 13629 | 4631 | 3301 | 10070 | 12019 | 11430 | 11374 |
| 95 | 9632 | 9884 | 10629 | 10946 | 11259 | 11520 | 13834 | 14949 | 13779 | 5054 | 3725 | 10542 | 12458 | 11868 | 11811 |
| 96 | 10061 | 10304 | 11009 | 11321 | 11627 | 11888 | 14159 | 15266 | 13911 | 5590 | 4269 | 11168 | 13012 | 12419 | 12361 |
| 97 | 8164 | 8414 | 9156 | 9474 | 9788 | 10049 | 12373 | 13492 | 12475 | 3695 | 2393 | 9541 | 11121 | 10526 | 10467 |
| 98 | 8690 | 8936 | 9660 | 9975 | 10286 | 10547 | 12850 | 13964 | 12822 | 4242 | 2936 | 10030 | 11669 | 11074 | 11015 |
| 99 | 9303 | 9547 | 10254 | 10567 | 10875 | 11135 | 13417 | 14526 | 13260 | 4869 | 3557 | 10585 | 12295 | 11701 | 11642 |
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T30 | 7471 | 7562 | 8247 | 8343 | 8473 | 8491 | 9912 | 10547 | 14064 | 9214 | 10427 | 3990 | 3016 | 3392 | 3457 |
| T31 | 6218 | 6329 | 7083 | 7206 | 7365 | 7407 | 9035 | 9767 | 13015 | 7925 | 9160 | 3257 | 2008 | 2230 | 2287 |
| T32 | 8524 | 8625 | 9327 | 9426 | 9559 | 9577 | 10974 | 11585 | 15148 | 9983 | 11150 | 4286 | 4102 | 4465 | 4529 |
| T33 | 7483 | 7604 | 8370 | 8495 | 8652 | 8692 | 10268 | 10962 | 14297 | 8804 | 9978 | 3287 | 3257 | 3517 | 3575 |
| T34 | 6090 | 6237 | 7081 | 7239 | 7429 | 7498 | 9295 | 10091 | 13106 | 7329 | 8532 | 2492 | 2361 | 2390 | 2431 |
| T35 | 5598 | 5775 | 6697 | 6886 | 7105 | 7201 | 9163 | 10026 | 12774 | 6497 | 7692 | 2024 | 2541 | 2363 | 2381 |
| T36 | 9070 | 9195 | 9964 | 10087 | 10240 | 10276 | 11785 | 12434 | 15875 | 10073 | 11178 | 4031 | 4817 | 5107 | 5166 |
| T37 | 8353 | 8499 | 9327 | 9472 | 9649 | 9704 | 11362 | 12078 | 15316 | 9129 | 10222 | 3077 | 4335 | 4532 | 4584 |
| T38 | 7241 | 7409 | 8296 | 8468 | 8669 | 8747 | 10571 | 11364 | 14348 | 7862 | 8970 | 2006 | 3614 | 3666 | 3706 |
| T39 | 8639 | 8809 | 9699 | 9869 | 10067 | 10142 | 11920 | 12682 | 15746 | 8932 | 9956 | 2662 | 4913 | 5026 | 5070 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

| | |
|---|---|
| LWA,ref: | Sound pressure level at WTG |
| K: | Pure tone |
| Dc: | Directivity correction |
| Adiv: | the attenuation due to geometrical divergence |
| Aatm: | the attenuation due to atmospheric absorption |
| Agr: | the attenuation due to ground effect |
| Abar: | the attenuation due to a barrier |
| Amisc: | the attenuation due to miscellaneous other effects |
| Cmet: | Meteorological correction |

## Calculation Results

### Noise sensitive area: A Lomarakennus A (Syvälahti)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 841 | 14 843 | **4,53** | 108,9 | 0,00 | 94,43 | - | - | 0,00 | 0,00 | - |
| 10 | 17 232 | 17 233 | **2,64** | 108,9 | 0,00 | 95,73 | - | - | 0,00 | 0,00 | - |
| 100 | 9 485 | 9 487 | **4,99** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 101 | 10 019 | 10 021 | **4,33** | 106,0 | 0,00 | 91,02 | - | - | 0,00 | 0,00 | - |
| 102 | 8 745 | 8 747 | **5,97** | 106,0 | 0,00 | 89,84 | - | - | 0,00 | 0,00 | - |
| 103 | 8 012 | 8 015 | **7,02** | 106,0 | 0,00 | 89,08 | - | - | 0,00 | 0,00 | - |
| 104 | 7 332 | 7 334 | **8,09** | 106,0 | 0,00 | 88,31 | - | - | 0,00 | 0,00 | - |
| 105 | 7 264 | 7 266 | **8,20** | 106,0 | 0,00 | 88,23 | - | - | 0,00 | 0,00 | - |
| 106 | 6 650 | 6 653 | **9,25** | 106,0 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| 107 | 7 868 | 7 870 | **7,24** | 106,0 | 0,00 | 88,92 | - | - | 0,00 | 0,00 | - |
| 108 | 8 760 | 8 762 | **5,95** | 106,0 | 0,00 | 89,85 | - | - | 0,00 | 0,00 | - |
| 109 | 7 965 | 7 967 | **7,09** | 106,0 | 0,00 | 89,03 | - | - | 0,00 | 0,00 | - |
| 11 | 16 785 | 16 786 | **2,98** | 108,9 | 0,00 | 95,50 | - | - | 0,00 | 0,00 | - |
| 110 | 8 450 | 8 452 | **6,38** | 106,0 | 0,00 | 89,54 | - | - | 0,00 | 0,00 | - |
| 111 | 5 792 | 5 795 | **10,89** | 106,0 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| 112 | 6 696 | 6 698 | **9,17** | 106,0 | 0,00 | 87,52 | - | - | 0,00 | 0,00 | - |
| 12 | 16 716 | 16 717 | **3,06** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 13 | 17 797 | 17 798 | **2,24** | 108,9 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 14 | 19 986 | 19 988 | **0,76** | 108,9 | 0,00 | 97,02 | - | - | 0,00 | 0,00 | - |
| 15 | 17 585 | 17 587 | **2,40** | 108,9 | 0,00 | 95,90 | - | - | 0,00 | 0,00 | - |
| 16 | 18 564 | 18 566 | **1,70** | 108,9 | 0,00 | 96,37 | - | - | 0,00 | 0,00 | - |
| 17 | 18 634 | 18 636 | **1,66** | 108,9 | 0,00 | 96,41 | - | - | 0,00 | 0,00 | - |
| 18 | 19 479 | 19 480 | **1,11** | 108,9 | 0,00 | 96,79 | - | - | 0,00 | 0,00 | - |
| 19 | 19 633 | 19 634 | **0,99** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 2 | 15 625 | 15 627 | **3,88** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 20 | 21 146 | 21 147 | **0,03** | 108,9 | 0,00 | 97,51 | - | - | 0,00 | 0,00 | - |
| 21 | 20 039 | 20 041 | **0,72** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 22 | 21 801 | 21 802 | **-0,34** | 108,9 | 0,00 | 97,77 | - | - | 0,00 | 0,00 | - |
| 23 | 21 818 | 21 820 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 24 | 19 052 | 19 053 | **1,37** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 25 | 21 363 | 21 364 | **-0,10** | 108,9 | 0,00 | 97,59 | - | - | 0,00 | 0,00 | - |
| 26 | 22 677 | 22 678 | **-0,88** | 108,9 | 0,00 | 98,11 | - | - | 0,00 | 0,00 | - |
| 27 | 22 360 | 22 361 | **-0,69** | 108,9 | 0,00 | 97,99 | - | - | 0,00 | 0,00 | - |
| 28 | 20 882 | 20 884 | **0,19** | 108,9 | 0,00 | 97,40 | - | - | 0,00 | 0,00 | - |
| 29 | 20 297 | 20 298 | **0,56** | 108,9 | 0,00 | 97,15 | - | - | 0,00 | 0,00 | - |
| 3 | 15 627 | 15 629 | **3,87** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 30 | 18 129 | 18 131 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 31 | 20 570 | 20 571 | **0,39** | 108,9 | 0,00 | 97,27 | - | - | 0,00 | 0,00 | - |
| 4 | 16 498 | 16 500 | **3,19** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 5 | 17 439 | 17 441 | **2,49** | 108,9 | 0,00 | 95,83 | - | - | 0,00 | 0,00 | - |
| 6 | 15 344 | 15 346 | **4,10** | 108,9 | 0,00 | 94,72 | - | - | 0,00 | 0,00 | - |
| 7 | 15 707 | 15 708 | **3,82** | 108,9 | 0,00 | 94,92 | - | - | 0,00 | 0,00 | - |
| 71 | 11 839 | 11 841 | **2,30** | 106,0 | 0,00 | 92,47 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | 11 301 | 11 302 | **2,87** | 106,0 | 0,00 | 92,06 | - | - | 0,00 | 0,00 | - |
| 73 | 10 704 | 10 706 | **3,52** | 106,0 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| 74 | 12 280 | 12 281 | **1,86** | 106,0 | 0,00 | 92,78 | - | - | 0,00 | 0,00 | - |
| 75 | 12 868 | 12 870 | **1,29** | 106,0 | 0,00 | 93,19 | - | - | 0,00 | 0,00 | - |
| 76 | 13 535 | 13 536 | **0,67** | 106,0 | 0,00 | 93,63 | - | - | 0,00 | 0,00 | - |
| 77 | 12 280 | 12 281 | **1,86** | 106,0 | 0,00 | 92,78 | - | - | 0,00 | 0,00 | - |
| 78 | 13 397 | 13 398 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 79 | 14 038 | 14 039 | **0,23** | 106,0 | 0,00 | 93,95 | - | - | 0,00 | 0,00 | - |
| 8 | 16 261 | 16 262 | **3,38** | 108,9 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 80 | 12 592 | 12 593 | **1,55** | 106,0 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| 81 | 11 494 | 11 496 | **2,66** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |
| 82 | 10 603 | 10 605 | **3,64** | 106,0 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 83 | 10 505 | 10 507 | **3,75** | 106,0 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| 84 | 11 721 | 11 723 | **2,43** | 106,0 | 0,00 | 92,38 | - | - | 0,00 | 0,00 | - |
| 85 | 11 329 | 11 330 | **2,84** | 106,0 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 86 | 8 996 | 8 998 | **5,63** | 106,0 | 0,00 | 90,08 | - | - | 0,00 | 0,00 | - |
| 87 | 8 413 | 8 415 | **6,44** | 106,0 | 0,00 | 89,50 | - | - | 0,00 | 0,00 | - |
| 88 | 7 276 | 7 278 | **8,18** | 106,0 | 0,00 | 88,24 | - | - | 0,00 | 0,00 | - |
| 89 | 6 548 | 6 550 | **9,44** | 106,0 | 0,00 | 87,33 | - | - | 0,00 | 0,00 | - |
| 9 | 18 381 | 18 383 | **1,83** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 90 | 6 013 | 6 016 | **10,44** | 106,0 | 0,00 | 86,59 | - | - | 0,00 | 0,00 | - |
| 91 | 6 757 | 6 760 | **9,06** | 106,0 | 0,00 | 87,60 | - | - | 0,00 | 0,00 | - |
| 92 | 7 770 | 7 772 | **7,39** | 106,0 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| 93 | 8 694 | 8 695 | **6,04** | 106,0 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| 94 | 9 275 | 9 277 | **5,26** | 106,0 | 0,00 | 90,35 | - | - | 0,00 | 0,00 | - |
| 95 | 9 632 | 9 634 | **4,82** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 96 | 10 061 | 10 062 | **4,28** | 106,0 | 0,00 | 91,05 | - | - | 0,00 | 0,00 | - |
| 97 | 8 164 | 8 166 | **6,80** | 106,0 | 0,00 | 89,24 | - | - | 0,00 | 0,00 | - |
| 98 | 8 690 | 8 692 | **6,05** | 106,0 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| 99 | 9 303 | 9 305 | **5,22** | 106,0 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T1 | 6 000 | 6 004 | **15,94** | 110,1 | 0,00 | 86,57 | - | - | 0,00 | 0,00 | - |
| T10 | 4 760 | 4 765 | **19,09** | 110,1 | 0,00 | 84,56 | - | - | 0,00 | 0,00 | - |
| T11 | 6 091 | 6 094 | **15,72** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T12 | 3 465 | 3 471 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T13 | 3 747 | 3 753 | **22,28** | 110,1 | 0,00 | 82,49 | - | - | 0,00 | 0,00 | - |
| T14 | 4 867 | 4 872 | **18,79** | 110,1 | 0,00 | 84,75 | - | - | 0,00 | 0,00 | - |
| T15 | 5 872 | 5 876 | **16,22** | 110,1 | 0,00 | 86,38 | - | - | 0,00 | 0,00 | - |
| T16 | 2 570 | 2 579 | **27,10** | 110,1 | 0,00 | 79,23 | - | - | 0,00 | 0,00 | - |
| T17 | 4 073 | 4 079 | **21,18** | 110,1 | 0,00 | 83,21 | - | - | 0,00 | 0,00 | - |
| T18 | 5 148 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T19 | 2 022 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 802 | 5 806 | **16,39** | 110,1 | 0,00 | 86,28 | - | - | 0,00 | 0,00 | - |
| T20 | 3 148 | 3 155 | **24,55** | 110,1 | 0,00 | 80,98 | - | - | 0,00 | 0,00 | - |
| T21 | 4 649 | 4 654 | **19,41** | 110,1 | 0,00 | 84,36 | - | - | 0,00 | 0,00 | - |
| T22 | 2 516 | 2 525 | **27,37** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T23 | 3 482 | 3 489 | **23,24** | 110,1 | 0,00 | 81,85 | - | - | 0,00 | 0,00 | - |
| T24 | 5 142 | 5 147 | **18,04** | 110,1 | 0,00 | 85,23 | - | - | 0,00 | 0,00 | - |
| T25 | 3 207 | 3 214 | **24,31** | 110,1 | 0,00 | 81,14 | - | - | 0,00 | 0,00 | - |
| T26 | 3 916 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 5 092 | 5 096 | **18,18** | 110,1 | 0,00 | 85,14 | - | - | 0,00 | 0,00 | - |
| T28 | 3 716 | 3 722 | **22,40** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T29 | 4 551 | 4 556 | **19,70** | 110,1 | 0,00 | 84,17 | - | - | 0,00 | 0,00 | - |
| T3 | 4 836 | 4 841 | **18,88** | 110,1 | 0,00 | 84,70 | - | - | 0,00 | 0,00 | - |
| T30 | 7 471 | 7 474 | **14,30** | 110,1 | 0,00 | 88,47 | - | - | 0,00 | 0,00 | - |
| T31 | 6 218 | 6 221 | **16,54** | 110,1 | 0,00 | 86,88 | - | - | 0,00 | 0,00 | - |
| T32 | 8 524 | 8 527 | **12,64** | 110,1 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| T33 | 7 483 | 7 486 | **14,22** | 110,1 | 0,00 | 88,49 | - | - | 0,00 | 0,00 | - |
| T34 | 6 090 | 6 094 | **16,75** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T35 | 5 598 | 5 602 | **17,68** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T36 | 9 070 | 9 072 | **11,80** | 110,1 | 0,00 | 90,15 | - | - | 0,00 | 0,00 | - |
| T37 | 8 353 | 8 356 | **12,79** | 110,1 | 0,00 | 89,44 | - | - | 0,00 | 0,00 | - |
| T38 | 7 241 | 7 245 | **14,37** | 110,1 | 0,00 | 88,20 | - | - | 0,00 | 0,00 | - |
| T39 | 8 639 | 8 641 | **12,15** | 110,1 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| T4 | 5 263 | 5 268 | **17,73** | 110,1 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T5 | 3 967 | 3 973 | **21,53** | 110,1 | 0,00 | 82,98 | - | - | 0,00 | 0,00 | - |
| T6 | 4 724 | 4 729 | **19,19** | 110,1 | 0,00 | 84,50 | - | - | 0,00 | 0,00 | - |
| T7 | 5 704 | 5 708 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T8 | 6 472 | 6 476 | **14,87** | 110,1 | 0,00 | 87,23 | - | - | 0,00 | 0,00 | - |
| T9 | 3 559 | 3 565 | **22,96** | 110,1 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,42** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 043 | 15 045 | **4,36** | 108,9 | 0,00 | 94,55 | - | - | 0,00 | 0,00 | - |
| 10 | 17 467 | 17 468 | **2,47** | 108,9 | 0,00 | 95,84 | - | - | 0,00 | 0,00 | - |
| 100 | 9 710 | 9 712 | **4,70** | 106,0 | 0,00 | 90,75 | - | - | 0,00 | 0,00 | - |
| 101 | 10 237 | 10 238 | **4,07** | 106,0 | 0,00 | 91,20 | - | - | 0,00 | 0,00 | - |
| 102 | 8 978 | 8 980 | **5,65** | 106,0 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| 103 | 8 247 | 8 249 | **6,68** | 106,0 | 0,00 | 89,33 | - | - | 0,00 | 0,00 | - |
| 104 | 7 570 | 7 572 | **7,71** | 106,0 | 0,00 | 88,58 | - | - | 0,00 | 0,00 | - |
| 105 | 7 483 | 7 485 | **7,84** | 106,0 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| 106 | 6 875 | 6 877 | **8,86** | 106,0 | 0,00 | 87,75 | - | - | 0,00 | 0,00 | - |
| 107 | 8 076 | 8 078 | **6,93** | 106,0 | 0,00 | 89,15 | - | - | 0,00 | 0,00 | - |
| 108 | 8 953 | 8 955 | **5,69** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 109 | 8 152 | 8 154 | **6,82** | 106,0 | 0,00 | 89,23 | - | - | 0,00 | 0,00 | - |
| 11 | 17 040 | 17 041 | **2,79** | 108,9 | 0,00 | 95,63 | - | - | 0,00 | 0,00 | - |
| 110 | 8 631 | 8 633 | **6,13** | 106,0 | 0,00 | 89,72 | - | - | 0,00 | 0,00 | - |
| 111 | 5 996 | 5 998 | **10,48** | 106,0 | 0,00 | 86,56 | - | - | 0,00 | 0,00 | - |
| 112 | 6 896 | 6 899 | **8,82** | 106,0 | 0,00 | 87,78 | - | - | 0,00 | 0,00 | - |
| 12 | 16 987 | 16 988 | **2,86** | 108,9 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 13 | 18 053 | 18 054 | **2,06** | 108,9 | 0,00 | 96,13 | - | - | 0,00 | 0,00 | - |
| 14 | 20 215 | 20 216 | **0,61** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 15 | 17 853 | 17 855 | **2,20** | 108,9 | 0,00 | 96,04 | - | - | 0,00 | 0,00 | - |
| 16 | 18 829 | 18 830 | **1,52** | 108,9 | 0,00 | 96,50 | - | - | 0,00 | 0,00 | - |
| 17 | 18 887 | 18 889 | **1,49** | 108,9 | 0,00 | 96,52 | - | - | 0,00 | 0,00 | - |
| 18 | 19 729 | 19 731 | **0,94** | 108,9 | 0,00 | 96,90 | - | - | 0,00 | 0,00 | - |
| 19 | 19 898 | 19 899 | **0,81** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 2 | 15 815 | 15 817 | **3,72** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 20 | 21 401 | 21 403 | **-0,12** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 21 | 20 281 | 20 282 | **0,57** | 108,9 | 0,00 | 97,14 | - | - | 0,00 | 0,00 | - |
| 22 | 22 049 | 22 050 | **-0,49** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 23 | 22 054 | 22 056 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 24 | 19 290 | 19 291 | **1,21** | 108,9 | 0,00 | 96,71 | - | - | 0,00 | 0,00 | - |
| 25 | 21 587 | 21 588 | **-0,24** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 26 | 22 919 | 22 920 | **-1,01** | 108,9 | 0,00 | 98,20 | - | - | 0,00 | 0,00 | - |
| 27 | 22 587 | 22 588 | **-0,82** | 108,9 | 0,00 | 98,08 | - | - | 0,00 | 0,00 | - |
| 28 | 21 122 | 21 123 | **0,05** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 29 | 20 549 | 20 550 | **0,40** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 3 | 15 848 | 15 850 | **3,70** | 108,9 | 0,00 | 95,00 | - | - | 0,00 | 0,00 | - |
| 30 | 18 367 | 18 369 | **1,84** | 108,9 | 0,00 | 96,28 | - | - | 0,00 | 0,00 | - |
| 31 | 20 789 | 20 791 | **0,25** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 4 | 16 718 | 16 720 | **3,03** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 5 | 17 658 | 17 660 | **2,34** | 108,9 | 0,00 | 95,94 | - | - | 0,00 | 0,00 | - |
| 6 | 15 583 | 15 585 | **3,91** | 108,9 | 0,00 | 94,85 | - | - | 0,00 | 0,00 | - |
| 7 | 15 962 | 15 963 | **3,62** | 108,9 | 0,00 | 95,06 | - | - | 0,00 | 0,00 | - |
| 71 | 12 081 | 12 082 | **2,06** | 106,0 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 72 | 11 543 | 11 545 | **2,61** | 106,0 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| 73 | 10 950 | 10 952 | **3,25** | 106,0 | 0,00 | 91,79 | - | - | 0,00 | 0,00 | - |
| 74 | 12 516 | 12 517 | **1,63** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 75 | 13 096 | 13 097 | **1,08** | 106,0 | 0,00 | 93,34 | - | - | 0,00 | 0,00 | - |
| 76 | 13 755 | 13 756 | **0,48** | 106,0 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 77 | 12 501 | 12 503 | **1,64** | 106,0 | 0,00 | 92,94 | - | - | 0,00 | 0,00 | - |
| 78 | 13 605 | 13 606 | **0,61** | 106,0 | 0,00 | 93,67 | - | - | 0,00 | 0,00 | - |
| 79 | 14 245 | 14 247 | **0,05** | 106,0 | 0,00 | 94,07 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 16 497 | 16 499 | **3,19** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 80 | 12 802 | 12 803 | **1,35** | 106,0 | 0,00 | 93,15 | - | - | 0,00 | 0,00 | - |
| 81 | 11 712 | 11 713 | **2,43** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 82 | 10 836 | 10 838 | **3,38** | 106,0 | 0,00 | 91,70 | - | - | 0,00 | 0,00 | - |
| 83 | 10 726 | 10 728 | **3,50** | 106,0 | 0,00 | 91,61 | - | - | 0,00 | 0,00 | - |
| 84 | 11 925 | 11 926 | **2,24** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 85 | 11 526 | 11 527 | **2,63** | 106,0 | 0,00 | 92,23 | - | - | 0,00 | 0,00 | - |
| 86 | 9 149 | 9 151 | **5,42** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 87 | 8 572 | 8 574 | **6,21** | 106,0 | 0,00 | 89,66 | - | - | 0,00 | 0,00 | - |
| 88 | 7 444 | 7 447 | **7,91** | 106,0 | 0,00 | 88,44 | - | - | 0,00 | 0,00 | - |
| 89 | 6 718 | 6 721 | **9,13** | 106,0 | 0,00 | 87,55 | - | - | 0,00 | 0,00 | - |
| 9 | 18 607 | 18 609 | **1,67** | 108,9 | 0,00 | 96,39 | - | - | 0,00 | 0,00 | - |
| 90 | 6 186 | 6 189 | **10,11** | 106,0 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| 91 | 6 905 | 6 908 | **8,80** | 106,0 | 0,00 | 87,79 | - | - | 0,00 | 0,00 | - |
| 92 | 7 923 | 7 925 | **7,16** | 106,0 | 0,00 | 88,98 | - | - | 0,00 | 0,00 | - |
| 93 | 8 953 | 8 954 | **5,69** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 94 | 9 533 | 9 534 | **4,93** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 95 | 9 884 | 9 886 | **4,50** | 106,0 | 0,00 | 90,90 | - | - | 0,00 | 0,00 | - |
| 96 | 10 304 | 10 306 | **3,99** | 106,0 | 0,00 | 91,26 | - | - | 0,00 | 0,00 | - |
| 97 | 8 414 | 8 416 | **6,44** | 106,0 | 0,00 | 89,50 | - | - | 0,00 | 0,00 | - |
| 98 | 8 936 | 8 938 | **5,71** | 106,0 | 0,00 | 90,02 | - | - | 0,00 | 0,00 | - |
| 99 | 9 547 | 9 548 | **4,91** | 106,0 | 0,00 | 90,60 | - | - | 0,00 | 0,00 | - |
| T1 | 5 708 | 5 712 | **16,64** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T10 | 4 581 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T11 | 5 943 | 5 947 | **16,06** | 110,1 | 0,00 | 86,49 | - | - | 0,00 | 0,00 | - |
| T12 | 3 277 | 3 284 | **24,03** | 110,1 | 0,00 | 81,33 | - | - | 0,00 | 0,00 | - |
| T13 | 3 619 | 3 625 | **22,74** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T14 | 4 750 | 4 755 | **19,12** | 110,1 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |
| T15 | 5 764 | 5 769 | **16,48** | 110,1 | 0,00 | 86,22 | - | - | 0,00 | 0,00 | - |
| T16 | 2 455 | 2 465 | **27,67** | 110,1 | 0,00 | 78,84 | - | - | 0,00 | 0,00 | - |
| T17 | 4 001 | 4 007 | **21,42** | 110,1 | 0,00 | 83,06 | - | - | 0,00 | 0,00 | - |
| T18 | 5 082 | 5 088 | **18,20** | 110,1 | 0,00 | 85,13 | - | - | 0,00 | 0,00 | - |
| T19 | 2 021 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 525 | 5 530 | **17,06** | 110,1 | 0,00 | 85,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 143 | 3 151 | **24,56** | 110,1 | 0,00 | 80,97 | - | - | 0,00 | 0,00 | - |
| T21 | 4 641 | 4 646 | **19,43** | 110,1 | 0,00 | 84,34 | - | - | 0,00 | 0,00 | - |
| T22 | 2 624 | 2 633 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T23 | 3 542 | 3 549 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T24 | 5 168 | 5 172 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T25 | 3 380 | 3 387 | **23,63** | 110,1 | 0,00 | 81,60 | - | - | 0,00 | 0,00 | - |
| T26 | 4 026 | 4 032 | **21,34** | 110,1 | 0,00 | 83,11 | - | - | 0,00 | 0,00 | - |
| T27 | 5 168 | 5 173 | **17,97** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T28 | 3 949 | 3 955 | **21,59** | 110,1 | 0,00 | 82,94 | - | - | 0,00 | 0,00 | - |
| T29 | 4 707 | 4 712 | **19,24** | 110,1 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| T3 | 4 558 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T30 | 7 562 | 7 565 | **13,56** | 110,1 | 0,00 | 88,58 | - | - | 0,00 | 0,00 | - |
| T31 | 6 329 | 6 333 | **15,61** | 110,1 | 0,00 | 87,03 | - | - | 0,00 | 0,00 | - |
| T32 | 8 625 | 8 627 | **11,91** | 110,1 | 0,00 | 89,72 | - | - | 0,00 | 0,00 | - |
| T33 | 7 604 | 7 607 | **13,28** | 110,1 | 0,00 | 88,62 | - | - | 0,00 | 0,00 | - |
| T34 | 6 237 | 6 240 | **15,86** | 110,1 | 0,00 | 86,90 | - | - | 0,00 | 0,00 | - |
| T35 | 5 775 | 5 779 | **16,94** | 110,1 | 0,00 | 86,24 | - | - | 0,00 | 0,00 | - |
| T36 | 9 195 | 9 197 | **10,89** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T37 | 8 499 | 8 502 | **12,02** | 110,1 | 0,00 | 89,59 | - | - | 0,00 | 0,00 | - |
| T38 | 7 409 | 7 412 | **13,75** | 110,1 | 0,00 | 88,40 | - | - | 0,00 | 0,00 | - |
| T39 | 8 809 | 8 812 | **11,59** | 110,1 | 0,00 | 89,90 | - | - | 0,00 | 0,00 | - |
| T4 | 5 014 | 5 019 | **18,39** | 110,1 | 0,00 | 85,01 | - | - | 0,00 | 0,00 | - |
| T5 | 3 694 | 3 700 | **22,47** | 110,1 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| T6 | 4 506 | 4 511 | **19,83** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T7 | 5 500 | 5 504 | **17,12** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T8 | 6 292 | 6 296 | **15,27** | 110,1 | 0,00 | 86,98 | - | - | 0,00 | 0,00 | - |
| T9 | 3 317 | 3 323 | **23,88** | 110,1 | 0,00 | 81,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,48** | | | | | | | | |

- Data undefined due to calculation with octave data

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: C Lomarakennus C (Mutalahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 555 | 15 557 | **3,93** | 108,9 | 0,00 | 94,84 | - | - | 0,00 | 0,00 | - |
| 10 | 18 116 | 18 118 | **2,17** | 108,9 | 0,00 | 96,16 | - | - | 0,00 | 0,00 | - |
| 100 | 10 340 | 10 341 | **4,11** | 106,0 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| 101 | 10 830 | 10 831 | **3,49** | 106,0 | 0,00 | 91,69 | - | - | 0,00 | 0,00 | - |
| 102 | 9 643 | 9 645 | **5,03** | 106,0 | 0,00 | 90,69 | - | - | 0,00 | 0,00 | - |
| 103 | 8 925 | 8 927 | **6,00** | 106,0 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| 104 | 8 265 | 8 267 | **6,96** | 106,0 | 0,00 | 89,35 | - | - | 0,00 | 0,00 | - |
| 105 | 8 101 | 8 103 | **7,07** | 106,0 | 0,00 | 89,17 | - | - | 0,00 | 0,00 | - |
| 106 | 7 521 | 7 523 | **8,03** | 106,0 | 0,00 | 88,53 | - | - | 0,00 | 0,00 | - |
| 107 | 8 648 | 8 650 | **6,21** | 106,0 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| 108 | 9 454 | 9 456 | **5,03** | 106,0 | 0,00 | 90,51 | - | - | 0,00 | 0,00 | - |
| 109 | 8 636 | 8 638 | **6,12** | 106,0 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| 11 | 17 781 | 17 783 | **2,55** | 108,9 | 0,00 | 96,00 | - | - | 0,00 | 0,00 | - |
| 110 | 9 089 | 9 091 | **5,50** | 106,0 | 0,00 | 90,17 | - | - | 0,00 | 0,00 | - |
| 111 | 6 570 | 6 573 | **9,54** | 106,0 | 0,00 | 87,36 | - | - | 0,00 | 0,00 | - |
| 112 | 7 446 | 7 448 | **7,99** | 106,0 | 0,00 | 88,44 | - | - | 0,00 | 0,00 | - |
| 12 | 17 809 | 17 810 | **2,63** | 108,9 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 13 | 18 799 | 18 800 | **1,83** | 108,9 | 0,00 | 96,48 | - | - | 0,00 | 0,00 | - |
| 14 | 20 832 | 20 833 | **0,32** | 108,9 | 0,00 | 97,38 | - | - | 0,00 | 0,00 | - |
| 15 | 18 659 | 18 660 | **2,01** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 16 | 19 614 | 19 615 | **1,34** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 17 | 19 618 | 19 619 | **1,26** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 18 | 20 447 | 20 448 | **0,73** | 108,9 | 0,00 | 97,21 | - | - | 0,00 | 0,00 | - |
| 19 | 20 682 | 20 683 | **0,64** | 108,9 | 0,00 | 97,31 | - | - | 0,00 | 0,00 | - |
| 2 | 16 273 | 16 275 | **3,37** | 108,9 | 0,00 | 95,23 | - | - | 0,00 | 0,00 | - |
| 20 | 22 141 | 22 142 | **-0,32** | 108,9 | 0,00 | 97,90 | - | - | 0,00 | 0,00 | - |
| 21 | 20 958 | 20 959 | **0,32** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |
| 22 | 22 754 | 22 755 | **-0,72** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 23 | 22 702 | 22 703 | **-0,77** | 108,9 | 0,00 | 98,12 | - | - | 0,00 | 0,00 | - |
| 24 | 19 950 | 19 951 | **0,93** | 108,9 | 0,00 | 97,00 | - | - | 0,00 | 0,00 | - |
| 25 | 22 180 | 22 181 | **-0,52** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 26 | 23 596 | 23 597 | **-1,24** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 27 | 23 193 | 23 195 | **-1,10** | 108,9 | 0,00 | 98,31 | - | - | 0,00 | 0,00 | - |
| 28 | 21 786 | 21 787 | **-0,21** | 108,9 | 0,00 | 97,76 | - | - | 0,00 | 0,00 | - |
| 29 | 21 271 | 21 272 | **0,19** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |
| 3 | 16 441 | 16 443 | **3,32** | 108,9 | 0,00 | 95,32 | - | - | 0,00 | 0,00 | - |
| 30 | 19 031 | 19 032 | **1,55** | 108,9 | 0,00 | 96,59 | - | - | 0,00 | 0,00 | - |
| 31 | 21 364 | 21 366 | **-0,06** | 108,9 | 0,00 | 97,59 | - | - | 0,00 | 0,00 | - |
| 4 | 17 304 | 17 306 | **2,68** | 108,9 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 5 | 18 238 | 18 240 | **1,99** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 6 | 16 254 | 16 256 | **3,59** | 108,9 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 7 | 16 705 | 16 706 | **3,35** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 71 | 12 772 | 12 773 | **1,62** | 106,0 | 0,00 | 93,13 | - | - | 0,00 | 0,00 | - |
| 72 | 12 239 | 12 240 | **2,15** | 106,0 | 0,00 | 92,76 | - | - | 0,00 | 0,00 | - |
| 73 | 11 665 | 11 666 | **2,77** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 74 | 13 179 | 13 180 | **1,19** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 75 | 13 721 | 13 722 | **0,64** | 106,0 | 0,00 | 93,75 | - | - | 0,00 | 0,00 | - |
| 76 | 14 347 | 14 348 | **0,05** | 106,0 | 0,00 | 94,14 | - | - | 0,00 | 0,00 | - |
| 77 | 13 102 | 13 103 | **1,17** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 78 | 14 145 | 14 146 | **0,14** | 106,0 | 0,00 | 94,01 | - | - | 0,00 | 0,00 | - |
| 79 | 14 782 | 14 784 | **-0,40** | 106,0 | 0,00 | 94,40 | - | - | 0,00 | 0,00 | - |
| 8 | 17 156 | 17 158 | **2,88** | 108,9 | 0,00 | 95,69 | - | - | 0,00 | 0,00 | - |
| 80 | 13 353 | 13 354 | **0,86** | 106,0 | 0,00 | 93,51 | - | - | 0,00 | 0,00 | - |
| 81 | 12 299 | 12 300 | **1,93** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| 82 | 11 492 | 11 494 | **2,86** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |
| 83 | 11 335 | 11 336 | **2,96** | 106,0 | 0,00 | 92,09 | - | - | 0,00 | 0,00 | - |
| 84 | 12 453 | 12 454 | **1,69** | 106,0 | 0,00 | 92,91 | - | - | 0,00 | 0,00 | - |
| 85 | 12 030 | 12 032 | **2,11** | 106,0 | 0,00 | 92,61 | - | - | 0,00 | 0,00 | - |
| 86 | 9 491 | 9 493 | **4,98** | 106,0 | 0,00 | 90,55 | - | - | 0,00 | 0,00 | - |
| 87 | 8 943 | 8 945 | **5,70** | 106,0 | 0,00 | 90,03 | - | - | 0,00 | 0,00 | - |
| 88 | 7 863 | 7 865 | **7,25** | 106,0 | 0,00 | 88,91 | - | - | 0,00 | 0,00 | - |
| 89 | 7 154 | 7 156 | **8,38** | 106,0 | 0,00 | 88,09 | - | - | 0,00 | 0,00 | - |
| 9 | 19 214 | 19 215 | **1,35** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 6 641 | 6 643 | **9,27** | 106,0 | 0,00 | 87,45 | - | - | 0,00 | 0,00 | - |
| 91 | 7 253 | 7 255 | **8,22** | 106,0 | 0,00 | 88,21 | - | - | 0,00 | 0,00 | - |
| 92 | 8 276 | 8 279 | **6,63** | 106,0 | 0,00 | 89,36 | - | - | 0,00 | 0,00 | - |
| 93 | 9 734 | 9 735 | **5,10** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 94 | 10 304 | 10 306 | **4,39** | 106,0 | 0,00 | 91,26 | - | - | 0,00 | 0,00 | - |
| 95 | 10 629 | 10 630 | **3,96** | 106,0 | 0,00 | 91,53 | - | - | 0,00 | 0,00 | - |
| 96 | 11 009 | 11 010 | **3,47** | 106,0 | 0,00 | 91,84 | - | - | 0,00 | 0,00 | - |
| 97 | 9 156 | 9 158 | **5,79** | 106,0 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| 98 | 9 660 | 9 662 | **5,10** | 106,0 | 0,00 | 90,70 | - | - | 0,00 | 0,00 | - |
| 99 | 10 254 | 10 256 | **4,35** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| T1 | 4 594 | 4 600 | **19,57** | 110,1 | 0,00 | 84,25 | - | - | 0,00 | 0,00 | - |
| T10 | 3 787 | 3 794 | **22,14** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T11 | 5 236 | 5 240 | **17,80** | 110,1 | 0,00 | 85,39 | - | - | 0,00 | 0,00 | - |
| T12 | 2 497 | 2 506 | **27,46** | 110,1 | 0,00 | 78,98 | - | - | 0,00 | 0,00 | - |
| T13 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T14 | 4 173 | 4 179 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T15 | 5 198 | 5 203 | **17,89** | 110,1 | 0,00 | 85,33 | - | - | 0,00 | 0,00 | - |
| T16 | 2 032 | 2 044 | **29,96** | 110,1 | 0,00 | 77,21 | - | - | 0,00 | 0,00 | - |
| T17 | 3 622 | 3 629 | **22,73** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T18 | 4 686 | 4 692 | **19,30** | 110,1 | 0,00 | 84,43 | - | - | 0,00 | 0,00 | - |
| T19 | 2 097 | 2 108 | **29,58** | 110,1 | 0,00 | 77,48 | - | - | 0,00 | 0,00 | - |
| T2 | 4 431 | 4 437 | **20,05** | 110,1 | 0,00 | 83,94 | - | - | 0,00 | 0,00 | - |
| T20 | 3 066 | 3 074 | **24,88** | 110,1 | 0,00 | 80,75 | - | - | 0,00 | 0,00 | - |
| T21 | 4 469 | 4 475 | **19,94** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T22 | 2 986 | 2 994 | **25,22** | 110,1 | 0,00 | 80,52 | - | - | 0,00 | 0,00 | - |
| T23 | 3 668 | 3 675 | **22,56** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |
| T24 | 5 099 | 5 104 | **18,16** | 110,1 | 0,00 | 85,16 | - | - | 0,00 | 0,00 | - |
| T25 | 3 912 | 3 917 | **21,88** | 110,1 | 0,00 | 82,86 | - | - | 0,00 | 0,00 | - |
| T26 | 4 304 | 4 310 | **20,45** | 110,1 | 0,00 | 83,69 | - | - | 0,00 | 0,00 | - |
| T27 | 5 286 | 5 290 | **17,67** | 110,1 | 0,00 | 85,47 | - | - | 0,00 | 0,00 | - |
| T28 | 4 677 | 4 682 | **19,80** | 110,1 | 0,00 | 84,41 | - | - | 0,00 | 0,00 | - |
| T29 | 5 129 | 5 133 | **18,08** | 110,1 | 0,00 | 85,21 | - | - | 0,00 | 0,00 | - |
| T3 | 3 465 | 3 472 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T30 | 8 247 | 8 250 | **13,02** | 110,1 | 0,00 | 89,33 | - | - | 0,00 | 0,00 | - |
| T31 | 7 083 | 7 086 | **14,83** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T32 | 9 327 | 9 330 | **11,46** | 110,1 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| T33 | 8 370 | 8 373 | **12,81** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T34 | 7 081 | 7 084 | **14,79** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T35 | 6 697 | 6 700 | **15,43** | 110,1 | 0,00 | 87,52 | - | - | 0,00 | 0,00 | - |
| T36 | 9 964 | 9 967 | **10,58** | 110,1 | 0,00 | 90,97 | - | - | 0,00 | 0,00 | - |
| T37 | 9 327 | 9 329 | **11,39** | 110,1 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| T38 | 8 296 | 8 299 | **12,87** | 110,1 | 0,00 | 89,38 | - | - | 0,00 | 0,00 | - |
| T39 | 9 699 | 9 702 | **10,87** | 110,1 | 0,00 | 90,74 | - | - | 0,00 | 0,00 | - |
| T4 | 3 990 | 3 996 | **21,45** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T5 | 2 614 | 2 623 | **26,89** | 110,1 | 0,00 | 79,38 | - | - | 0,00 | 0,00 | - |
| T6 | 3 581 | 3 588 | **22,88** | 110,1 | 0,00 | 82,10 | - | - | 0,00 | 0,00 | - |
| T7 | 4 606 | 4 611 | **19,54** | 110,1 | 0,00 | 84,28 | - | - | 0,00 | 0,00 | - |
| T8 | 5 469 | 5 474 | **17,20** | 110,1 | 0,00 | 85,77 | - | - | 0,00 | 0,00 | - |
| T9 | 2 335 | 2 344 | **28,29** | 110,1 | 0,00 | 78,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,66** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: D Lomarakennus D (Mutaniemi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 832 | 15 834 | **3,71** | 108,9 | 0,00 | 94,99 | - | - | 0,00 | 0,00 | - |
| 10 | 18 417 | 18 418 | **1,80** | 108,9 | 0,00 | 96,30 | - | - | 0,00 | 0,00 | - |
| 100 | 10 640 | 10 642 | **3,60** | 106,0 | 0,00 | 91,54 | - | - | 0,00 | 0,00 | - |
| 101 | 11 124 | 11 126 | **3,06** | 106,0 | 0,00 | 91,93 | - | - | 0,00 | 0,00 | - |
| 102 | 9 950 | 9 952 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 103 | 9 234 | 9 236 | **5,31** | 106,0 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| 104 | 8 577 | 8 579 | **6,20** | 106,0 | 0,00 | 89,67 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 8 402 | 8 405 | **6,45** | 106,0 | 0,00 | 89,49 | - | - | 0,00 | 0,00 | - |
| 106 | 7 827 | 7 829 | **7,30** | 106,0 | 0,00 | 88,87 | - | - | 0,00 | 0,00 | - |
| 107 | 8 941 | 8 943 | **5,70** | 106,0 | 0,00 | 90,03 | - | - | 0,00 | 0,00 | - |
| 108 | 9 734 | 9 735 | **4,68** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 109 | 8 913 | 8 915 | **5,74** | 106,0 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| 11 | 18 096 | 18 098 | **2,02** | 108,9 | 0,00 | 96,15 | - | - | 0,00 | 0,00 | - |
| 110 | 9 361 | 9 363 | **5,15** | 106,0 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| 111 | 6 868 | 6 870 | **8,87** | 106,0 | 0,00 | 87,74 | - | - | 0,00 | 0,00 | - |
| 112 | 7 737 | 7 739 | **7,44** | 106,0 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| 12 | 18 134 | 18 135 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 13 | 19 114 | 19 115 | **1,33** | 108,9 | 0,00 | 96,63 | - | - | 0,00 | 0,00 | - |
| 14 | 21 126 | 21 128 | **0,04** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 15 | 18 982 | 18 983 | **1,42** | 108,9 | 0,00 | 96,57 | - | - | 0,00 | 0,00 | - |
| 16 | 19 935 | 19 936 | **0,80** | 108,9 | 0,00 | 96,99 | - | - | 0,00 | 0,00 | - |
| 17 | 19 931 | 19 933 | **0,79** | 108,9 | 0,00 | 96,99 | - | - | 0,00 | 0,00 | - |
| 18 | 20 757 | 20 759 | **0,30** | 108,9 | 0,00 | 97,34 | - | - | 0,00 | 0,00 | - |
| 19 | 21 002 | 21 004 | **0,12** | 108,9 | 0,00 | 97,45 | - | - | 0,00 | 0,00 | - |
| 2 | 16 539 | 16 541 | **3,16** | 108,9 | 0,00 | 95,37 | - | - | 0,00 | 0,00 | - |
| 20 | 22 455 | 22 456 | **-0,75** | 108,9 | 0,00 | 98,03 | - | - | 0,00 | 0,00 | - |
| 21 | 21 262 | 21 263 | **-0,04** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 22 | 23 063 | 23 064 | **-1,10** | 108,9 | 0,00 | 98,26 | - | - | 0,00 | 0,00 | - |
| 23 | 23 001 | 23 002 | **-1,06** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 24 | 20 251 | 20 253 | **0,59** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 25 | 22 470 | 22 471 | **-0,75** | 108,9 | 0,00 | 98,03 | - | - | 0,00 | 0,00 | - |
| 26 | 23 900 | 23 901 | **-1,56** | 108,9 | 0,00 | 98,57 | - | - | 0,00 | 0,00 | - |
| 27 | 23 486 | 23 487 | **-1,33** | 108,9 | 0,00 | 98,42 | - | - | 0,00 | 0,00 | - |
| 28 | 22 088 | 22 089 | **-0,53** | 108,9 | 0,00 | 97,88 | - | - | 0,00 | 0,00 | - |
| 29 | 21 582 | 21 584 | **-0,22** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 3 | 16 733 | 16 735 | **3,03** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 30 | 19 333 | 19 335 | **1,18** | 108,9 | 0,00 | 96,73 | - | - | 0,00 | 0,00 | - |
| 31 | 21 651 | 21 653 | **-0,27** | 108,9 | 0,00 | 97,71 | - | - | 0,00 | 0,00 | - |
| 4 | 17 594 | 17 596 | **2,39** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 5 | 18 527 | 18 528 | **1,73** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 6 | 16 559 | 16 560 | **3,15** | 108,9 | 0,00 | 95,38 | - | - | 0,00 | 0,00 | - |
| 7 | 17 020 | 17 022 | **2,80** | 108,9 | 0,00 | 95,62 | - | - | 0,00 | 0,00 | - |
| 71 | 13 080 | 13 082 | **1,09** | 106,0 | 0,00 | 93,33 | - | - | 0,00 | 0,00 | - |
| 72 | 12 549 | 12 550 | **1,59** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 73 | 11 978 | 11 979 | **2,16** | 106,0 | 0,00 | 92,57 | - | - | 0,00 | 0,00 | - |
| 74 | 13 484 | 13 485 | **0,72** | 106,0 | 0,00 | 93,60 | - | - | 0,00 | 0,00 | - |
| 75 | 14 019 | 14 020 | **0,25** | 106,0 | 0,00 | 93,94 | - | - | 0,00 | 0,00 | - |
| 76 | 14 639 | 14 640 | **-0,27** | 106,0 | 0,00 | 94,31 | - | - | 0,00 | 0,00 | - |
| 77 | 13 396 | 13 398 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 78 | 14 428 | 14 429 | **-0,10** | 106,0 | 0,00 | 94,18 | - | - | 0,00 | 0,00 | - |
| 79 | 15 065 | 15 066 | **-0,63** | 106,0 | 0,00 | 94,56 | - | - | 0,00 | 0,00 | - |
| 8 | 17 458 | 17 460 | **2,48** | 108,9 | 0,00 | 95,84 | - | - | 0,00 | 0,00 | - |
| 80 | 13 638 | 13 639 | **0,58** | 106,0 | 0,00 | 93,70 | - | - | 0,00 | 0,00 | - |
| 81 | 12 591 | 12 593 | **1,56** | 106,0 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| 82 | 11 796 | 11 798 | **2,35** | 106,0 | 0,00 | 92,44 | - | - | 0,00 | 0,00 | - |
| 83 | 11 631 | 11 633 | **2,52** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 84 | 12 735 | 12 736 | **1,42** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 85 | 12 308 | 12 309 | **1,83** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| 86 | 9 740 | 9 742 | **4,67** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 87 | 9 199 | 9 201 | **5,36** | 106,0 | 0,00 | 90,28 | - | - | 0,00 | 0,00 | - |
| 88 | 8 130 | 8 132 | **6,85** | 106,0 | 0,00 | 89,20 | - | - | 0,00 | 0,00 | - |
| 89 | 7 426 | 7 428 | **7,94** | 106,0 | 0,00 | 88,42 | - | - | 0,00 | 0,00 | - |
| 9 | 19 507 | 19 508 | **1,07** | 108,9 | 0,00 | 96,80 | - | - | 0,00 | 0,00 | - |
| 90 | 6 917 | 6 920 | **8,78** | 106,0 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| 91 | 7 507 | 7 510 | **7,80** | 106,0 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| 92 | 8 530 | 8 532 | **6,27** | 106,0 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| 93 | 10 056 | 10 058 | **4,29** | 106,0 | 0,00 | 91,05 | - | - | 0,00 | 0,00 | - |
| 94 | 10 625 | 10 627 | **3,63** | 106,0 | 0,00 | 91,53 | - | - | 0,00 | 0,00 | - |
| 95 | 10 946 | 10 947 | **3,25** | 106,0 | 0,00 | 91,79 | - | - | 0,00 | 0,00 | - |
| 96 | 11 321 | 11 322 | **2,85** | 106,0 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 97 | 9 474 | 9 476 | **5,00** | 106,0 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | 9 975 | 9 977 | **4,38** | 106,0 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| 99 | 10 567 | 10 569 | **3,68** | 106,0 | 0,00 | 91,48 | - | - | 0,00 | 0,00 | - |
| T1 | 4 300 | 4 306 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T10 | 3 720 | 3 726 | **22,38** | 110,1 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| T11 | 5 193 | 5 197 | **17,91** | 110,1 | 0,00 | 85,32 | - | - | 0,00 | 0,00 | - |
| T12 | 2 460 | 2 469 | **27,65** | 110,1 | 0,00 | 78,85 | - | - | 0,00 | 0,00 | - |
| T13 | 3 088 | 3 096 | **24,79** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T14 | 4 192 | 4 198 | **20,80** | 110,1 | 0,00 | 83,46 | - | - | 0,00 | 0,00 | - |
| T15 | 5 211 | 5 216 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T16 | 2 157 | 2 168 | **29,24** | 110,1 | 0,00 | 77,72 | - | - | 0,00 | 0,00 | - |
| T17 | 3 717 | 3 724 | **22,39** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T18 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T19 | 2 348 | 2 358 | **28,22** | 110,1 | 0,00 | 78,45 | - | - | 0,00 | 0,00 | - |
| T2 | 4 172 | 4 178 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T20 | 3 258 | 3 265 | **24,10** | 110,1 | 0,00 | 81,28 | - | - | 0,00 | 0,00 | - |
| T21 | 4 615 | 4 621 | **19,51** | 110,1 | 0,00 | 84,29 | - | - | 0,00 | 0,00 | - |
| T22 | 3 268 | 3 276 | **24,06** | 110,1 | 0,00 | 81,31 | - | - | 0,00 | 0,00 | - |
| T23 | 3 898 | 3 904 | **21,76** | 110,1 | 0,00 | 82,83 | - | - | 0,00 | 0,00 | - |
| T24 | 5 268 | 5 273 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T25 | 4 212 | 4 217 | **20,74** | 110,1 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| T26 | 4 559 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T27 | 5 499 | 5 503 | **17,13** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T28 | 4 999 | 5 003 | **18,43** | 110,1 | 0,00 | 84,99 | - | - | 0,00 | 0,00 | - |
| T29 | 5 405 | 5 409 | **17,36** | 110,1 | 0,00 | 85,66 | - | - | 0,00 | 0,00 | - |
| T3 | 3 209 | 3 216 | **24,30** | 110,1 | 0,00 | 81,15 | - | - | 0,00 | 0,00 | - |
| T30 | 8 343 | 8 346 | **13,47** | 110,1 | 0,00 | 89,43 | - | - | 0,00 | 0,00 | - |
| T31 | 7 206 | 7 209 | **15,12** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T32 | 9 426 | 9 429 | **11,92** | 110,1 | 0,00 | 90,49 | - | - | 0,00 | 0,00 | - |
| T33 | 8 495 | 8 497 | **13,12** | 110,1 | 0,00 | 89,59 | - | - | 0,00 | 0,00 | - |
| T34 | 7 239 | 7 242 | **14,97** | 110,1 | 0,00 | 88,20 | - | - | 0,00 | 0,00 | - |
| T35 | 6 886 | 6 889 | **15,25** | 110,1 | 0,00 | 87,76 | - | - | 0,00 | 0,00 | - |
| T36 | 10 087 | 10 089 | **10,93** | 110,1 | 0,00 | 91,08 | - | - | 0,00 | 0,00 | - |
| T37 | 9 472 | 9 475 | **11,70** | 110,1 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |
| T38 | 8 468 | 8 470 | **12,99** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T39 | 9 869 | 9 871 | **11,05** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| T4 | 3 792 | 3 798 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| T5 | 2 378 | 2 387 | **28,06** | 110,1 | 0,00 | 78,56 | - | - | 0,00 | 0,00 | - |
| T6 | 3 448 | 3 455 | **23,37** | 110,1 | 0,00 | 81,77 | - | - | 0,00 | 0,00 | - |
| T7 | 4 482 | 4 487 | **19,90** | 110,1 | 0,00 | 84,04 | - | - | 0,00 | 0,00 | - |
| T8 | 5 374 | 5 378 | **17,44** | 110,1 | 0,00 | 85,61 | - | - | 0,00 | 0,00 | - |
| T9 | 2 185 | 2 195 | **29,09** | 110,1 | 0,00 | 77,83 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,53** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: E Asuinrakennus E (Alanko)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 100 | 16 102 | **3,50** | 108,9 | 0,00 | 95,14 | - | - | 0,00 | 0,00 | - |
| 10 | 18 710 | 18 712 | **1,60** | 108,9 | 0,00 | 96,44 | - | - | 0,00 | 0,00 | - |
| 100 | 10 935 | 10 937 | **3,27** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 101 | 11 412 | 11 414 | **2,75** | 106,0 | 0,00 | 92,15 | - | - | 0,00 | 0,00 | - |
| 102 | 10 252 | 10 253 | **4,05** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 103 | 9 538 | 9 540 | **4,92** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 104 | 8 885 | 8 887 | **5,78** | 106,0 | 0,00 | 89,97 | - | - | 0,00 | 0,00 | - |
| 105 | 8 698 | 8 700 | **6,03** | 106,0 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| 106 | 8 128 | 8 130 | **6,85** | 106,0 | 0,00 | 89,20 | - | - | 0,00 | 0,00 | - |
| 107 | 9 228 | 9 230 | **5,32** | 106,0 | 0,00 | 90,30 | - | - | 0,00 | 0,00 | - |
| 108 | 10 006 | 10 008 | **4,34** | 106,0 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| 109 | 9 184 | 9 186 | **5,38** | 106,0 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| 11 | 18 406 | 18 407 | **1,81** | 108,9 | 0,00 | 96,30 | - | - | 0,00 | 0,00 | - |
| 110 | 9 626 | 9 628 | **4,81** | 106,0 | 0,00 | 90,67 | - | - | 0,00 | 0,00 | - |
| 111 | 7 160 | 7 162 | **8,37** | 106,0 | 0,00 | 88,10 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112 | 8 023 | 8 025 | **7,01** | 106,0 | 0,00 | 89,09 | - | - | 0,00 | 0,00 | - |
| 12 | 18 455 | 18 457 | **1,78** | 108,9 | 0,00 | 96,32 | - | - | 0,00 | 0,00 | - |
| 13 | 19 424 | 19 425 | **1,12** | 108,9 | 0,00 | 96,77 | - | - | 0,00 | 0,00 | - |
| 14 | 21 413 | 21 414 | **-0,12** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 15 | 19 301 | 19 303 | **1,21** | 108,9 | 0,00 | 96,71 | - | - | 0,00 | 0,00 | - |
| 16 | 20 250 | 20 252 | **0,59** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 17 | 20 239 | 20 240 | **0,60** | 108,9 | 0,00 | 97,12 | - | - | 0,00 | 0,00 | - |
| 18 | 21 062 | 21 063 | **0,11** | 108,9 | 0,00 | 97,47 | - | - | 0,00 | 0,00 | - |
| 19 | 21 318 | 21 319 | **-0,07** | 108,9 | 0,00 | 97,58 | - | - | 0,00 | 0,00 | - |
| 2 | 16 796 | 16 798 | **2,97** | 108,9 | 0,00 | 95,51 | - | - | 0,00 | 0,00 | - |
| 20 | 22 763 | 22 764 | **-0,93** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 21 | 21 560 | 21 561 | **-0,22** | 108,9 | 0,00 | 97,67 | - | - | 0,00 | 0,00 | - |
| 22 | 23 365 | 23 366 | **-1,27** | 108,9 | 0,00 | 98,37 | - | - | 0,00 | 0,00 | - |
| 23 | 23 293 | 23 294 | **-1,23** | 108,9 | 0,00 | 98,34 | - | - | 0,00 | 0,00 | - |
| 24 | 20 546 | 20 547 | **0,40** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 25 | 22 751 | 22 753 | **-0,92** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 26 | 24 197 | 24 198 | **-1,73** | 108,9 | 0,00 | 98,68 | - | - | 0,00 | 0,00 | - |
| 27 | 23 770 | 23 771 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 28 | 22 383 | 22 384 | **-0,71** | 108,9 | 0,00 | 98,00 | - | - | 0,00 | 0,00 | - |
| 29 | 21 888 | 21 889 | **-0,40** | 108,9 | 0,00 | 97,80 | - | - | 0,00 | 0,00 | - |
| 3 | 17 016 | 17 018 | **2,81** | 108,9 | 0,00 | 95,62 | - | - | 0,00 | 0,00 | - |
| 30 | 19 629 | 19 630 | **0,99** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 31 | 21 930 | 21 931 | **-0,44** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 4 | 17 876 | 17 878 | **2,18** | 108,9 | 0,00 | 96,05 | - | - | 0,00 | 0,00 | - |
| 5 | 18 807 | 18 809 | **1,53** | 108,9 | 0,00 | 96,49 | - | - | 0,00 | 0,00 | - |
| 6 | 16 857 | 16 858 | **2,92** | 108,9 | 0,00 | 95,54 | - | - | 0,00 | 0,00 | - |
| 7 | 17 330 | 17 331 | **2,57** | 108,9 | 0,00 | 95,78 | - | - | 0,00 | 0,00 | - |
| 71 | 13 384 | 13 385 | **0,81** | 106,0 | 0,00 | 93,53 | - | - | 0,00 | 0,00 | - |
| 72 | 12 853 | 12 854 | **1,30** | 106,0 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| 73 | 12 286 | 12 287 | **1,85** | 106,0 | 0,00 | 92,79 | - | - | 0,00 | 0,00 | - |
| 74 | 13 782 | 13 783 | **0,45** | 106,0 | 0,00 | 93,79 | - | - | 0,00 | 0,00 | - |
| 75 | 14 310 | 14 311 | **0,00** | 106,0 | 0,00 | 94,11 | - | - | 0,00 | 0,00 | - |
| 76 | 14 923 | 14 925 | **-0,50** | 106,0 | 0,00 | 94,48 | - | - | 0,00 | 0,00 | - |
| 77 | 13 684 | 13 685 | **0,54** | 106,0 | 0,00 | 93,72 | - | - | 0,00 | 0,00 | - |
| 78 | 14 703 | 14 704 | **-0,33** | 106,0 | 0,00 | 94,35 | - | - | 0,00 | 0,00 | - |
| 79 | 15 338 | 15 340 | **-0,85** | 106,0 | 0,00 | 94,72 | - | - | 0,00 | 0,00 | - |
| 8 | 17 754 | 17 755 | **2,27** | 108,9 | 0,00 | 95,99 | - | - | 0,00 | 0,00 | - |
| 80 | 13 916 | 13 917 | **0,34** | 106,0 | 0,00 | 93,87 | - | - | 0,00 | 0,00 | - |
| 81 | 12 877 | 12 878 | **1,31** | 106,0 | 0,00 | 93,20 | - | - | 0,00 | 0,00 | - |
| 82 | 12 095 | 12 096 | **2,04** | 106,0 | 0,00 | 92,65 | - | - | 0,00 | 0,00 | - |
| 83 | 11 921 | 11 923 | **2,22** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 84 | 13 009 | 13 010 | **1,16** | 106,0 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| 85 | 12 578 | 12 579 | **1,57** | 106,0 | 0,00 | 92,99 | - | - | 0,00 | 0,00 | - |
| 86 | 9 980 | 9 982 | **4,37** | 106,0 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| 87 | 9 447 | 9 449 | **5,04** | 106,0 | 0,00 | 90,51 | - | - | 0,00 | 0,00 | - |
| 88 | 8 391 | 8 393 | **6,47** | 106,0 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| 89 | 7 691 | 7 694 | **7,51** | 106,0 | 0,00 | 88,72 | - | - | 0,00 | 0,00 | - |
| 9 | 19 792 | 19 794 | **0,89** | 108,9 | 0,00 | 96,93 | - | - | 0,00 | 0,00 | - |
| 90 | 7 188 | 7 191 | **8,32** | 106,0 | 0,00 | 88,14 | - | - | 0,00 | 0,00 | - |
| 91 | 7 755 | 7 758 | **7,42** | 106,0 | 0,00 | 88,79 | - | - | 0,00 | 0,00 | - |
| 92 | 8 776 | 8 778 | **5,93** | 106,0 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| 93 | 10 375 | 10 377 | **3,91** | 106,0 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| 94 | 10 942 | 10 944 | **3,27** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 95 | 11 259 | 11 260 | **2,91** | 106,0 | 0,00 | 92,03 | - | - | 0,00 | 0,00 | - |
| 96 | 11 627 | 11 629 | **2,52** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 97 | 9 788 | 9 790 | **4,61** | 106,0 | 0,00 | 90,82 | - | - | 0,00 | 0,00 | - |
| 98 | 10 286 | 10 288 | **4,01** | 106,0 | 0,00 | 91,25 | - | - | 0,00 | 0,00 | - |
| 99 | 10 875 | 10 876 | **3,33** | 106,0 | 0,00 | 91,73 | - | - | 0,00 | 0,00 | - |
| T1 | 3 999 | 4 006 | **21,42** | 110,1 | 0,00 | 83,05 | - | - | 0,00 | 0,00 | - |
| T10 | 3 660 | 3 666 | **22,60** | 110,1 | 0,00 | 82,28 | - | - | 0,00 | 0,00 | - |
| T11 | 5 149 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T12 | 2 446 | 2 455 | **27,72** | 110,1 | 0,00 | 78,80 | - | - | 0,00 | 0,00 | - |
| T13 | 3 142 | 3 149 | **24,57** | 110,1 | 0,00 | 80,96 | - | - | 0,00 | 0,00 | - |
| T14 | 4 216 | 4 221 | **20,72** | 110,1 | 0,00 | 83,51 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T15 | 5 224 | 5 228 | **17,83** | 110,1 | 0,00 | 85,37 | - | - | 0,00 | 0,00 | - |
| T16 | 2 307 | 2 317 | **28,43** | 110,1 | 0,00 | 78,30 | - | - | 0,00 | 0,00 | - |
| T17 | 3 820 | 3 826 | **22,03** | 110,1 | 0,00 | 82,66 | - | - | 0,00 | 0,00 | - |
| T18 | 4 841 | 4 846 | **18,86** | 110,1 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| T19 | 2 607 | 2 616 | **26,93** | 110,1 | 0,00 | 79,35 | - | - | 0,00 | 0,00 | - |
| T2 | 3 906 | 3 913 | **21,73** | 110,1 | 0,00 | 82,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 456 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T21 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T22 | 3 551 | 3 558 | **22,99** | 110,1 | 0,00 | 82,02 | - | - | 0,00 | 0,00 | - |
| T23 | 4 128 | 4 134 | **21,00** | 110,1 | 0,00 | 83,33 | - | - | 0,00 | 0,00 | - |
| T24 | 5 435 | 5 439 | **17,29** | 110,1 | 0,00 | 85,71 | - | - | 0,00 | 0,00 | - |
| T25 | 4 509 | 4 514 | **19,82** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T26 | 4 811 | 4 816 | **18,95** | 110,1 | 0,00 | 84,65 | - | - | 0,00 | 0,00 | - |
| T27 | 5 709 | 5 713 | **16,61** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T28 | 5 318 | 5 322 | **17,58** | 110,1 | 0,00 | 85,52 | - | - | 0,00 | 0,00 | - |
| T29 | 5 677 | 5 680 | **16,69** | 110,1 | 0,00 | 86,09 | - | - | 0,00 | 0,00 | - |
| T3 | 2 950 | 2 958 | **25,37** | 110,1 | 0,00 | 80,42 | - | - | 0,00 | 0,00 | - |
| T30 | 8 473 | 8 476 | **12,23** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T31 | 7 365 | 7 368 | **13,90** | 110,1 | 0,00 | 88,35 | - | - | 0,00 | 0,00 | - |
| T32 | 9 559 | 9 561 | **10,70** | 110,1 | 0,00 | 90,61 | - | - | 0,00 | 0,00 | - |
| T33 | 8 652 | 8 655 | **11,94** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T34 | 7 429 | 7 431 | **13,60** | 110,1 | 0,00 | 88,42 | - | - | 0,00 | 0,00 | - |
| T35 | 7 105 | 7 108 | **14,23** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| T36 | 10 240 | 10 242 | **9,78** | 110,1 | 0,00 | 91,21 | - | - | 0,00 | 0,00 | - |
| T37 | 9 649 | 9 651 | **10,45** | 110,1 | 0,00 | 90,69 | - | - | 0,00 | 0,00 | - |
| T38 | 8 669 | 8 671 | **11,71** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T39 | 10 067 | 10 070 | **9,78** | 110,1 | 0,00 | 91,06 | - | - | 0,00 | 0,00 | - |
| T4 | 3 593 | 3 599 | **22,84** | 110,1 | 0,00 | 82,12 | - | - | 0,00 | 0,00 | - |
| T5 | 2 149 | 2 159 | **29,29** | 110,1 | 0,00 | 77,68 | - | - | 0,00 | 0,00 | - |
| T6 | 3 322 | 3 329 | **23,85** | 110,1 | 0,00 | 81,45 | - | - | 0,00 | 0,00 | - |
| T7 | 4 358 | 4 363 | **20,28** | 110,1 | 0,00 | 83,80 | - | - | 0,00 | 0,00 | - |
| T8 | 5 275 | 5 280 | **17,69** | 110,1 | 0,00 | 85,45 | - | - | 0,00 | 0,00 | - |
| T9 | 2 057 | 2 068 | **29,82** | 110,1 | 0,00 | 77,31 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,50** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: F Asuinrakennus F (Joensuu)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 350 | 16 352 | **3,31** | 108,9 | 0,00 | 95,27 | - | - | 0,00 | 0,00 | - |
| 10 | 18 968 | 18 969 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 100 | 11 193 | 11 195 | **2,98** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 101 | 11 669 | 11 670 | **2,48** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 102 | 10 511 | 10 513 | **3,74** | 106,0 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| 103 | 9 798 | 9 800 | **4,60** | 106,0 | 0,00 | 90,82 | - | - | 0,00 | 0,00 | - |
| 104 | 9 145 | 9 147 | **5,43** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 105 | 8 957 | 8 959 | **5,68** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 106 | 8 388 | 8 390 | **6,47** | 106,0 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| 107 | 9 484 | 9 486 | **4,99** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 108 | 10 258 | 10 260 | **4,04** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 109 | 9 436 | 9 437 | **5,05** | 106,0 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| 11 | 18 666 | 18 668 | **1,63** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 110 | 9 875 | 9 877 | **4,50** | 106,0 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| 111 | 7 417 | 7 420 | **7,95** | 106,0 | 0,00 | 88,41 | - | - | 0,00 | 0,00 | - |
| 112 | 8 279 | 8 281 | **6,63** | 106,0 | 0,00 | 89,36 | - | - | 0,00 | 0,00 | - |
| 12 | 18 716 | 18 718 | **1,60** | 108,9 | 0,00 | 96,45 | - | - | 0,00 | 0,00 | - |
| 13 | 19 684 | 19 686 | **0,95** | 108,9 | 0,00 | 96,88 | - | - | 0,00 | 0,00 | - |
| 14 | 21 669 | 21 670 | **-0,27** | 108,9 | 0,00 | 97,72 | - | - | 0,00 | 0,00 | - |
| 15 | 19 562 | 19 564 | **1,04** | 108,9 | 0,00 | 96,83 | - | - | 0,00 | 0,00 | - |
| 16 | 20 512 | 20 513 | **0,43** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 17 | 20 499 | 20 500 | **0,43** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 18 | 21 322 | 21 323 | **-0,05** | 108,9 | 0,00 | 97,58 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 21 579 | 21 580 | **-0,23** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 2 | 17 041 | 17 043 | **2,78** | 108,9 | 0,00 | 95,63 | - | - | 0,00 | 0,00 | - |
| 20 | 23 023 | 23 024 | **-1,07** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 21 | 21 818 | 21 819 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 22 | 23 625 | 23 626 | **-1,41** | 108,9 | 0,00 | 98,47 | - | - | 0,00 | 0,00 | - |
| 23 | 23 550 | 23 551 | **-1,37** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 24 | 20 804 | 20 805 | **0,24** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 25 | 23 006 | 23 007 | **-1,06** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 26 | 24 455 | 24 456 | **-1,86** | 108,9 | 0,00 | 98,77 | - | - | 0,00 | 0,00 | - |
| 27 | 24 025 | 24 026 | **-1,63** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 28 | 22 641 | 22 642 | **-0,86** | 108,9 | 0,00 | 98,10 | - | - | 0,00 | 0,00 | - |
| 29 | 22 148 | 22 149 | **-0,56** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 3 | 17 271 | 17 273 | **2,62** | 108,9 | 0,00 | 95,75 | - | - | 0,00 | 0,00 | - |
| 30 | 19 887 | 19 888 | **0,82** | 108,9 | 0,00 | 96,97 | - | - | 0,00 | 0,00 | - |
| 31 | 22 183 | 22 184 | **-0,59** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 4 | 18 130 | 18 132 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 5 | 19 061 | 19 063 | **1,36** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 6 | 17 115 | 17 117 | **2,73** | 108,9 | 0,00 | 95,67 | - | - | 0,00 | 0,00 | - |
| 7 | 17 591 | 17 592 | **2,38** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 71 | 13 643 | 13 644 | **0,58** | 106,0 | 0,00 | 93,70 | - | - | 0,00 | 0,00 | - |
| 72 | 13 113 | 13 114 | **1,06** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 73 | 12 546 | 12 547 | **1,60** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 74 | 14 041 | 14 042 | **0,23** | 106,0 | 0,00 | 93,95 | - | - | 0,00 | 0,00 | - |
| 75 | 14 567 | 14 568 | **-0,22** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 76 | 15 179 | 15 180 | **-0,71** | 106,0 | 0,00 | 94,63 | - | - | 0,00 | 0,00 | - |
| 77 | 13 940 | 13 941 | **0,32** | 106,0 | 0,00 | 93,89 | - | - | 0,00 | 0,00 | - |
| 78 | 14 955 | 14 957 | **-0,54** | 106,0 | 0,00 | 94,50 | - | - | 0,00 | 0,00 | - |
| 79 | 15 590 | 15 592 | **-1,05** | 106,0 | 0,00 | 94,86 | - | - | 0,00 | 0,00 | - |
| 8 | 18 012 | 18 013 | **2,08** | 108,9 | 0,00 | 96,11 | - | - | 0,00 | 0,00 | - |
| 80 | 14 169 | 14 170 | **0,12** | 106,0 | 0,00 | 94,03 | - | - | 0,00 | 0,00 | - |
| 81 | 13 132 | 13 134 | **1,06** | 106,0 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 82 | 12 353 | 12 355 | **1,79** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 83 | 12 178 | 12 179 | **1,96** | 106,0 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| 84 | 13 261 | 13 262 | **0,92** | 106,0 | 0,00 | 93,45 | - | - | 0,00 | 0,00 | - |
| 85 | 12 828 | 12 830 | **1,33** | 106,0 | 0,00 | 93,16 | - | - | 0,00 | 0,00 | - |
| 86 | 10 220 | 10 222 | **4,09** | 106,0 | 0,00 | 91,19 | - | - | 0,00 | 0,00 | - |
| 87 | 9 690 | 9 691 | **4,73** | 106,0 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| 88 | 8 638 | 8 640 | **6,12** | 106,0 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| 89 | 7 941 | 7 943 | **7,13** | 106,0 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| 9 | 20 047 | 20 049 | **0,73** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 90 | 7 440 | 7 442 | **7,91** | 106,0 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| 91 | 7 999 | 8 001 | **7,04** | 106,0 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| 92 | 9 018 | 9 020 | **5,60** | 106,0 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| 93 | 10 636 | 10 638 | **3,61** | 106,0 | 0,00 | 91,54 | - | - | 0,00 | 0,00 | - |
| 94 | 11 203 | 11 205 | **2,99** | 106,0 | 0,00 | 91,99 | - | - | 0,00 | 0,00 | - |
| 95 | 11 520 | 11 521 | **2,63** | 106,0 | 0,00 | 92,23 | - | - | 0,00 | 0,00 | - |
| 96 | 11 888 | 11 889 | **2,25** | 106,0 | 0,00 | 92,50 | - | - | 0,00 | 0,00 | - |
| 97 | 10 049 | 10 051 | **4,29** | 106,0 | 0,00 | 91,04 | - | - | 0,00 | 0,00 | - |
| 98 | 10 547 | 10 548 | **3,70** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 99 | 11 135 | 11 137 | **3,05** | 106,0 | 0,00 | 91,94 | - | - | 0,00 | 0,00 | - |
| T1 | 3 835 | 3 841 | **21,98** | 110,1 | 0,00 | 82,69 | - | - | 0,00 | 0,00 | - |
| T10 | 3 727 | 3 733 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T11 | 5 222 | 5 227 | **17,83** | 110,1 | 0,00 | 85,36 | - | - | 0,00 | 0,00 | - |
| T12 | 2 557 | 2 565 | **27,17** | 110,1 | 0,00 | 79,18 | - | - | 0,00 | 0,00 | - |
| T13 | 3 291 | 3 297 | **23,98** | 110,1 | 0,00 | 81,36 | - | - | 0,00 | 0,00 | - |
| T14 | 4 340 | 4 345 | **20,34** | 110,1 | 0,00 | 83,76 | - | - | 0,00 | 0,00 | - |
| T15 | 5 338 | 5 342 | **17,53** | 110,1 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| T16 | 2 514 | 2 523 | **27,38** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T17 | 3 995 | 4 001 | **21,44** | 110,1 | 0,00 | 83,04 | - | - | 0,00 | 0,00 | - |
| T18 | 4 998 | 5 003 | **18,43** | 110,1 | 0,00 | 84,98 | - | - | 0,00 | 0,00 | - |
| T19 | 2 857 | 2 865 | **25,78** | 110,1 | 0,00 | 80,14 | - | - | 0,00 | 0,00 | - |
| T2 | 3 786 | 3 793 | **22,15** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T20 | 3 682 | 3 688 | **22,52** | 110,1 | 0,00 | 82,34 | - | - | 0,00 | 0,00 | - |
| T21 | 4 960 | 4 965 | **18,53** | 110,1 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T22 | 3 807 | 3 813 | **22,08** | 110,1 | 0,00 | 82,63 | - | - | 0,00 | 0,00 | - |
| T23 | 4 366 | 4 372 | **20,25** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T24 | 5 642 | 5 646 | **16,77** | 110,1 | 0,00 | 86,03 | - | - | 0,00 | 0,00 | - |
| T25 | 4 768 | 4 773 | **19,07** | 110,1 | 0,00 | 84,58 | - | - | 0,00 | 0,00 | - |
| T26 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,09 | - | - | 0,00 | 0,00 | - |
| T27 | 5 936 | 5 940 | **16,07** | 110,1 | 0,00 | 86,48 | - | - | 0,00 | 0,00 | - |
| T28 | 5 579 | 5 583 | **16,93** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T29 | 5 929 | 5 933 | **16,09** | 110,1 | 0,00 | 86,46 | - | - | 0,00 | 0,00 | - |
| T3 | 2 843 | 2 851 | **25,84** | 110,1 | 0,00 | 80,10 | - | - | 0,00 | 0,00 | - |
| T30 | 8 491 | 8 493 | **12,01** | 110,1 | 0,00 | 89,58 | - | - | 0,00 | 0,00 | - |
| T31 | 7 407 | 7 410 | **13,67** | 110,1 | 0,00 | 88,40 | - | - | 0,00 | 0,00 | - |
| T32 | 9 577 | 9 579 | **10,48** | 110,1 | 0,00 | 90,63 | - | - | 0,00 | 0,00 | - |
| T33 | 8 692 | 8 695 | **11,70** | 110,1 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| T34 | 7 498 | 7 501 | **13,42** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T35 | 7 201 | 7 204 | **13,88** | 110,1 | 0,00 | 88,15 | - | - | 0,00 | 0,00 | - |
| T36 | 10 276 | 10 278 | **9,56** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T37 | 9 704 | 9 706 | **10,24** | 110,1 | 0,00 | 90,74 | - | - | 0,00 | 0,00 | - |
| T38 | 8 747 | 8 749 | **11,51** | 110,1 | 0,00 | 89,84 | - | - | 0,00 | 0,00 | - |
| T39 | 10 142 | 10 144 | **9,62** | 110,1 | 0,00 | 91,12 | - | - | 0,00 | 0,00 | - |
| T4 | 3 543 | 3 550 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T5 | 2 081 | 2 091 | **29,68** | 110,1 | 0,00 | 77,41 | - | - | 0,00 | 0,00 | - |
| T6 | 3 339 | 3 345 | **23,79** | 110,1 | 0,00 | 81,49 | - | - | 0,00 | 0,00 | - |
| T7 | 4 371 | 4 376 | **20,24** | 110,1 | 0,00 | 83,82 | - | - | 0,00 | 0,00 | - |
| T8 | 5 307 | 5 312 | **17,61** | 110,1 | 0,00 | 85,50 | - | - | 0,00 | 0,00 | - |
| T9 | 2 087 | 2 097 | **29,65** | 110,1 | 0,00 | 77,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,20** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: G Asuinrakennus G (Heiniaho)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 351 | 18 352 | **1,85** | 108,9 | 0,00 | 96,27 | - | - | 0,00 | 0,00 | - |
| 10 | 21 130 | 21 131 | **0,05** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 100 | 13 393 | 13 394 | **0,82** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 101 | 13 822 | 13 824 | **0,43** | 106,0 | 0,00 | 93,81 | - | - | 0,00 | 0,00 | - |
| 102 | 12 757 | 12 759 | **1,42** | 106,0 | 0,00 | 93,12 | - | - | 0,00 | 0,00 | - |
| 103 | 12 065 | 12 067 | **2,10** | 106,0 | 0,00 | 92,63 | - | - | 0,00 | 0,00 | - |
| 104 | 11 438 | 11 439 | **2,75** | 106,0 | 0,00 | 92,17 | - | - | 0,00 | 0,00 | - |
| 105 | 11 180 | 11 182 | **3,02** | 106,0 | 0,00 | 91,97 | - | - | 0,00 | 0,00 | - |
| 106 | 10 648 | 10 650 | **3,62** | 106,0 | 0,00 | 91,55 | - | - | 0,00 | 0,00 | - |
| 107 | 11 649 | 11 651 | **2,54** | 106,0 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |
| 108 | 12 329 | 12 330 | **1,82** | 106,0 | 0,00 | 92,82 | - | - | 0,00 | 0,00 | - |
| 109 | 11 505 | 11 506 | **2,67** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 11 | 20 940 | 20 941 | **0,17** | 108,9 | 0,00 | 97,42 | - | - | 0,00 | 0,00 | - |
| 110 | 11 904 | 11 905 | **2,25** | 106,0 | 0,00 | 92,51 | - | - | 0,00 | 0,00 | - |
| 111 | 9 634 | 9 636 | **4,84** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 112 | 10 449 | 10 450 | **3,85** | 106,0 | 0,00 | 91,38 | - | - | 0,00 | 0,00 | - |
| 12 | 21 074 | 21 075 | **0,09** | 108,9 | 0,00 | 97,48 | - | - | 0,00 | 0,00 | - |
| 13 | 21 958 | 21 959 | **-0,45** | 108,9 | 0,00 | 97,83 | - | - | 0,00 | 0,00 | - |
| 14 | 23 776 | 23 777 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 15 | 21 901 | 21 902 | **-0,41** | 108,9 | 0,00 | 97,81 | - | - | 0,00 | 0,00 | - |
| 16 | 22 827 | 22 828 | **-0,95** | 108,9 | 0,00 | 98,17 | - | - | 0,00 | 0,00 | - |
| 17 | 22 753 | 22 754 | **-0,91** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 18 | 23 558 | 23 559 | **-1,35** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 19 | 23 891 | 23 892 | **-1,55** | 108,9 | 0,00 | 98,57 | - | - | 0,00 | 0,00 | - |
| 2 | 18 961 | 18 963 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 20 | 25 280 | 25 281 | **-2,30** | 108,9 | 0,00 | 99,06 | - | - | 0,00 | 0,00 | - |
| 21 | 24 002 | 24 003 | **-1,61** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 22 | 25 839 | 25 840 | **-2,59** | 108,9 | 0,00 | 99,25 | - | - | 0,00 | 0,00 | - |
| 23 | 25 691 | 25 692 | **-2,51** | 108,9 | 0,00 | 99,20 | - | - | 0,00 | 0,00 | - |
| 24 | 22 971 | 22 972 | **-1,04** | 108,9 | 0,00 | 98,22 | - | - | 0,00 | 0,00 | - |
| 25 | 25 075 | 25 076 | **-2,19** | 108,9 | 0,00 | 98,99 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 26 631 | 26 632 | **-2,99** | 108,9 | 0,00 | 99,51 | - | - | 0,00 | 0,00 | - |
| 27 | 26 109 | 26 110 | **-2,73** | 108,9 | 0,00 | 99,34 | - | - | 0,00 | 0,00 | - |
| 28 | 24 806 | 24 807 | **-2,05** | 108,9 | 0,00 | 98,89 | - | - | 0,00 | 0,00 | - |
| 29 | 24 387 | 24 388 | **-1,80** | 108,9 | 0,00 | 98,74 | - | - | 0,00 | 0,00 | - |
| 3 | 19 371 | 19 373 | **1,16** | 108,9 | 0,00 | 96,74 | - | - | 0,00 | 0,00 | - |
| 30 | 22 062 | 22 063 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 31 | 24 231 | 24 232 | **-1,74** | 108,9 | 0,00 | 98,69 | - | - | 0,00 | 0,00 | - |
| 4 | 20 215 | 20 217 | **0,62** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 5 | 21 132 | 21 134 | **0,04** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 6 | 19 313 | 19 315 | **1,22** | 108,9 | 0,00 | 96,72 | - | - | 0,00 | 0,00 | - |
| 7 | 19 869 | 19 870 | **0,85** | 108,9 | 0,00 | 96,96 | - | - | 0,00 | 0,00 | - |
| 71 | 15 885 | 15 886 | **-1,26** | 106,0 | 0,00 | 95,02 | - | - | 0,00 | 0,00 | - |
| 72 | 15 365 | 15 366 | **-0,86** | 106,0 | 0,00 | 94,73 | - | - | 0,00 | 0,00 | - |
| 73 | 14 822 | 14 823 | **-0,41** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 74 | 16 250 | 16 251 | **-1,54** | 106,0 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 75 | 16 728 | 16 729 | **-1,90** | 106,0 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 76 | 17 293 | 17 294 | **-2,31** | 106,0 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 77 | 16 076 | 16 078 | **-1,41** | 106,0 | 0,00 | 95,12 | - | - | 0,00 | 0,00 | - |
| 78 | 17 007 | 17 008 | **-2,11** | 106,0 | 0,00 | 95,61 | - | - | 0,00 | 0,00 | - |
| 79 | 17 631 | 17 632 | **-2,55** | 106,0 | 0,00 | 95,93 | - | - | 0,00 | 0,00 | - |
| 8 | 20 190 | 20 191 | **0,64** | 108,9 | 0,00 | 97,10 | - | - | 0,00 | 0,00 | - |
| 80 | 16 242 | 16 243 | **-1,54** | 106,0 | 0,00 | 95,21 | - | - | 0,00 | 0,00 | - |
| 81 | 15 261 | 15 263 | **-0,78** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 82 | 14 569 | 14 570 | **-0,21** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 83 | 14 343 | 14 344 | **-0,01** | 106,0 | 0,00 | 94,13 | - | - | 0,00 | 0,00 | - |
| 84 | 15 316 | 15 317 | **-0,83** | 106,0 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| 85 | 14 860 | 14 861 | **-0,46** | 106,0 | 0,00 | 94,44 | - | - | 0,00 | 0,00 | - |
| 86 | 12 094 | 12 096 | **2,05** | 106,0 | 0,00 | 92,65 | - | - | 0,00 | 0,00 | - |
| 87 | 11 617 | 11 619 | **2,54** | 106,0 | 0,00 | 92,30 | - | - | 0,00 | 0,00 | - |
| 88 | 10 656 | 10 658 | **3,59** | 106,0 | 0,00 | 91,55 | - | - | 0,00 | 0,00 | - |
| 89 | 10 001 | 10 003 | **4,37** | 106,0 | 0,00 | 91,00 | - | - | 0,00 | 0,00 | - |
| 9 | 22 149 | 22 150 | **-0,56** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 90 | 9 539 | 9 540 | **4,95** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 91 | 9 956 | 9 958 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 92 | 10 944 | 10 946 | **3,26** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 93 | 12 990 | 12 991 | **1,21** | 106,0 | 0,00 | 93,27 | - | - | 0,00 | 0,00 | - |
| 94 | 13 544 | 13 545 | **0,69** | 106,0 | 0,00 | 93,64 | - | - | 0,00 | 0,00 | - |
| 95 | 13 834 | 13 835 | **0,43** | 106,0 | 0,00 | 93,82 | - | - | 0,00 | 0,00 | - |
| 96 | 14 159 | 14 160 | **0,15** | 106,0 | 0,00 | 94,02 | - | - | 0,00 | 0,00 | - |
| 97 | 12 373 | 12 375 | **1,79** | 106,0 | 0,00 | 92,85 | - | - | 0,00 | 0,00 | - |
| 98 | 12 850 | 12 851 | **1,33** | 106,0 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| 99 | 13 417 | 13 418 | **0,80** | 106,0 | 0,00 | 93,55 | - | - | 0,00 | 0,00 | - |
| T1 | 2 060 | 2 071 | **29,79** | 110,1 | 0,00 | 77,33 | - | - | 0,00 | 0,00 | - |
| T10 | 4 264 | 4 269 | **20,57** | 110,1 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| T11 | 5 583 | 5 587 | **16,92** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T12 | 3 725 | 3 731 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T13 | 4 582 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T14 | 5 269 | 5 274 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T15 | 6 057 | 6 061 | **15,79** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T16 | 4 379 | 4 384 | **20,25** | 110,1 | 0,00 | 83,84 | - | - | 0,00 | 0,00 | - |
| T17 | 5 410 | 5 414 | **17,35** | 110,1 | 0,00 | 85,67 | - | - | 0,00 | 0,00 | - |
| T18 | 6 152 | 6 157 | **15,58** | 110,1 | 0,00 | 86,79 | - | - | 0,00 | 0,00 | - |
| T19 | 5 065 | 5 069 | **18,30** | 110,1 | 0,00 | 85,10 | - | - | 0,00 | 0,00 | - |
| T2 | 2 521 | 2 531 | **27,34** | 110,1 | 0,00 | 79,07 | - | - | 0,00 | 0,00 | - |
| T20 | 5 581 | 5 585 | **16,94** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T21 | 6 500 | 6 504 | **14,81** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T22 | 6 055 | 6 059 | **15,84** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T23 | 6 358 | 6 361 | **15,14** | 110,1 | 0,00 | 87,07 | - | - | 0,00 | 0,00 | - |
| T24 | 7 236 | 7 239 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T25 | 7 055 | 7 058 | **13,88** | 110,1 | 0,00 | 87,97 | - | - | 0,00 | 0,00 | - |
| T26 | 7 119 | 7 122 | **13,75** | 110,1 | 0,00 | 88,05 | - | - | 0,00 | 0,00 | - |
| T27 | 7 745 | 7 748 | **12,69** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T28 | 7 962 | 7 964 | **12,41** | 110,1 | 0,00 | 89,02 | - | - | 0,00 | 0,00 | - |
| T29 | 8 064 | 8 066 | **12,23** | 110,1 | 0,00 | 89,13 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T3 | 2 071 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T30 | 9 912 | 9 914 | **9,74** | 110,1 | 0,00 | 90,92 | - | - | 0,00 | 0,00 | - |
| T31 | 9 035 | 9 038 | **11,10** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T32 | 10 974 | 10 976 | **8,44** | 110,1 | 0,00 | 91,81 | - | - | 0,00 | 0,00 | - |
| T33 | 10 268 | 10 270 | **9,45** | 110,1 | 0,00 | 91,23 | - | - | 0,00 | 0,00 | - |
| T34 | 9 295 | 9 297 | **10,74** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T35 | 9 163 | 9 165 | **10,89** | 110,1 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| T36 | 11 785 | 11 787 | **7,58** | 110,1 | 0,00 | 92,43 | - | - | 0,00 | 0,00 | - |
| T37 | 11 362 | 11 364 | **8,16** | 110,1 | 0,00 | 92,11 | - | - | 0,00 | 0,00 | - |
| T38 | 10 571 | 10 573 | **9,09** | 110,1 | 0,00 | 91,48 | - | - | 0,00 | 0,00 | - |
| T39 | 11 920 | 11 922 | **7,53** | 110,1 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| T4 | 3 074 | 3 081 | **24,85** | 110,1 | 0,00 | 80,77 | - | - | 0,00 | 0,00 | - |
| T5 | 2 163 | 2 173 | **29,21** | 110,1 | 0,00 | 77,74 | - | - | 0,00 | 0,00 | - |
| T6 | 3 538 | 3 545 | **23,04** | 110,1 | 0,00 | 81,99 | - | - | 0,00 | 0,00 | - |
| T7 | 4 299 | 4 304 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T8 | 5 266 | 5 270 | **17,72** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T9 | 2 879 | 2 887 | **25,69** | 110,1 | 0,00 | 80,21 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,45** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: H Asuinrakennus H (Mäkelä)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 19 383 | 19 385 | **1,15** | 108,9 | 0,00 | 96,75 | - | - | 0,00 | 0,00 | - |
| 10 | 22 204 | 22 205 | **-0,60** | 108,9 | 0,00 | 97,93 | - | - | 0,00 | 0,00 | - |
| 100 | 14 485 | 14 486 | **-0,15** | 106,0 | 0,00 | 94,22 | - | - | 0,00 | 0,00 | - |
| 101 | 14 903 | 14 904 | **-0,50** | 106,0 | 0,00 | 94,47 | - | - | 0,00 | 0,00 | - |
| 102 | 13 860 | 13 861 | **0,39** | 106,0 | 0,00 | 93,84 | - | - | 0,00 | 0,00 | - |
| 103 | 13 173 | 13 175 | **1,00** | 106,0 | 0,00 | 93,39 | - | - | 0,00 | 0,00 | - |
| 104 | 12 551 | 12 552 | **1,59** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 105 | 12 280 | 12 282 | **1,86** | 106,0 | 0,00 | 92,79 | - | - | 0,00 | 0,00 | - |
| 106 | 11 756 | 11 758 | **2,39** | 106,0 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 107 | 12 736 | 12 737 | **1,43** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 108 | 13 392 | 13 393 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 109 | 12 570 | 12 571 | **1,57** | 106,0 | 0,00 | 92,99 | - | - | 0,00 | 0,00 | - |
| 11 | 22 042 | 22 043 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 110 | 12 958 | 12 959 | **1,20** | 106,0 | 0,00 | 93,25 | - | - | 0,00 | 0,00 | - |
| 111 | 10 736 | 10 738 | **3,49** | 106,0 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| 112 | 11 539 | 11 540 | **2,61** | 106,0 | 0,00 | 92,24 | - | - | 0,00 | 0,00 | - |
| 12 | 22 195 | 22 197 | **-0,59** | 108,9 | 0,00 | 97,93 | - | - | 0,00 | 0,00 | - |
| 13 | 23 061 | 23 062 | **-1,10** | 108,9 | 0,00 | 98,26 | - | - | 0,00 | 0,00 | - |
| 14 | 24 834 | 24 835 | **-2,07** | 108,9 | 0,00 | 98,90 | - | - | 0,00 | 0,00 | - |
| 15 | 23 018 | 23 020 | **-1,07** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 16 | 23 939 | 23 940 | **-1,58** | 108,9 | 0,00 | 98,58 | - | - | 0,00 | 0,00 | - |
| 17 | 23 851 | 23 852 | **-1,54** | 108,9 | 0,00 | 98,55 | - | - | 0,00 | 0,00 | - |
| 18 | 24 650 | 24 651 | **-1,95** | 108,9 | 0,00 | 98,84 | - | - | 0,00 | 0,00 | - |
| 19 | 25 002 | 25 003 | **-2,16** | 108,9 | 0,00 | 98,96 | - | - | 0,00 | 0,00 | - |
| 2 | 19 969 | 19 971 | **0,77** | 108,9 | 0,00 | 97,01 | - | - | 0,00 | 0,00 | - |
| 20 | 26 378 | 26 379 | **-2,87** | 108,9 | 0,00 | 99,43 | - | - | 0,00 | 0,00 | - |
| 21 | 25 081 | 25 082 | **-2,20** | 108,9 | 0,00 | 98,99 | - | - | 0,00 | 0,00 | - |
| 22 | 26 925 | 26 926 | **-3,14** | 108,9 | 0,00 | 99,60 | - | - | 0,00 | 0,00 | - |
| 23 | 26 757 | 26 758 | **-3,06** | 108,9 | 0,00 | 99,55 | - | - | 0,00 | 0,00 | - |
| 24 | 24 046 | 24 047 | **-1,64** | 108,9 | 0,00 | 98,62 | - | - | 0,00 | 0,00 | - |
| 25 | 26 122 | 26 123 | **-2,74** | 108,9 | 0,00 | 99,34 | - | - | 0,00 | 0,00 | - |
| 26 | 27 707 | 27 708 | **-3,52** | 108,9 | 0,00 | 99,85 | - | - | 0,00 | 0,00 | - |
| 27 | 27 159 | 27 160 | **-3,26** | 108,9 | 0,00 | 99,68 | - | - | 0,00 | 0,00 | - |
| 28 | 25 880 | 25 881 | **-2,61** | 108,9 | 0,00 | 99,26 | - | - | 0,00 | 0,00 | - |
| 29 | 25 480 | 25 481 | **-2,39** | 108,9 | 0,00 | 99,12 | - | - | 0,00 | 0,00 | - |
| 3 | 20 431 | 20 432 | **0,47** | 108,9 | 0,00 | 97,21 | - | - | 0,00 | 0,00 | - |
| 30 | 23 140 | 23 141 | **-1,14** | 108,9 | 0,00 | 98,29 | - | - | 0,00 | 0,00 | - |
| 31 | 25 272 | 25 273 | **-2,30** | 108,9 | 0,00 | 99,05 | - | - | 0,00 | 0,00 | - |
| 4 | 21 270 | 21 271 | **-0,04** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 22 182 | 22 183 | **-0,59** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 6 | 20 399 | 20 400 | **0,50** | 108,9 | 0,00 | 97,19 | - | - | 0,00 | 0,00 | - |
| 7 | 20 974 | 20 975 | **0,14** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |
| 71 | 16 984 | 16 985 | **-2,10** | 106,0 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 72 | 16 466 | 16 467 | **-1,72** | 106,0 | 0,00 | 95,33 | - | - | 0,00 | 0,00 | - |
| 73 | 15 929 | 15 930 | **-1,31** | 106,0 | 0,00 | 95,04 | - | - | 0,00 | 0,00 | - |
| 74 | 17 340 | 17 341 | **-2,35** | 106,0 | 0,00 | 95,78 | - | - | 0,00 | 0,00 | - |
| 75 | 17 806 | 17 807 | **-2,68** | 106,0 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 76 | 18 359 | 18 360 | **-3,06** | 106,0 | 0,00 | 96,28 | - | - | 0,00 | 0,00 | - |
| 77 | 17 149 | 17 150 | **-2,22** | 106,0 | 0,00 | 95,69 | - | - | 0,00 | 0,00 | - |
| 78 | 18 056 | 18 057 | **-2,85** | 106,0 | 0,00 | 96,13 | - | - | 0,00 | 0,00 | - |
| 79 | 18 677 | 18 678 | **-3,27** | 106,0 | 0,00 | 96,43 | - | - | 0,00 | 0,00 | - |
| 8 | 21 270 | 21 271 | **-0,04** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |
| 80 | 17 298 | 17 299 | **-2,32** | 106,0 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 81 | 16 334 | 16 334 | **-1,62** | 106,0 | 0,00 | 95,26 | - | - | 0,00 | 0,00 | - |
| 82 | 15 663 | 15 664 | **-1,11** | 106,0 | 0,00 | 94,90 | - | - | 0,00 | 0,00 | - |
| 83 | 15 425 | 15 426 | **-0,92** | 106,0 | 0,00 | 94,76 | - | - | 0,00 | 0,00 | - |
| 84 | 16 368 | 16 369 | **-1,65** | 106,0 | 0,00 | 95,28 | - | - | 0,00 | 0,00 | - |
| 85 | 15 907 | 15 908 | **-1,30** | 106,0 | 0,00 | 95,03 | - | - | 0,00 | 0,00 | - |
| 86 | 13 107 | 13 108 | **1,07** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 87 | 12 646 | 12 647 | **1,50** | 106,0 | 0,00 | 93,04 | - | - | 0,00 | 0,00 | - |
| 88 | 11 711 | 11 713 | **2,43** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 89 | 11 069 | 11 070 | **3,12** | 106,0 | 0,00 | 91,88 | - | - | 0,00 | 0,00 | - |
| 9 | 23 206 | 23 208 | **-1,18** | 108,9 | 0,00 | 98,31 | - | - | 0,00 | 0,00 | - |
| 90 | 10 616 | 10 618 | **3,62** | 106,0 | 0,00 | 91,52 | - | - | 0,00 | 0,00 | - |
| 91 | 10 999 | 11 001 | **3,19** | 106,0 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 92 | 11 975 | 11 976 | **2,16** | 106,0 | 0,00 | 92,57 | - | - | 0,00 | 0,00 | - |
| 93 | 14 113 | 14 114 | **0,19** | 106,0 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |
| 94 | 14 665 | 14 666 | **-0,30** | 106,0 | 0,00 | 94,33 | - | - | 0,00 | 0,00 | - |
| 95 | 14 949 | 14 950 | **-0,54** | 106,0 | 0,00 | 94,49 | - | - | 0,00 | 0,00 | - |
| 96 | 15 266 | 15 267 | **-0,79** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 97 | 13 492 | 13 493 | **0,72** | 106,0 | 0,00 | 93,60 | - | - | 0,00 | 0,00 | - |
| 98 | 13 964 | 13 965 | **0,29** | 106,0 | 0,00 | 93,90 | - | - | 0,00 | 0,00 | - |
| 99 | 14 526 | 14 527 | **-0,19** | 106,0 | 0,00 | 94,24 | - | - | 0,00 | 0,00 | - |
| T1 | 2 090 | 2 102 | **29,62** | 110,1 | 0,00 | 77,45 | - | - | 0,00 | 0,00 | - |
| T10 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| T11 | 6 241 | 6 244 | **15,38** | 110,1 | 0,00 | 86,91 | - | - | 0,00 | 0,00 | - |
| T12 | 4 712 | 4 716 | **19,23** | 110,1 | 0,00 | 84,47 | - | - | 0,00 | 0,00 | - |
| T13 | 5 551 | 5 555 | **17,00** | 110,1 | 0,00 | 85,89 | - | - | 0,00 | 0,00 | - |
| T14 | 6 120 | 6 123 | **15,65** | 110,1 | 0,00 | 86,74 | - | - | 0,00 | 0,00 | - |
| T15 | 6 813 | 6 816 | **14,24** | 110,1 | 0,00 | 87,67 | - | - | 0,00 | 0,00 | - |
| T16 | 5 460 | 5 464 | **17,22** | 110,1 | 0,00 | 85,75 | - | - | 0,00 | 0,00 | - |
| T17 | 6 379 | 6 383 | **15,08** | 110,1 | 0,00 | 87,10 | - | - | 0,00 | 0,00 | - |
| T18 | 7 035 | 7 038 | **13,85** | 110,1 | 0,00 | 87,95 | - | - | 0,00 | 0,00 | - |
| T19 | 6 182 | 6 186 | **15,52** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T2 | 2 797 | 2 805 | **26,05** | 110,1 | 0,00 | 79,96 | - | - | 0,00 | 0,00 | - |
| T20 | 6 647 | 6 650 | **14,54** | 110,1 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| T21 | 7 475 | 7 478 | **13,12** | 110,1 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| T22 | 7 173 | 7 176 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T23 | 7 432 | 7 435 | **13,19** | 110,1 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| T24 | 8 212 | 8 214 | **11,96** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T25 | 8 175 | 8 177 | **12,02** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T26 | 8 201 | 8 203 | **11,97** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T27 | 8 768 | 8 770 | **11,14** | 110,1 | 0,00 | 89,86 | - | - | 0,00 | 0,00 | - |
| T28 | 9 092 | 9 094 | **10,73** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T29 | 9 154 | 9 157 | **10,60** | 110,1 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| T3 | 2 728 | 2 736 | **26,36** | 110,1 | 0,00 | 79,74 | - | - | 0,00 | 0,00 | - |
| T30 | 10 547 | 10 549 | **8,90** | 110,1 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| T31 | 9 767 | 9 769 | **10,00** | 110,1 | 0,00 | 90,80 | - | - | 0,00 | 0,00 | - |
| T32 | 11 585 | 11 587 | **7,72** | 110,1 | 0,00 | 92,28 | - | - | 0,00 | 0,00 | - |
| T33 | 10 962 | 10 964 | **8,46** | 110,1 | 0,00 | 91,80 | - | - | 0,00 | 0,00 | - |
| T34 | 10 091 | 10 093 | **9,61** | 110,1 | 0,00 | 91,08 | - | - | 0,00 | 0,00 | - |
| T35 | 10 026 | 10 028 | **9,68** | 110,1 | 0,00 | 91,02 | - | - | 0,00 | 0,00 | - |
| T36 | 12 434 | 12 436 | **6,77** | 110,1 | 0,00 | 92,89 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T37 | 12 078 | 12 080 | **7,23** | 110,1 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| T38 | 11 364 | 11 366 | **8,08** | 110,1 | 0,00 | 92,11 | - | - | 0,00 | 0,00 | - |
| T39 | 12 682 | 12 684 | **6,66** | 110,1 | 0,00 | 93,07 | - | - | 0,00 | 0,00 | - |
| T4 | 3 644 | 3 650 | **22,65** | 110,1 | 0,00 | 82,25 | - | - | 0,00 | 0,00 | - |
| T5 | 3 094 | 3 100 | **24,77** | 110,1 | 0,00 | 80,83 | - | - | 0,00 | 0,00 | - |
| T6 | 4 292 | 4 297 | **20,49** | 110,1 | 0,00 | 83,66 | - | - | 0,00 | 0,00 | - |
| T7 | 4 883 | 4 887 | **18,75** | 110,1 | 0,00 | 84,78 | - | - | 0,00 | 0,00 | - |
| T8 | 5 791 | 5 795 | **16,41** | 110,1 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| T9 | 3 860 | 3 866 | **21,89** | 110,1 | 0,00 | 82,74 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,29** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: I Lomarakennus I

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 989 | 16 990 | **2,82** | 108,9 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 10 | 20 165 | 20 166 | **0,64** | 108,9 | 0,00 | 97,09 | - | - | 0,00 | 0,00 | - |
| 100 | 12 936 | 12 937 | **1,22** | 106,0 | 0,00 | 93,24 | - | - | 0,00 | 0,00 | - |
| 101 | 13 178 | 13 179 | **1,00** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 102 | 12 517 | 12 518 | **1,64** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 103 | 11 964 | 11 965 | **2,17** | 106,0 | 0,00 | 92,56 | - | - | 0,00 | 0,00 | - |
| 104 | 11 493 | 11 494 | **2,66** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |
| 105 | 11 007 | 11 009 | **3,19** | 106,0 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 106 | 10 666 | 10 668 | **3,57** | 106,0 | 0,00 | 91,56 | - | - | 0,00 | 0,00 | - |
| 107 | 11 231 | 11 233 | **2,94** | 106,0 | 0,00 | 92,01 | - | - | 0,00 | 0,00 | - |
| 108 | 11 552 | 11 553 | **2,60** | 106,0 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| 109 | 10 808 | 10 809 | **3,41** | 106,0 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| 11 | 20 393 | 20 394 | **0,50** | 108,9 | 0,00 | 97,19 | - | - | 0,00 | 0,00 | - |
| 110 | 11 047 | 11 048 | **3,14** | 106,0 | 0,00 | 91,87 | - | - | 0,00 | 0,00 | - |
| 111 | 9 635 | 9 637 | **4,80** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 112 | 10 184 | 10 185 | **4,13** | 106,0 | 0,00 | 91,16 | - | - | 0,00 | 0,00 | - |
| 12 | 20 906 | 20 907 | **0,18** | 108,9 | 0,00 | 97,41 | - | - | 0,00 | 0,00 | - |
| 13 | 21 386 | 21 387 | **-0,11** | 108,9 | 0,00 | 97,60 | - | - | 0,00 | 0,00 | - |
| 14 | 22 562 | 22 563 | **-0,81** | 108,9 | 0,00 | 98,07 | - | - | 0,00 | 0,00 | - |
| 15 | 21 618 | 21 619 | **-0,25** | 108,9 | 0,00 | 97,70 | - | - | 0,00 | 0,00 | - |
| 16 | 22 411 | 22 412 | **-0,72** | 108,9 | 0,00 | 98,01 | - | - | 0,00 | 0,00 | - |
| 17 | 22 080 | 22 081 | **-0,53** | 108,9 | 0,00 | 97,88 | - | - | 0,00 | 0,00 | - |
| 18 | 22 793 | 22 794 | **-0,94** | 108,9 | 0,00 | 98,16 | - | - | 0,00 | 0,00 | - |
| 19 | 23 435 | 23 436 | **-1,31** | 108,9 | 0,00 | 98,40 | - | - | 0,00 | 0,00 | - |
| 2 | 17 355 | 17 357 | **2,55** | 108,9 | 0,00 | 95,79 | - | - | 0,00 | 0,00 | - |
| 20 | 24 561 | 24 562 | **-1,91** | 108,9 | 0,00 | 98,81 | - | - | 0,00 | 0,00 | - |
| 21 | 23 038 | 23 039 | **-1,08** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 22 | 24 943 | 24 944 | **-2,13** | 108,9 | 0,00 | 98,94 | - | - | 0,00 | 0,00 | - |
| 23 | 24 542 | 24 543 | **-1,91** | 108,9 | 0,00 | 98,80 | - | - | 0,00 | 0,00 | - |
| 24 | 21 972 | 21 973 | **-0,46** | 108,9 | 0,00 | 97,84 | - | - | 0,00 | 0,00 | - |
| 25 | 23 715 | 23 716 | **-1,46** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |
| 26 | 25 584 | 25 585 | **-2,46** | 108,9 | 0,00 | 99,16 | - | - | 0,00 | 0,00 | - |
| 27 | 24 772 | 24 773 | **-2,03** | 108,9 | 0,00 | 98,88 | - | - | 0,00 | 0,00 | - |
| 28 | 23 759 | 23 760 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 29 | 23 617 | 23 618 | **-1,41** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 3 | 18 265 | 18 267 | **1,91** | 108,9 | 0,00 | 96,23 | - | - | 0,00 | 0,00 | - |
| 30 | 21 115 | 21 116 | **0,05** | 108,9 | 0,00 | 97,49 | - | - | 0,00 | 0,00 | - |
| 31 | 22 826 | 22 827 | **-0,96** | 108,9 | 0,00 | 98,17 | - | - | 0,00 | 0,00 | - |
| 4 | 19 032 | 19 033 | **1,38** | 108,9 | 0,00 | 96,59 | - | - | 0,00 | 0,00 | - |
| 5 | 19 878 | 19 879 | **0,83** | 108,9 | 0,00 | 96,97 | - | - | 0,00 | 0,00 | - |
| 6 | 18 535 | 18 536 | **1,72** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 7 | 19 379 | 19 380 | **1,15** | 108,9 | 0,00 | 96,75 | - | - | 0,00 | 0,00 | - |
| 71 | 15 421 | 15 422 | **-0,92** | 106,0 | 0,00 | 94,76 | - | - | 0,00 | 0,00 | - |
| 72 | 14 966 | 14 967 | **-0,55** | 106,0 | 0,00 | 94,50 | - | - | 0,00 | 0,00 | - |
| 73 | 14 551 | 14 552 | **-0,21** | 106,0 | 0,00 | 94,26 | - | - | 0,00 | 0,00 | - |
| 74 | 15 644 | 15 645 | **-1,09** | 106,0 | 0,00 | 94,89 | - | - | 0,00 | 0,00 | - |
| 75 | 15 930 | 15 931 | **-1,31** | 106,0 | 0,00 | 95,04 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | 16 319 | 16 320 | **-1,61** | 106,0 | 0,00 | 95,25 | - | - | 0,00 | 0,00 | - |
| 77 | 15 235 | 15 236 | **-0,77** | 106,0 | 0,00 | 94,66 | - | - | 0,00 | 0,00 | - |
| 78 | 15 854 | 15 855 | **-1,26** | 106,0 | 0,00 | 95,00 | - | - | 0,00 | 0,00 | - |
| 79 | 16 417 | 16 418 | **-1,68** | 106,0 | 0,00 | 95,31 | - | - | 0,00 | 0,00 | - |
| 8 | 19 312 | 19 313 | **1,20** | 108,9 | 0,00 | 96,72 | - | - | 0,00 | 0,00 | - |
| 80 | 15 192 | 15 193 | **-0,73** | 106,0 | 0,00 | 94,63 | - | - | 0,00 | 0,00 | - |
| 81 | 14 441 | 14 442 | **-0,12** | 106,0 | 0,00 | 94,19 | - | - | 0,00 | 0,00 | - |
| 82 | 14 086 | 14 087 | **0,19** | 106,0 | 0,00 | 93,98 | - | - | 0,00 | 0,00 | - |
| 83 | 13 696 | 13 697 | **0,53** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 84 | 14 264 | 14 266 | **0,03** | 106,0 | 0,00 | 94,09 | - | - | 0,00 | 0,00 | - |
| 85 | 13 767 | 13 768 | **0,47** | 106,0 | 0,00 | 93,78 | - | - | 0,00 | 0,00 | - |
| 86 | 10 806 | 10 807 | **3,41** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 87 | 10 516 | 10 518 | **3,74** | 106,0 | 0,00 | 91,44 | - | - | 0,00 | 0,00 | - |
| 88 | 9 914 | 9 916 | **4,45** | 106,0 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| 89 | 9 468 | 9 470 | **5,01** | 106,0 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |
| 9 | 20 958 | 20 960 | **0,15** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |
| 90 | 9 186 | 9 188 | **5,38** | 106,0 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| 91 | 9 150 | 9 152 | **5,42** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 92 | 9 920 | 9 921 | **4,45** | 106,0 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| 93 | 13 174 | 13 175 | **1,00** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 94 | 13 629 | 13 630 | **0,59** | 106,0 | 0,00 | 93,69 | - | - | 0,00 | 0,00 | - |
| 95 | 13 779 | 13 780 | **0,46** | 106,0 | 0,00 | 93,79 | - | - | 0,00 | 0,00 | - |
| 96 | 13 911 | 13 912 | **0,34** | 106,0 | 0,00 | 93,87 | - | - | 0,00 | 0,00 | - |
| 97 | 12 475 | 12 477 | **1,67** | 106,0 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| 98 | 12 822 | 12 824 | **1,33** | 106,0 | 0,00 | 93,16 | - | - | 0,00 | 0,00 | - |
| 99 | 13 260 | 13 261 | **0,93** | 106,0 | 0,00 | 93,45 | - | - | 0,00 | 0,00 | - |
| T1 | 2 625 | 2 634 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T10 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T11 | 2 945 | 2 952 | **25,40** | 110,1 | 0,00 | 80,40 | - | - | 0,00 | 0,00 | - |
| T12 | 4 055 | 4 059 | **21,25** | 110,1 | 0,00 | 83,17 | - | - | 0,00 | 0,00 | - |
| T13 | 4 315 | 4 320 | **20,41** | 110,1 | 0,00 | 83,71 | - | - | 0,00 | 0,00 | - |
| T14 | 3 870 | 3 876 | **21,86** | 110,1 | 0,00 | 82,77 | - | - | 0,00 | 0,00 | - |
| T15 | 3 806 | 3 813 | **22,08** | 110,1 | 0,00 | 82,62 | - | - | 0,00 | 0,00 | - |
| T16 | 5 213 | 5 217 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T17 | 4 798 | 4 802 | **18,99** | 110,1 | 0,00 | 84,63 | - | - | 0,00 | 0,00 | - |
| T18 | 4 661 | 4 667 | **19,37** | 110,1 | 0,00 | 84,38 | - | - | 0,00 | 0,00 | - |
| T19 | 6 200 | 6 203 | **15,47** | 110,1 | 0,00 | 86,85 | - | - | 0,00 | 0,00 | - |
| T2 | 2 072 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T20 | 5 814 | 5 818 | **16,36** | 110,1 | 0,00 | 86,30 | - | - | 0,00 | 0,00 | - |
| T21 | 5 603 | 5 607 | **16,87** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T22 | 6 929 | 6 932 | **14,04** | 110,1 | 0,00 | 87,82 | - | - | 0,00 | 0,00 | - |
| T23 | 6 481 | 6 485 | **14,86** | 110,1 | 0,00 | 87,24 | - | - | 0,00 | 0,00 | - |
| T24 | 6 187 | 6 190 | **15,50** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T25 | 7 771 | 7 773 | **12,64** | 110,1 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| T26 | 7 177 | 7 179 | **13,61** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T27 | 7 019 | 7 022 | **13,88** | 110,1 | 0,00 | 87,93 | - | - | 0,00 | 0,00 | - |
| T28 | 8 851 | 8 853 | **11,02** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T29 | 8 087 | 8 089 | **12,15** | 110,1 | 0,00 | 89,16 | - | - | 0,00 | 0,00 | - |
| T3 | 2 832 | 2 840 | **25,89** | 110,1 | 0,00 | 80,07 | - | - | 0,00 | 0,00 | - |
| T30 | 14 064 | 14 065 | **5,38** | 110,1 | 0,00 | 93,96 | - | - | 0,00 | 0,00 | - |
| T31 | 13 015 | 13 017 | **6,41** | 110,1 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| T32 | 15 148 | 15 150 | **4,37** | 110,1 | 0,00 | 94,61 | - | - | 0,00 | 0,00 | - |
| T33 | 14 297 | 14 299 | **5,16** | 110,1 | 0,00 | 94,11 | - | - | 0,00 | 0,00 | - |
| T34 | 13 106 | 13 108 | **6,22** | 110,1 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| T35 | 12 774 | 12 776 | **6,48** | 110,1 | 0,00 | 93,13 | - | - | 0,00 | 0,00 | - |
| T36 | 15 875 | 15 876 | **3,75** | 110,1 | 0,00 | 95,01 | - | - | 0,00 | 0,00 | - |
| T37 | 15 316 | 15 318 | **4,18** | 110,1 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| T38 | 14 348 | 14 349 | **5,01** | 110,1 | 0,00 | 94,14 | - | - | 0,00 | 0,00 | - |
| T39 | 15 746 | 15 748 | **3,76** | 110,1 | 0,00 | 94,94 | - | - | 0,00 | 0,00 | - |
| T4 | 2 100 | 2 111 | **29,57** | 110,1 | 0,00 | 77,49 | - | - | 0,00 | 0,00 | - |
| T5 | 3 534 | 3 539 | **23,06** | 110,1 | 0,00 | 81,98 | - | - | 0,00 | 0,00 | - |
| T6 | 2 703 | 2 711 | **26,48** | 110,1 | 0,00 | 79,66 | - | - | 0,00 | 0,00 | - |
| T7 | 1 994 | 2 005 | **30,19** | 110,1 | 0,00 | 77,04 | - | - | 0,00 | 0,00 | - |
| T8 | 2 093 | 2 104 | **29,61** | 110,1 | 0,00 | 77,46 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T9 | 3 792 | 3 797 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,68** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10 816 | 10 819 | **8,41** | 108,9 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| 10 | 12 731 | 12 733 | **6,42** | 108,9 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 100 | 5 336 | 5 339 | **12,02** | 106,0 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| 101 | 5 965 | 5 968 | **10,54** | 106,0 | 0,00 | 86,52 | - | - | 0,00 | 0,00 | - |
| 102 | 4 524 | 4 529 | **14,29** | 106,0 | 0,00 | 84,12 | - | - | 0,00 | 0,00 | - |
| 103 | 3 832 | 3 837 | **16,55** | 106,0 | 0,00 | 82,68 | - | - | 0,00 | 0,00 | - |
| 104 | 3 186 | 3 191 | **19,04** | 106,0 | 0,00 | 81,08 | - | - | 0,00 | 0,00 | - |
| 105 | 3 510 | 3 515 | **17,74** | 106,0 | 0,00 | 81,92 | - | - | 0,00 | 0,00 | - |
| 106 | 2 929 | 2 935 | **20,15** | 106,0 | 0,00 | 80,35 | - | - | 0,00 | 0,00 | - |
| 107 | 4 206 | 4 211 | **15,28** | 106,0 | 0,00 | 83,49 | - | - | 0,00 | 0,00 | - |
| 108 | 5 261 | 5 264 | **12,22** | 106,0 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |
| 109 | 4 706 | 4 710 | **13,77** | 106,0 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| 11 | 12 069 | 12 072 | **7,07** | 108,9 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 110 | 5 208 | 5 212 | **12,37** | 106,0 | 0,00 | 85,34 | - | - | 0,00 | 0,00 | - |
| 111 | 2 849 | 2 856 | **20,51** | 106,0 | 0,00 | 80,11 | - | - | 0,00 | 0,00 | - |
| 112 | 3 475 | 3 480 | **17,87** | 106,0 | 0,00 | 81,83 | - | - | 0,00 | 0,00 | - |
| 12 | 11 863 | 11 865 | **7,30** | 108,9 | 0,00 | 92,49 | - | - | 0,00 | 0,00 | - |
| 13 | 13 066 | 13 069 | **6,10** | 108,9 | 0,00 | 93,32 | - | - | 0,00 | 0,00 | - |
| 14 | 15 537 | 15 539 | **3,95** | 108,9 | 0,00 | 94,83 | - | - | 0,00 | 0,00 | - |
| 15 | 12 753 | 12 755 | **6,42** | 108,9 | 0,00 | 93,11 | - | - | 0,00 | 0,00 | - |
| 16 | 13 759 | 13 761 | **5,50** | 108,9 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 17 | 13 928 | 13 930 | **5,31** | 108,9 | 0,00 | 93,88 | - | - | 0,00 | 0,00 | - |
| 18 | 14 795 | 14 797 | **4,56** | 108,9 | 0,00 | 94,40 | - | - | 0,00 | 0,00 | - |
| 19 | 14 825 | 14 827 | **4,56** | 108,9 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 2 | 11 759 | 11 762 | **7,39** | 108,9 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 20 | 16 409 | 16 411 | **3,26** | 108,9 | 0,00 | 95,30 | - | - | 0,00 | 0,00 | - |
| 21 | 15 441 | 15 443 | **4,02** | 108,9 | 0,00 | 94,77 | - | - | 0,00 | 0,00 | - |
| 22 | 17 129 | 17 130 | **2,73** | 108,9 | 0,00 | 95,68 | - | - | 0,00 | 0,00 | - |
| 23 | 17 275 | 17 277 | **2,61** | 108,9 | 0,00 | 95,75 | - | - | 0,00 | 0,00 | - |
| 24 | 14 503 | 14 505 | **4,81** | 108,9 | 0,00 | 94,23 | - | - | 0,00 | 0,00 | - |
| 25 | 16 962 | 16 964 | **2,84** | 108,9 | 0,00 | 95,59 | - | - | 0,00 | 0,00 | - |
| 26 | 18 060 | 18 062 | **2,05** | 108,9 | 0,00 | 96,14 | - | - | 0,00 | 0,00 | - |
| 27 | 17 914 | 17 916 | **2,15** | 108,9 | 0,00 | 96,06 | - | - | 0,00 | 0,00 | - |
| 28 | 16 307 | 16 309 | **3,34** | 108,9 | 0,00 | 95,25 | - | - | 0,00 | 0,00 | - |
| 29 | 15 598 | 15 599 | **3,90** | 108,9 | 0,00 | 94,86 | - | - | 0,00 | 0,00 | - |
| 3 | 11 315 | 11 319 | **7,86** | 108,9 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 30 | 13 581 | 13 584 | **5,62** | 108,9 | 0,00 | 93,66 | - | - | 0,00 | 0,00 | - |
| 31 | 16 227 | 16 229 | **3,40** | 108,9 | 0,00 | 95,21 | - | - | 0,00 | 0,00 | - |
| 4 | 12 190 | 12 192 | **6,95** | 108,9 | 0,00 | 92,72 | - | - | 0,00 | 0,00 | - |
| 5 | 13 130 | 13 133 | **6,04** | 108,9 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 6 | 10 815 | 10 817 | **8,41** | 108,9 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| 7 | 10 999 | 11 001 | **8,20** | 108,9 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 71 | 7 339 | 7 342 | **8,08** | 106,0 | 0,00 | 88,32 | - | - | 0,00 | 0,00 | - |
| 72 | 6 804 | 6 807 | **8,98** | 106,0 | 0,00 | 87,66 | - | - | 0,00 | 0,00 | - |
| 73 | 6 172 | 6 174 | **10,14** | 106,0 | 0,00 | 86,81 | - | - | 0,00 | 0,00 | - |
| 74 | 7 848 | 7 850 | **7,27** | 106,0 | 0,00 | 88,90 | - | - | 0,00 | 0,00 | - |
| 75 | 8 536 | 8 539 | **6,26** | 106,0 | 0,00 | 89,63 | - | - | 0,00 | 0,00 | - |
| 76 | 9 288 | 9 290 | **5,26** | 106,0 | 0,00 | 90,36 | - | - | 0,00 | 0,00 | - |
| 77 | 8 053 | 8 056 | **6,98** | 106,0 | 0,00 | 89,12 | - | - | 0,00 | 0,00 | - |
| 78 | 9 330 | 9 332 | **5,19** | 106,0 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| 79 | 9 956 | 9 959 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 8 | 11 749 | 11 752 | **7,40** | 108,9 | 0,00 | 92,40 | - | - | 0,00 | 0,00 | - |
| 80 | 8 526 | 8 528 | **6,28** | 106,0 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| 81 | 7 356 | 7 358 | **8,05** | 106,0 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| 82 | 6 271 | 6 274 | **9,96** | 106,0 | 0,00 | 86,95 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | 6 354 | 6 357 | **9,79** | 106,0 | 0,00 | 87,06 | - | - | 0,00 | 0,00 | - |
| 84 | 7 790 | 7 792 | **7,36** | 106,0 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| 85 | 7 517 | 7 520 | **7,79** | 106,0 | 0,00 | 88,52 | - | - | 0,00 | 0,00 | - |
| 86 | 6 182 | 6 185 | **10,12** | 106,0 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| 87 | 5 584 | 5 587 | **11,40** | 106,0 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| 88 | 4 522 | 4 526 | **14,29** | 106,0 | 0,00 | 84,11 | - | - | 0,00 | 0,00 | - |
| 89 | 3 979 | 3 984 | **16,04** | 106,0 | 0,00 | 83,01 | - | - | 0,00 | 0,00 | - |
| 9 | 13 980 | 13 982 | **5,26** | 108,9 | 0,00 | 93,91 | - | - | 0,00 | 0,00 | - |
| 90 | 3 599 | 3 604 | **17,40** | 106,0 | 0,00 | 82,14 | - | - | 0,00 | 0,00 | - |
| 91 | 4 542 | 4 547 | **14,23** | 106,0 | 0,00 | 84,15 | - | - | 0,00 | 0,00 | - |
| 92 | 5 187 | 5 191 | **12,41** | 106,0 | 0,00 | 85,31 | - | - | 0,00 | 0,00 | - |
| 93 | 4 047 | 4 052 | **15,81** | 106,0 | 0,00 | 83,15 | - | - | 0,00 | 0,00 | - |
| 94 | 4 631 | 4 635 | **13,97** | 106,0 | 0,00 | 84,32 | - | - | 0,00 | 0,00 | - |
| 95 | 5 054 | 5 058 | **12,77** | 106,0 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| 96 | 5 590 | 5 594 | **11,38** | 106,0 | 0,00 | 85,95 | - | - | 0,00 | 0,00 | - |
| 97 | 3 695 | 3 700 | **17,08** | 106,0 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| 98 | 4 242 | 4 247 | **15,19** | 106,0 | 0,00 | 83,56 | - | - | 0,00 | 0,00 | - |
| 99 | 4 869 | 4 873 | **13,29** | 106,0 | 0,00 | 84,76 | - | - | 0,00 | 0,00 | - |
| T1 | 10 347 | 10 350 | **9,04** | 110,1 | 0,00 | 91,30 | - | - | 0,00 | 0,00 | - |
| T10 | 7 801 | 7 804 | **12,59** | 110,1 | 0,00 | 88,85 | - | - | 0,00 | 0,00 | - |
| T11 | 8 471 | 8 474 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T12 | 6 911 | 6 915 | **14,07** | 110,1 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| T13 | 6 530 | 6 534 | **14,75** | 110,1 | 0,00 | 87,30 | - | - | 0,00 | 0,00 | - |
| T14 | 7 173 | 7 177 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T15 | 7 793 | 7 797 | **12,60** | 110,1 | 0,00 | 88,84 | - | - | 0,00 | 0,00 | - |
| T16 | 5 758 | 5 762 | **16,49** | 110,1 | 0,00 | 86,21 | - | - | 0,00 | 0,00 | - |
| T17 | 6 144 | 6 149 | **15,59** | 110,1 | 0,00 | 86,78 | - | - | 0,00 | 0,00 | - |
| T18 | 6 738 | 6 742 | **14,37** | 110,1 | 0,00 | 87,58 | - | - | 0,00 | 0,00 | - |
| T19 | 4 792 | 4 798 | **19,00** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T2 | 9 915 | 9 918 | **9,59** | 110,1 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| T20 | 5 038 | 5 043 | **18,32** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T21 | 5 719 | 5 724 | **16,58** | 110,1 | 0,00 | 86,15 | - | - | 0,00 | 0,00 | - |
| T22 | 3 932 | 3 939 | **21,65** | 110,1 | 0,00 | 82,91 | - | - | 0,00 | 0,00 | - |
| T23 | 4 449 | 4 455 | **20,00** | 110,1 | 0,00 | 83,98 | - | - | 0,00 | 0,00 | - |
| T24 | 5 551 | 5 556 | **16,99** | 110,1 | 0,00 | 85,90 | - | - | 0,00 | 0,00 | - |
| T25 | 3 090 | 3 098 | **24,78** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T26 | 3 915 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 4 795 | 4 800 | **18,99** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T28 | 2 023 | 2 035 | **30,01** | 110,1 | 0,00 | 77,17 | - | - | 0,00 | 0,00 | - |
| T29 | 3 336 | 3 343 | **23,80** | 110,1 | 0,00 | 81,48 | - | - | 0,00 | 0,00 | - |
| T3 | 9 032 | 9 035 | **10,77** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T30 | 9 214 | 9 216 | **10,52** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T31 | 7 925 | 7 928 | **12,40** | 110,1 | 0,00 | 88,98 | - | - | 0,00 | 0,00 | - |
| T32 | 9 983 | 9 985 | **9,50** | 110,1 | 0,00 | 90,99 | - | - | 0,00 | 0,00 | - |
| T33 | 8 804 | 8 807 | **11,09** | 110,1 | 0,00 | 89,90 | - | - | 0,00 | 0,00 | - |
| T34 | 7 329 | 7 332 | **13,36** | 110,1 | 0,00 | 88,30 | - | - | 0,00 | 0,00 | - |
| T35 | 6 497 | 6 501 | **14,82** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T36 | 10 073 | 10 075 | **9,39** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T37 | 9 129 | 9 132 | **10,63** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T38 | 7 862 | 7 865 | **12,49** | 110,1 | 0,00 | 88,91 | - | - | 0,00 | 0,00 | - |
| T39 | 8 932 | 8 935 | **10,91** | 110,1 | 0,00 | 90,02 | - | - | 0,00 | 0,00 | - |
| T4 | 9 042 | 9 045 | **10,75** | 110,1 | 0,00 | 90,13 | - | - | 0,00 | 0,00 | - |
| T5 | 8 186 | 8 189 | **12,00** | 110,1 | 0,00 | 89,26 | - | - | 0,00 | 0,00 | - |
| T6 | 8 213 | 8 216 | **11,95** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T7 | 8 871 | 8 874 | **10,99** | 110,1 | 0,00 | 89,96 | - | - | 0,00 | 0,00 | - |
| T8 | 9 214 | 9 217 | **10,51** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 502 | 7 505 | **13,07** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,99** | | | | | | | | |

- Data undefined due to calculation with octave data

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: K Asuinrakennus K (Takalo)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9 530 | 9 534 | **9,94** | 108,9 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 10 | 11 401 | 11 403 | **7,77** | 108,9 | 0,00 | 92,14 | - | - | 0,00 | 0,00 | - |
| 100 | 4 079 | 4 084 | **15,73** | 106,0 | 0,00 | 83,22 | - | - | 0,00 | 0,00 | - |
| 101 | 4 719 | 4 723 | **13,72** | 106,0 | 0,00 | 84,48 | - | - | 0,00 | 0,00 | - |
| 102 | 3 269 | 3 275 | **18,72** | 106,0 | 0,00 | 81,30 | - | - | 0,00 | 0,00 | - |
| 103 | 2 618 | 2 626 | **21,61** | 106,0 | 0,00 | 79,39 | - | - | 0,00 | 0,00 | - |
| 104 | 2 038 | 2 047 | **24,81** | 106,0 | 0,00 | 77,22 | - | - | 0,00 | 0,00 | - |
| 105 | 2 516 | 2 524 | **22,13** | 106,0 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| 106 | 2 062 | 2 071 | **24,67** | 106,0 | 0,00 | 77,32 | - | - | 0,00 | 0,00 | - |
| 107 | 3 174 | 3 180 | **19,08** | 106,0 | 0,00 | 81,05 | - | - | 0,00 | 0,00 | - |
| 108 | 4 211 | 4 215 | **15,27** | 106,0 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| 109 | 3 789 | 3 794 | **16,70** | 106,0 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| 11 | 10 755 | 10 758 | **8,47** | 108,9 | 0,00 | 91,63 | - | - | 0,00 | 0,00 | - |
| 110 | 4 254 | 4 259 | **15,13** | 106,0 | 0,00 | 83,59 | - | - | 0,00 | 0,00 | - |
| 111 | 2 455 | 2 463 | **22,45** | 106,0 | 0,00 | 78,83 | - | - | 0,00 | 0,00 | - |
| 112 | 2 754 | 2 761 | **20,96** | 106,0 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| 12 | 10 596 | 10 599 | **8,69** | 108,9 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 13 | 11 756 | 11 758 | **7,39** | 108,9 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 14 | 14 207 | 14 209 | **5,06** | 108,9 | 0,00 | 94,05 | - | - | 0,00 | 0,00 | - |
| 15 | 11 475 | 11 478 | **7,73** | 108,9 | 0,00 | 92,20 | - | - | 0,00 | 0,00 | - |
| 16 | 12 470 | 12 472 | **6,70** | 108,9 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| 17 | 12 614 | 12 616 | **6,53** | 108,9 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| 18 | 13 478 | 13 480 | **5,71** | 108,9 | 0,00 | 93,59 | - | - | 0,00 | 0,00 | - |
| 19 | 13 538 | 13 540 | **5,69** | 108,9 | 0,00 | 93,63 | - | - | 0,00 | 0,00 | - |
| 2 | 10 494 | 10 497 | **8,79** | 108,9 | 0,00 | 91,42 | - | - | 0,00 | 0,00 | - |
| 20 | 15 102 | 15 104 | **4,30** | 108,9 | 0,00 | 94,58 | - | - | 0,00 | 0,00 | - |
| 21 | 14 115 | 14 117 | **5,14** | 108,9 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |
| 22 | 15 810 | 15 812 | **3,75** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 23 | 15 946 | 15 948 | **3,62** | 108,9 | 0,00 | 95,05 | - | - | 0,00 | 0,00 | - |
| 24 | 13 174 | 13 176 | **6,00** | 108,9 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 25 | 15 633 | 15 634 | **3,87** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 26 | 16 736 | 16 738 | **3,01** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 27 | 16 584 | 16 586 | **3,13** | 108,9 | 0,00 | 95,39 | - | - | 0,00 | 0,00 | - |
| 28 | 14 979 | 14 981 | **4,40** | 108,9 | 0,00 | 94,51 | - | - | 0,00 | 0,00 | - |
| 29 | 14 283 | 14 285 | **5,00** | 108,9 | 0,00 | 94,10 | - | - | 0,00 | 0,00 | - |
| 3 | 9 994 | 9 998 | **9,36** | 108,9 | 0,00 | 91,00 | - | - | 0,00 | 0,00 | - |
| 30 | 12 252 | 12 255 | **6,89** | 108,9 | 0,00 | 92,77 | - | - | 0,00 | 0,00 | - |
| 31 | 14 900 | 14 902 | **4,47** | 108,9 | 0,00 | 94,47 | - | - | 0,00 | 0,00 | - |
| 4 | 10 868 | 10 871 | **8,35** | 108,9 | 0,00 | 91,73 | - | - | 0,00 | 0,00 | - |
| 5 | 11 807 | 11 810 | **7,34** | 108,9 | 0,00 | 92,44 | - | - | 0,00 | 0,00 | - |
| 6 | 9 484 | 9 488 | **9,98** | 108,9 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 7 | 9 683 | 9 685 | **9,74** | 108,9 | 0,00 | 90,72 | - | - | 0,00 | 0,00 | - |
| 71 | 6 011 | 6 014 | **10,45** | 106,0 | 0,00 | 86,58 | - | - | 0,00 | 0,00 | - |
| 72 | 5 477 | 5 480 | **11,66** | 106,0 | 0,00 | 85,78 | - | - | 0,00 | 0,00 | - |
| 73 | 4 843 | 4 847 | **13,35** | 106,0 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| 74 | 6 523 | 6 526 | **9,48** | 106,0 | 0,00 | 87,29 | - | - | 0,00 | 0,00 | - |
| 75 | 7 219 | 7 222 | **8,27** | 106,0 | 0,00 | 88,17 | - | - | 0,00 | 0,00 | - |
| 76 | 7 977 | 7 980 | **7,08** | 106,0 | 0,00 | 89,04 | - | - | 0,00 | 0,00 | - |
| 77 | 6 751 | 6 754 | **9,07** | 106,0 | 0,00 | 87,59 | - | - | 0,00 | 0,00 | - |
| 78 | 8 045 | 8 047 | **7,00** | 106,0 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |
| 79 | 8 666 | 8 668 | **6,10** | 106,0 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| 8 | 10 419 | 10 422 | **8,86** | 108,9 | 0,00 | 91,36 | - | - | 0,00 | 0,00 | - |
| 80 | 7 246 | 7 249 | **8,25** | 106,0 | 0,00 | 88,21 | - | - | 0,00 | 0,00 | - |
| 81 | 6 073 | 6 076 | **10,34** | 106,0 | 0,00 | 86,67 | - | - | 0,00 | 0,00 | - |
| 82 | 4 964 | 4 967 | **13,02** | 106,0 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |
| 83 | 5 079 | 5 083 | **12,72** | 106,0 | 0,00 | 85,12 | - | - | 0,00 | 0,00 | - |
| 84 | 6 543 | 6 546 | **9,46** | 106,0 | 0,00 | 87,32 | - | - | 0,00 | 0,00 | - |
| 85 | 6 301 | 6 304 | **9,89** | 106,0 | 0,00 | 86,99 | - | - | 0,00 | 0,00 | - |
| 86 | 5 309 | 5 313 | **12,10** | 106,0 | 0,00 | 85,51 | - | - | 0,00 | 0,00 | - |
| 87 | 4 749 | 4 754 | **13,64** | 106,0 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |
| 88 | 3 830 | 3 835 | **16,56** | 106,0 | 0,00 | 82,68 | - | - | 0,00 | 0,00 | - |
| 89 | 3 457 | 3 462 | **17,94** | 106,0 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| 9 | 12 651 | 12 654 | **6,49** | 108,9 | 0,00 | 93,04 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 3 233 | 3 239 | **18,84** | 106,0 | 0,00 | 81,21 | - | - | 0,00 | 0,00 | - |
| 91 | 4 063 | 4 068 | **15,75** | 106,0 | 0,00 | 83,19 | - | - | 0,00 | 0,00 | - |
| 92 | 4 480 | 4 485 | **14,42** | 106,0 | 0,00 | 84,03 | - | - | 0,00 | 0,00 | - |
| 93 | 2 717 | 2 724 | **21,14** | 106,0 | 0,00 | 79,70 | - | - | 0,00 | 0,00 | - |
| 94 | 3 301 | 3 306 | **18,56** | 106,0 | 0,00 | 81,39 | - | - | 0,00 | 0,00 | - |
| 95 | 3 725 | 3 730 | **16,94** | 106,0 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| 96 | 4 269 | 4 273 | **15,08** | 106,0 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| 97 | 2 393 | 2 401 | **22,81** | 106,0 | 0,00 | 78,61 | - | - | 0,00 | 0,00 | - |
| 98 | 2 936 | 2 943 | **20,12** | 106,0 | 0,00 | 80,37 | - | - | 0,00 | 0,00 | - |
| 99 | 3 557 | 3 563 | **17,56** | 106,0 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| T1 | 11 268 | 11 270 | **7,95** | 110,1 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| T10 | 8 473 | 8 476 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T11 | 8 946 | 8 949 | **10,89** | 110,1 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| T12 | 7 729 | 7 732 | **12,70** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T13 | 7 234 | 7 238 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T14 | 7 715 | 7 719 | **12,73** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T15 | 8 196 | 8 199 | **11,98** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T16 | 6 619 | 6 623 | **14,59** | 110,1 | 0,00 | 87,42 | - | - | 0,00 | 0,00 | - |
| T17 | 6 726 | 6 730 | **14,39** | 110,1 | 0,00 | 87,56 | - | - | 0,00 | 0,00 | - |
| T18 | 7 142 | 7 147 | **13,67** | 110,1 | 0,00 | 88,08 | - | - | 0,00 | 0,00 | - |
| T19 | 5 706 | 5 711 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T2 | 10 776 | 10 779 | **8,52** | 110,1 | 0,00 | 91,65 | - | - | 0,00 | 0,00 | - |
| T20 | 5 729 | 5 734 | **16,56** | 110,1 | 0,00 | 86,17 | - | - | 0,00 | 0,00 | - |
| T21 | 6 108 | 6 112 | **15,68** | 110,1 | 0,00 | 86,72 | - | - | 0,00 | 0,00 | - |
| T22 | 4 762 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T23 | 5 033 | 5 038 | **18,33** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T24 | 5 785 | 5 789 | **16,43** | 110,1 | 0,00 | 86,25 | - | - | 0,00 | 0,00 | - |
| T25 | 3 801 | 3 808 | **22,09** | 110,1 | 0,00 | 82,61 | - | - | 0,00 | 0,00 | - |
| T26 | 4 364 | 4 370 | **20,26** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T27 | 4 946 | 4 951 | **18,57** | 110,1 | 0,00 | 84,89 | - | - | 0,00 | 0,00 | - |
| T28 | 2 753 | 2 761 | **26,25** | 110,1 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| T29 | 3 555 | 3 562 | **22,97** | 110,1 | 0,00 | 82,03 | - | - | 0,00 | 0,00 | - |
| T3 | 9 937 | 9 939 | **9,56** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T30 | 10 427 | 10 429 | **8,95** | 110,1 | 0,00 | 91,37 | - | - | 0,00 | 0,00 | - |
| T31 | 9 160 | 9 162 | **10,59** | 110,1 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| T32 | 11 150 | 11 152 | **8,09** | 110,1 | 0,00 | 91,95 | - | - | 0,00 | 0,00 | - |
| T33 | 9 978 | 9 981 | **9,51** | 110,1 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| T34 | 8 532 | 8 535 | **11,48** | 110,1 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| T35 | 7 692 | 7 695 | **12,76** | 110,1 | 0,00 | 88,72 | - | - | 0,00 | 0,00 | - |
| T36 | 11 178 | 11 180 | **8,06** | 110,1 | 0,00 | 91,97 | - | - | 0,00 | 0,00 | - |
| T37 | 10 222 | 10 225 | **9,20** | 110,1 | 0,00 | 91,19 | - | - | 0,00 | 0,00 | - |
| T38 | 8 970 | 8 973 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |
| T39 | 9 956 | 9 958 | **9,61** | 110,1 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| T4 | 9 838 | 9 841 | **9,69** | 110,1 | 0,00 | 90,86 | - | - | 0,00 | 0,00 | - |
| T5 | 9 120 | 9 123 | **10,64** | 110,1 | 0,00 | 90,20 | - | - | 0,00 | 0,00 | - |
| T6 | 8 970 | 8 972 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |
| T7 | 9 521 | 9 524 | **10,10** | 110,1 | 0,00 | 90,58 | - | - | 0,00 | 0,00 | - |
| T8 | 9 743 | 9 746 | **9,81** | 110,1 | 0,00 | 90,78 | - | - | 0,00 | 0,00 | - |
| T9 | 8 396 | 8 399 | **11,68** | 110,1 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| Sum | | | **36,46** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 500 | 16 502 | **3,21** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 10 | 17 677 | 17 678 | **2,32** | 108,9 | 0,00 | 95,95 | - | - | 0,00 | 0,00 | - |
| 100 | 11 272 | 11 273 | **2,99** | 106,0 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| 101 | 11 917 | 11 919 | **2,31** | 106,0 | 0,00 | 92,52 | - | - | 0,00 | 0,00 | - |
| 102 | 10 487 | 10 489 | **3,89** | 106,0 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| 103 | 9 901 | 9 902 | **4,86** | 106,0 | 0,00 | 90,91 | - | - | 0,00 | 0,00 | - |
| 104 | 9 346 | 9 348 | **5,70** | 106,0 | 0,00 | 90,41 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 9 784 | 9 786 | **5,25** | 106,0 | 0,00 | 90,81 | - | - | 0,00 | 0,00 | - |
| 106 | 9 240 | 9 242 | **5,99** | 106,0 | 0,00 | 90,32 | - | - | 0,00 | 0,00 | - |
| 107 | 10 466 | 10 467 | **4,39** | 106,0 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| 108 | 11 512 | 11 514 | **3,18** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 109 | 11 020 | 11 022 | **3,82** | 106,0 | 0,00 | 91,85 | - | - | 0,00 | 0,00 | - |
| 11 | 16 528 | 16 530 | **3,17** | 108,9 | 0,00 | 95,37 | - | - | 0,00 | 0,00 | - |
| 110 | 11 513 | 11 514 | **3,25** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 111 | 9 132 | 9 134 | **6,25** | 106,0 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| 112 | 9 806 | 9 808 | **5,30** | 106,0 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| 12 | 15 748 | 15 749 | **3,79** | 108,9 | 0,00 | 94,95 | - | - | 0,00 | 0,00 | - |
| 13 | 17 412 | 17 414 | **2,55** | 108,9 | 0,00 | 95,82 | - | - | 0,00 | 0,00 | - |
| 14 | 20 455 | 20 457 | **0,49** | 108,9 | 0,00 | 97,22 | - | - | 0,00 | 0,00 | - |
| 15 | 16 689 | 16 690 | **3,06** | 108,9 | 0,00 | 95,45 | - | - | 0,00 | 0,00 | - |
| 16 | 17 765 | 17 767 | **2,27** | 108,9 | 0,00 | 95,99 | - | - | 0,00 | 0,00 | - |
| 17 | 18 305 | 18 306 | **1,91** | 108,9 | 0,00 | 96,25 | - | - | 0,00 | 0,00 | - |
| 18 | 19 197 | 19 198 | **1,30** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |
| 19 | 18 758 | 18 760 | **1,57** | 108,9 | 0,00 | 96,46 | - | - | 0,00 | 0,00 | - |
| 2 | 17 541 | 17 543 | **2,45** | 108,9 | 0,00 | 95,88 | - | - | 0,00 | 0,00 | - |
| 20 | 20 564 | 20 565 | **0,41** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 21 | 20 046 | 20 047 | **0,73** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 22 | 21 464 | 21 465 | **-0,12** | 108,9 | 0,00 | 97,63 | - | - | 0,00 | 0,00 | - |
| 23 | 21 938 | 21 939 | **-0,43** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 24 | 19 263 | 19 265 | **1,27** | 108,9 | 0,00 | 96,70 | - | - | 0,00 | 0,00 | - |
| 25 | 21 917 | 21 919 | **-0,41** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 26 | 22 518 | 22 519 | **-0,76** | 108,9 | 0,00 | 98,05 | - | - | 0,00 | 0,00 | - |
| 27 | 22 757 | 22 759 | **-0,89** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 28 | 20 931 | 20 932 | **0,18** | 108,9 | 0,00 | 97,42 | - | - | 0,00 | 0,00 | - |
| 29 | 19 914 | 19 915 | **0,84** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 3 | 16 648 | 16 650 | **3,08** | 108,9 | 0,00 | 95,43 | - | - | 0,00 | 0,00 | - |
| 30 | 18 388 | 18 390 | **1,87** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 31 | 21 305 | 21 307 | **-0,07** | 108,9 | 0,00 | 97,57 | - | - | 0,00 | 0,00 | - |
| 4 | 17 482 | 17 484 | **2,46** | 108,9 | 0,00 | 95,85 | - | - | 0,00 | 0,00 | - |
| 5 | 18 378 | 18 380 | **1,83** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 6 | 15 818 | 15 820 | **3,77** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 7 | 15 555 | 15 557 | **4,00** | 108,9 | 0,00 | 94,84 | - | - | 0,00 | 0,00 | - |
| 71 | 12 678 | 12 679 | **1,51** | 106,0 | 0,00 | 93,06 | - | - | 0,00 | 0,00 | - |
| 72 | 12 203 | 12 205 | **1,96** | 106,0 | 0,00 | 92,73 | - | - | 0,00 | 0,00 | - |
| 73 | 11 585 | 11 586 | **2,60** | 106,0 | 0,00 | 92,28 | - | - | 0,00 | 0,00 | - |
| 74 | 13 244 | 13 246 | **0,97** | 106,0 | 0,00 | 93,44 | - | - | 0,00 | 0,00 | - |
| 75 | 14 016 | 14 017 | **0,27** | 106,0 | 0,00 | 93,93 | - | - | 0,00 | 0,00 | - |
| 76 | 14 820 | 14 822 | **-0,41** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 77 | 13 693 | 13 694 | **0,56** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 78 | 15 048 | 15 049 | **-0,59** | 106,0 | 0,00 | 94,55 | - | - | 0,00 | 0,00 | - |
| 79 | 15 628 | 15 629 | **-1,06** | 106,0 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 8 | 16 730 | 16 731 | **3,03** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 80 | 14 291 | 14 292 | **0,05** | 106,0 | 0,00 | 94,10 | - | - | 0,00 | 0,00 | - |
| 81 | 13 134 | 13 135 | **1,08** | 106,0 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 82 | 11 944 | 11 945 | **2,24** | 106,0 | 0,00 | 92,54 | - | - | 0,00 | 0,00 | - |
| 83 | 12 198 | 12 200 | **1,99** | 106,0 | 0,00 | 92,73 | - | - | 0,00 | 0,00 | - |
| 84 | 13 706 | 13 707 | **0,57** | 106,0 | 0,00 | 93,74 | - | - | 0,00 | 0,00 | - |
| 85 | 13 526 | 13 527 | **0,75** | 106,0 | 0,00 | 93,62 | - | - | 0,00 | 0,00 | - |
| 86 | 12 510 | 12 512 | **2,25** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 87 | 11 915 | 11 916 | **2,87** | 106,0 | 0,00 | 92,52 | - | - | 0,00 | 0,00 | - |
| 88 | 10 845 | 10 847 | **4,09** | 106,0 | 0,00 | 91,71 | - | - | 0,00 | 0,00 | - |
| 89 | 10 265 | 10 266 | **4,81** | 106,0 | 0,00 | 91,23 | - | - | 0,00 | 0,00 | - |
| 9 | 19 046 | 19 048 | **1,39** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 90 | 9 832 | 9 834 | **5,37** | 106,0 | 0,00 | 90,85 | - | - | 0,00 | 0,00 | - |
| 91 | 10 793 | 10 795 | **4,21** | 106,0 | 0,00 | 91,66 | - | - | 0,00 | 0,00 | - |
| 92 | 11 509 | 11 510 | **3,35** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 93 | 9 588 | 9 589 | **4,92** | 106,0 | 0,00 | 90,64 | - | - | 0,00 | 0,00 | - |
| 94 | 10 070 | 10 072 | **4,31** | 106,0 | 0,00 | 91,06 | - | - | 0,00 | 0,00 | - |
| 95 | 10 542 | 10 544 | **3,75** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 96 | 11 168 | 11 169 | **3,06** | 106,0 | 0,00 | 91,96 | - | - | 0,00 | 0,00 | - |
| 97 | 9 541 | 9 542 | **5,03** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | 10 030 | 10 032 | **4,39** | 106,0 | 0,00 | 91,03 | - | - | 0,00 | 0,00 | - |
| 99 | 10 585 | 10 586 | **3,72** | 106,0 | 0,00 | 91,49 | - | - | 0,00 | 0,00 | - |
| T1 | 12 636 | 12 638 | **7,85** | 110,1 | 0,00 | 93,03 | - | - | 0,00 | 0,00 | - |
| T10 | 11 638 | 11 640 | **8,74** | 110,1 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| T11 | 12 857 | 12 859 | **7,39** | 110,1 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| T12 | 10 368 | 10 370 | **10,26** | 110,1 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| T13 | 10 507 | 10 509 | **10,04** | 110,1 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| T14 | 11 547 | 11 549 | **8,81** | 110,1 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| T15 | 12 471 | 12 473 | **7,78** | 110,1 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| T16 | 9 350 | 9 352 | **11,55** | 110,1 | 0,00 | 90,42 | - | - | 0,00 | 0,00 | - |
| T17 | 10 591 | 10 594 | **9,92** | 110,1 | 0,00 | 91,50 | - | - | 0,00 | 0,00 | - |
| T18 | 11 555 | 11 557 | **8,75** | 110,1 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| T19 | 8 505 | 8 507 | **12,74** | 110,1 | 0,00 | 89,60 | - | - | 0,00 | 0,00 | - |
| T2 | 12 590 | 12 592 | **7,85** | 110,1 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| T20 | 9 434 | 9 436 | **11,38** | 110,1 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| T21 | 10 738 | 10 741 | **9,69** | 110,1 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| T22 | 8 288 | 8 291 | **13,00** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T23 | 9 295 | 9 298 | **11,54** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T24 | 10 912 | 10 914 | **9,46** | 110,1 | 0,00 | 91,76 | - | - | 0,00 | 0,00 | - |
| T25 | 8 107 | 8 110 | **13,23** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T26 | 9 191 | 9 194 | **11,65** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T27 | 10 402 | 10 404 | **10,05** | 110,1 | 0,00 | 91,34 | - | - | 0,00 | 0,00 | - |
| T28 | 7 498 | 7 501 | **14,15** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T29 | 9 098 | 9 101 | **11,74** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T3 | 11 631 | 11 633 | **8,89** | 110,1 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| T30 | 3 990 | 3 996 | **22,70** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T31 | 3 257 | 3 264 | **25,30** | 110,1 | 0,00 | 81,27 | - | - | 0,00 | 0,00 | - |
| T32 | 4 286 | 4 292 | **21,76** | 110,1 | 0,00 | 83,65 | - | - | 0,00 | 0,00 | - |
| T33 | 3 287 | 3 294 | **25,20** | 110,1 | 0,00 | 81,35 | - | - | 0,00 | 0,00 | - |
| T34 | 2 492 | 2 501 | **28,63** | 110,1 | 0,00 | 78,96 | - | - | 0,00 | 0,00 | - |
| T35 | 2 024 | 2 036 | **31,10** | 110,1 | 0,00 | 77,18 | - | - | 0,00 | 0,00 | - |
| T36 | 4 031 | 4 037 | **22,56** | 110,1 | 0,00 | 83,12 | - | - | 0,00 | 0,00 | - |
| T37 | 3 077 | 3 085 | **26,03** | 110,1 | 0,00 | 80,79 | - | - | 0,00 | 0,00 | - |
| T38 | 2 006 | 2 018 | **31,25** | 110,1 | 0,00 | 77,10 | - | - | 0,00 | 0,00 | - |
| T39 | 2 662 | 2 671 | **27,82** | 110,1 | 0,00 | 79,53 | - | - | 0,00 | 0,00 | - |
| T4 | 12 167 | 12 169 | **8,25** | 110,1 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| T5 | 10 799 | 10 801 | **9,84** | 110,1 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| T6 | 11 650 | 11 653 | **8,75** | 110,1 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |
| T7 | 12 619 | 12 621 | **7,69** | 110,1 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| T8 | 13 338 | 13 340 | **6,92** | 110,1 | 0,00 | 93,50 | - | - | 0,00 | 0,00 | - |
| T9 | 10 475 | 10 477 | **10,19** | 110,1 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,78** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: M Lomarakennus M (Haukilahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 226 | 18 228 | **2,09** | 108,9 | 0,00 | 96,21 | - | - | 0,00 | 0,00 | - |
| 10 | 20 098 | 20 099 | **0,72** | 108,9 | 0,00 | 97,06 | - | - | 0,00 | 0,00 | - |
| 100 | 12 734 | 12 736 | **1,60** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 101 | 13 350 | 13 351 | **1,04** | 106,0 | 0,00 | 93,51 | - | - | 0,00 | 0,00 | - |
| 102 | 11 928 | 11 929 | **2,39** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 103 | 11 214 | 11 215 | **3,17** | 106,0 | 0,00 | 92,00 | - | - | 0,00 | 0,00 | - |
| 104 | 10 539 | 10 541 | **3,98** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 105 | 10 713 | 10 714 | **3,87** | 106,0 | 0,00 | 91,60 | - | - | 0,00 | 0,00 | - |
| 106 | 10 079 | 10 081 | **4,63** | 106,0 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| 107 | 11 398 | 11 400 | **3,14** | 106,0 | 0,00 | 92,14 | - | - | 0,00 | 0,00 | - |
| 108 | 12 413 | 12 415 | **2,23** | 106,0 | 0,00 | 92,88 | - | - | 0,00 | 0,00 | - |
| 109 | 11 707 | 11 709 | **3,01** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 11 | 19 284 | 19 286 | **1,33** | 108,9 | 0,00 | 96,70 | - | - | 0,00 | 0,00 | - |
| 110 | 12 222 | 12 223 | **2,47** | 106,0 | 0,00 | 92,74 | - | - | 0,00 | 0,00 | - |
| 111 | 9 499 | 9 501 | **5,59** | 106,0 | 0,00 | 90,56 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112 | 10 376 | 10 378 | **4,51** | 106,0 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| 12 | 18 831 | 18 832 | **1,56** | 108,9 | 0,00 | 96,50 | - | - | 0,00 | 0,00 | - |
| 13 | 20 250 | 20 252 | **0,64** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 14 | 22 912 | 22 913 | **-0,98** | 108,9 | 0,00 | 98,20 | - | - | 0,00 | 0,00 | - |
| 15 | 19 759 | 19 760 | **0,94** | 108,9 | 0,00 | 96,92 | - | - | 0,00 | 0,00 | - |
| 16 | 20 810 | 20 811 | **0,27** | 108,9 | 0,00 | 97,37 | - | - | 0,00 | 0,00 | - |
| 17 | 21 133 | 21 134 | **0,10** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 18 | 22 016 | 22 018 | **-0,42** | 108,9 | 0,00 | 97,86 | - | - | 0,00 | 0,00 | - |
| 19 | 21 856 | 21 857 | **-0,37** | 108,9 | 0,00 | 97,79 | - | - | 0,00 | 0,00 | - |
| 2 | 19 141 | 19 142 | **1,51** | 108,9 | 0,00 | 96,64 | - | - | 0,00 | 0,00 | - |
| 20 | 23 550 | 23 551 | **-1,37** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 21 | 22 735 | 22 736 | **-0,88** | 108,9 | 0,00 | 98,13 | - | - | 0,00 | 0,00 | - |
| 22 | 24 344 | 24 345 | **-1,77** | 108,9 | 0,00 | 98,73 | - | - | 0,00 | 0,00 | - |
| 23 | 24 596 | 24 597 | **-1,92** | 108,9 | 0,00 | 98,82 | - | - | 0,00 | 0,00 | - |
| 24 | 21 835 | 21 836 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 25 | 24 349 | 24 351 | **-1,78** | 108,9 | 0,00 | 98,73 | - | - | 0,00 | 0,00 | - |
| 26 | 25 323 | 25 324 | **-2,25** | 108,9 | 0,00 | 99,07 | - | - | 0,00 | 0,00 | - |
| 27 | 25 282 | 25 283 | **-2,28** | 108,9 | 0,00 | 99,06 | - | - | 0,00 | 0,00 | - |
| 28 | 23 611 | 23 613 | **-1,38** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 29 | 22 795 | 22 796 | **-0,91** | 108,9 | 0,00 | 98,16 | - | - | 0,00 | 0,00 | - |
| 3 | 18 737 | 18 739 | **1,65** | 108,9 | 0,00 | 96,45 | - | - | 0,00 | 0,00 | - |
| 30 | 20 920 | 20 921 | **0,18** | 108,9 | 0,00 | 97,41 | - | - | 0,00 | 0,00 | - |
| 31 | 23 633 | 23 634 | **-1,37** | 108,9 | 0,00 | 98,47 | - | - | 0,00 | 0,00 | - |
| 4 | 19 610 | 19 611 | **1,06** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 5 | 20 548 | 20 550 | **0,46** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 6 | 18 181 | 18 183 | **2,00** | 108,9 | 0,00 | 96,19 | - | - | 0,00 | 0,00 | - |
| 7 | 18 235 | 18 237 | **2,04** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 71 | 14 743 | 14 744 | **-0,31** | 106,0 | 0,00 | 94,37 | - | - | 0,00 | 0,00 | - |
| 72 | 14 213 | 14 214 | **0,14** | 106,0 | 0,00 | 94,05 | - | - | 0,00 | 0,00 | - |
| 73 | 13 577 | 13 578 | **0,70** | 106,0 | 0,00 | 93,66 | - | - | 0,00 | 0,00 | - |
| 74 | 15 263 | 15 264 | **-0,73** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 75 | 15 961 | 15 962 | **-1,27** | 106,0 | 0,00 | 95,06 | - | - | 0,00 | 0,00 | - |
| 76 | 16 714 | 16 715 | **-1,82** | 106,0 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 77 | 15 478 | 15 479 | **-0,85** | 106,0 | 0,00 | 94,80 | - | - | 0,00 | 0,00 | - |
| 78 | 16 741 | 16 742 | **-1,79** | 106,0 | 0,00 | 95,48 | - | - | 0,00 | 0,00 | - |
| 79 | 17 372 | 17 373 | **-2,25** | 106,0 | 0,00 | 95,80 | - | - | 0,00 | 0,00 | - |
| 8 | 19 118 | 19 119 | **1,36** | 108,9 | 0,00 | 96,63 | - | - | 0,00 | 0,00 | - |
| 80 | 15 933 | 15 934 | **-1,17** | 106,0 | 0,00 | 95,05 | - | - | 0,00 | 0,00 | - |
| 81 | 14 769 | 14 770 | **-0,24** | 106,0 | 0,00 | 94,39 | - | - | 0,00 | 0,00 | - |
| 82 | 13 697 | 13 698 | **0,64** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 83 | 13 763 | 13 764 | **0,63** | 106,0 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 84 | 15 162 | 15 163 | **-0,50** | 106,0 | 0,00 | 94,62 | - | - | 0,00 | 0,00 | - |
| 85 | 14 850 | 14 851 | **-0,21** | 106,0 | 0,00 | 94,44 | - | - | 0,00 | 0,00 | - |
| 86 | 12 977 | 12 979 | **1,75** | 106,0 | 0,00 | 93,26 | - | - | 0,00 | 0,00 | - |
| 87 | 12 365 | 12 366 | **2,35** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 88 | 11 197 | 11 199 | **3,59** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 89 | 10 486 | 10 487 | **4,42** | 106,0 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| 9 | 21 376 | 21 378 | **-0,07** | 108,9 | 0,00 | 97,60 | - | - | 0,00 | 0,00 | - |
| 90 | 9 956 | 9 958 | **5,06** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 91 | 10 838 | 10 840 | **4,04** | 106,0 | 0,00 | 91,70 | - | - | 0,00 | 0,00 | - |
| 92 | 11 786 | 11 788 | **2,97** | 106,0 | 0,00 | 92,43 | - | - | 0,00 | 0,00 | - |
| 93 | 11 445 | 11 446 | **2,78** | 106,0 | 0,00 | 92,17 | - | - | 0,00 | 0,00 | - |
| 94 | 12 019 | 12 020 | **2,18** | 106,0 | 0,00 | 92,60 | - | - | 0,00 | 0,00 | - |
| 95 | 12 458 | 12 460 | **1,75** | 106,0 | 0,00 | 92,91 | - | - | 0,00 | 0,00 | - |
| 96 | 13 012 | 13 013 | **1,23** | 106,0 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| 97 | 11 121 | 11 122 | **3,18** | 106,0 | 0,00 | 91,92 | - | - | 0,00 | 0,00 | - |
| 98 | 11 669 | 11 670 | **2,59** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 99 | 12 295 | 12 297 | **1,94** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| T1 | 8 960 | 8 963 | **12,33** | 110,1 | 0,00 | 90,05 | - | - | 0,00 | 0,00 | - |
| T10 | 9 035 | 9 038 | **12,29** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T11 | 10 479 | 10 481 | **10,37** | 110,1 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| T12 | 7 744 | 7 747 | **14,21** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T13 | 8 221 | 8 224 | **13,43** | 110,1 | 0,00 | 89,30 | - | - | 0,00 | 0,00 | - |
| T14 | 9 357 | 9 360 | **11,80** | 110,1 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T15 | 10 380 | 10 383 | **10,44** | 110,1 | 0,00 | 91,33 | - | - | 0,00 | 0,00 | - |
| T16 | 7 082 | 7 086 | **15,11** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T17 | 8 642 | 8 645 | **12,63** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T18 | 9 724 | 9 726 | **11,12** | 110,1 | 0,00 | 90,76 | - | - | 0,00 | 0,00 | - |
| T19 | 6 612 | 6 615 | **15,77** | 110,1 | 0,00 | 87,41 | - | - | 0,00 | 0,00 | - |
| T2 | 9 123 | 9 126 | **12,11** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T20 | 7 735 | 7 738 | **13,91** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T21 | 9 235 | 9 237 | **11,67** | 110,1 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| T22 | 6 954 | 6 958 | **15,01** | 110,1 | 0,00 | 87,85 | - | - | 0,00 | 0,00 | - |
| T23 | 7 994 | 7 997 | **13,36** | 110,1 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| T24 | 9 693 | 9 696 | **10,94** | 110,1 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| T25 | 7 352 | 7 355 | **14,28** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T26 | 8 286 | 8 288 | **12,85** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T27 | 9 533 | 9 536 | **11,07** | 110,1 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| T28 | 7 363 | 7 366 | **14,12** | 110,1 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| T29 | 8 685 | 8 688 | **12,17** | 110,1 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| T3 | 8 241 | 8 244 | **13,43** | 110,1 | 0,00 | 89,32 | - | - | 0,00 | 0,00 | - |
| T30 | 3 016 | 3 023 | **25,10** | 110,1 | 0,00 | 80,61 | - | - | 0,00 | 0,00 | - |
| T31 | 2 008 | 2 018 | **30,11** | 110,1 | 0,00 | 77,10 | - | - | 0,00 | 0,00 | - |
| T32 | 4 102 | 4 107 | **21,09** | 110,1 | 0,00 | 83,27 | - | - | 0,00 | 0,00 | - |
| T33 | 3 257 | 3 264 | **24,11** | 110,1 | 0,00 | 81,27 | - | - | 0,00 | 0,00 | - |
| T34 | 2 361 | 2 371 | **28,15** | 110,1 | 0,00 | 78,50 | - | - | 0,00 | 0,00 | - |
| T35 | 2 541 | 2 550 | **27,25** | 110,1 | 0,00 | 79,13 | - | - | 0,00 | 0,00 | - |
| T36 | 4 817 | 4 822 | **18,93** | 110,1 | 0,00 | 84,66 | - | - | 0,00 | 0,00 | - |
| T37 | 4 335 | 4 341 | **20,35** | 110,1 | 0,00 | 83,75 | - | - | 0,00 | 0,00 | - |
| T38 | 3 614 | 3 621 | **22,76** | 110,1 | 0,00 | 82,18 | - | - | 0,00 | 0,00 | - |
| T39 | 4 913 | 4 917 | **18,66** | 110,1 | 0,00 | 84,83 | - | - | 0,00 | 0,00 | - |
| T4 | 9 015 | 9 018 | **12,33** | 110,1 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| T5 | 7 547 | 7 550 | **14,53** | 110,1 | 0,00 | 88,56 | - | - | 0,00 | 0,00 | - |
| T6 | 8 773 | 8 776 | **12,68** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T7 | 9 809 | 9 812 | **11,25** | 110,1 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| T8 | 10 705 | 10 707 | **10,09** | 110,1 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| T9 | 7 508 | 7 510 | **14,60** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **36,08** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: N Lomarakennus N (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 629 | 17 630 | **2,38** | 108,9 | 0,00 | 95,93 | - | - | 0,00 | 0,00 | - |
| 10 | 19 514 | 19 515 | **1,06** | 108,9 | 0,00 | 96,81 | - | - | 0,00 | 0,00 | - |
| 100 | 12 136 | 12 138 | **2,04** | 106,0 | 0,00 | 92,68 | - | - | 0,00 | 0,00 | - |
| 101 | 12 751 | 12 752 | **1,46** | 106,0 | 0,00 | 93,11 | - | - | 0,00 | 0,00 | - |
| 102 | 11 330 | 11 332 | **2,88** | 106,0 | 0,00 | 92,09 | - | - | 0,00 | 0,00 | - |
| 103 | 10 615 | 10 617 | **3,70** | 106,0 | 0,00 | 91,52 | - | - | 0,00 | 0,00 | - |
| 104 | 9 940 | 9 942 | **4,52** | 106,0 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| 105 | 10 113 | 10 115 | **4,32** | 106,0 | 0,00 | 91,10 | - | - | 0,00 | 0,00 | - |
| 106 | 9 480 | 9 481 | **5,11** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 107 | 10 799 | 10 800 | **3,51** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 108 | 11 815 | 11 816 | **2,39** | 106,0 | 0,00 | 92,45 | - | - | 0,00 | 0,00 | - |
| 109 | 11 110 | 11 112 | **3,12** | 106,0 | 0,00 | 91,92 | - | - | 0,00 | 0,00 | - |
| 11 | 18 715 | 18 716 | **1,70** | 108,9 | 0,00 | 96,44 | - | - | 0,00 | 0,00 | - |
| 110 | 11 625 | 11 626 | **2,57** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 111 | 8 904 | 8 906 | **5,79** | 106,0 | 0,00 | 89,99 | - | - | 0,00 | 0,00 | - |
| 112 | 9 779 | 9 781 | **4,68** | 106,0 | 0,00 | 90,81 | - | - | 0,00 | 0,00 | - |
| 12 | 18 280 | 18 282 | **1,94** | 108,9 | 0,00 | 96,24 | - | - | 0,00 | 0,00 | - |
| 13 | 19 684 | 19 685 | **1,03** | 108,9 | 0,00 | 96,88 | - | - | 0,00 | 0,00 | - |
| 14 | 22 327 | 22 329 | **-0,67** | 108,9 | 0,00 | 97,98 | - | - | 0,00 | 0,00 | - |
| 15 | 19 206 | 19 208 | **1,30** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |
| 16 | 20 255 | 20 256 | **0,62** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 17 | 20 565 | 20 566 | **0,48** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 18 | 21 447 | 21 449 | **-0,08** | 108,9 | 0,00 | 97,63 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 21 303 | 21 304 | **-0,04** | 108,9 | 0,00 | 97,57 | - | - | 0,00 | 0,00 | - |
| 2 | 18 542 | 18 543 | **1,76** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 20 | 22 989 | 22 990 | **-1,05** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 21 | 22 159 | 22 160 | **-0,55** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 22 | 23 776 | 23 777 | **-1,44** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 23 | 24 018 | 24 019 | **-1,62** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 24 | 21 255 | 21 257 | **-0,03** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 25 | 23 763 | 23 765 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 26 | 24 751 | 24 752 | **-1,96** | 108,9 | 0,00 | 98,87 | - | - | 0,00 | 0,00 | - |
| 27 | 24 699 | 24 700 | **-2,00** | 108,9 | 0,00 | 98,85 | - | - | 0,00 | 0,00 | - |
| 28 | 23 035 | 23 036 | **-1,07** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 29 | 22 228 | 22 229 | **-0,56** | 108,9 | 0,00 | 97,94 | - | - | 0,00 | 0,00 | - |
| 3 | 18 145 | 18 146 | **1,99** | 108,9 | 0,00 | 96,18 | - | - | 0,00 | 0,00 | - |
| 30 | 20 339 | 20 341 | **0,53** | 108,9 | 0,00 | 97,17 | - | - | 0,00 | 0,00 | - |
| 31 | 23 044 | 23 045 | **-1,09** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 4 | 19 018 | 19 019 | **1,39** | 108,9 | 0,00 | 96,58 | - | - | 0,00 | 0,00 | - |
| 5 | 19 957 | 19 958 | **0,78** | 108,9 | 0,00 | 97,00 | - | - | 0,00 | 0,00 | - |
| 6 | 17 597 | 17 599 | **2,38** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 7 | 17 663 | 17 665 | **2,43** | 108,9 | 0,00 | 95,94 | - | - | 0,00 | 0,00 | - |
| 71 | 14 154 | 14 155 | **0,13** | 106,0 | 0,00 | 94,02 | - | - | 0,00 | 0,00 | - |
| 72 | 13 623 | 13 624 | **0,60** | 106,0 | 0,00 | 93,69 | - | - | 0,00 | 0,00 | - |
| 73 | 12 987 | 12 988 | **1,18** | 106,0 | 0,00 | 93,27 | - | - | 0,00 | 0,00 | - |
| 74 | 14 672 | 14 673 | **-0,31** | 106,0 | 0,00 | 94,33 | - | - | 0,00 | 0,00 | - |
| 75 | 15 368 | 15 369 | **-0,87** | 106,0 | 0,00 | 94,73 | - | - | 0,00 | 0,00 | - |
| 76 | 16 119 | 16 121 | **-1,44** | 106,0 | 0,00 | 95,15 | - | - | 0,00 | 0,00 | - |
| 77 | 14 882 | 14 883 | **-0,45** | 106,0 | 0,00 | 94,45 | - | - | 0,00 | 0,00 | - |
| 78 | 16 143 | 16 145 | **-1,45** | 106,0 | 0,00 | 95,16 | - | - | 0,00 | 0,00 | - |
| 79 | 16 775 | 16 776 | **-1,93** | 106,0 | 0,00 | 95,49 | - | - | 0,00 | 0,00 | - |
| 8 | 18 533 | 18 535 | **1,72** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 80 | 15 335 | 15 337 | **-0,82** | 106,0 | 0,00 | 94,71 | - | - | 0,00 | 0,00 | - |
| 81 | 14 171 | 14 173 | **0,14** | 106,0 | 0,00 | 94,03 | - | - | 0,00 | 0,00 | - |
| 82 | 13 102 | 13 103 | **1,10** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 83 | 13 165 | 13 166 | **1,05** | 106,0 | 0,00 | 93,39 | - | - | 0,00 | 0,00 | - |
| 84 | 14 563 | 14 564 | **-0,16** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 85 | 14 251 | 14 252 | **0,11** | 106,0 | 0,00 | 94,08 | - | - | 0,00 | 0,00 | - |
| 86 | 12 386 | 12 387 | **1,77** | 106,0 | 0,00 | 92,86 | - | - | 0,00 | 0,00 | - |
| 87 | 11 772 | 11 774 | **2,38** | 106,0 | 0,00 | 92,42 | - | - | 0,00 | 0,00 | - |
| 88 | 10 605 | 10 606 | **3,65** | 106,0 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 89 | 9 895 | 9 897 | **4,50** | 106,0 | 0,00 | 90,91 | - | - | 0,00 | 0,00 | - |
| 9 | 20 789 | 20 790 | **0,25** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 90 | 9 367 | 9 369 | **5,16** | 106,0 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| 91 | 10 253 | 10 255 | **4,07** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 92 | 11 197 | 11 198 | **3,00** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 93 | 10 855 | 10 857 | **3,35** | 106,0 | 0,00 | 91,71 | - | - | 0,00 | 0,00 | - |
| 94 | 11 430 | 11 431 | **2,73** | 106,0 | 0,00 | 92,16 | - | - | 0,00 | 0,00 | - |
| 95 | 11 868 | 11 870 | **2,27** | 106,0 | 0,00 | 92,49 | - | - | 0,00 | 0,00 | - |
| 96 | 12 419 | 12 420 | **1,72** | 106,0 | 0,00 | 92,88 | - | - | 0,00 | 0,00 | - |
| 97 | 10 526 | 10 528 | **3,77** | 106,0 | 0,00 | 91,45 | - | - | 0,00 | 0,00 | - |
| 98 | 11 074 | 11 076 | **3,15** | 106,0 | 0,00 | 91,89 | - | - | 0,00 | 0,00 | - |
| 99 | 11 701 | 11 703 | **2,45** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| T1 | 8 779 | 8 782 | **12,71** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T10 | 8 649 | 8 652 | **11,97** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T11 | 10 073 | 10 075 | **9,90** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T12 | 7 349 | 7 352 | **13,93** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T13 | 7 785 | 7 788 | **12,96** | 110,1 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| T14 | 8 920 | 8 923 | **11,25** | 110,1 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| T15 | 9 939 | 9 941 | **9,82** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T16 | 6 632 | 6 635 | **14,80** | 110,1 | 0,00 | 87,44 | - | - | 0,00 | 0,00 | - |
| T17 | 8 172 | 8 175 | **12,18** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T18 | 9 250 | 9 253 | **10,62** | 110,1 | 0,00 | 90,33 | - | - | 0,00 | 0,00 | - |
| T19 | 6 113 | 6 117 | **15,75** | 110,1 | 0,00 | 86,73 | - | - | 0,00 | 0,00 | - |
| T2 | 8 894 | 8 896 | **12,43** | 110,1 | 0,00 | 89,98 | - | - | 0,00 | 0,00 | - |
| T20 | 7 232 | 7 235 | **13,60** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T21 | 8 727 | 8 730 | **11,25** | 110,1 | 0,00 | 89,82 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T22 | 6 413 | 6 417 | **15,04** | 110,1 | 0,00 | 87,15 | - | - | 0,00 | 0,00 | - |
| T23 | 7 461 | 7 464 | **13,20** | 110,1 | 0,00 | 88,46 | - | - | 0,00 | 0,00 | - |
| T24 | 9 167 | 9 169 | **10,63** | 110,1 | 0,00 | 90,25 | - | - | 0,00 | 0,00 | - |
| T25 | 6 781 | 6 784 | **14,33** | 110,1 | 0,00 | 87,63 | - | - | 0,00 | 0,00 | - |
| T26 | 7 729 | 7 732 | **12,75** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T27 | 8 983 | 8 986 | **10,87** | 110,1 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| T28 | 6 771 | 6 774 | **14,34** | 110,1 | 0,00 | 87,62 | - | - | 0,00 | 0,00 | - |
| T29 | 8 108 | 8 111 | **12,15** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T3 | 7 988 | 7 991 | **13,69** | 110,1 | 0,00 | 89,05 | - | - | 0,00 | 0,00 | - |
| T30 | 3 392 | 3 398 | **23,59** | 110,1 | 0,00 | 81,62 | - | - | 0,00 | 0,00 | - |
| T31 | 2 230 | 2 240 | **28,85** | 110,1 | 0,00 | 78,00 | - | - | 0,00 | 0,00 | - |
| T32 | 4 465 | 4 470 | **19,95** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T33 | 3 517 | 3 524 | **23,11** | 110,1 | 0,00 | 81,94 | - | - | 0,00 | 0,00 | - |
| T34 | 2 390 | 2 400 | **28,00** | 110,1 | 0,00 | 78,60 | - | - | 0,00 | 0,00 | - |
| T35 | 2 363 | 2 373 | **28,14** | 110,1 | 0,00 | 78,50 | - | - | 0,00 | 0,00 | - |
| T36 | 5 107 | 5 112 | **18,14** | 110,1 | 0,00 | 85,17 | - | - | 0,00 | 0,00 | - |
| T37 | 4 532 | 4 537 | **19,75** | 110,1 | 0,00 | 84,14 | - | - | 0,00 | 0,00 | - |
| T38 | 3 666 | 3 672 | **22,57** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |
| T39 | 5 026 | 5 030 | **18,36** | 110,1 | 0,00 | 85,03 | - | - | 0,00 | 0,00 | - |
| T4 | 8 720 | 8 723 | **12,40** | 110,1 | 0,00 | 89,81 | - | - | 0,00 | 0,00 | - |
| T5 | 7 259 | 7 262 | **14,70** | 110,1 | 0,00 | 88,22 | - | - | 0,00 | 0,00 | - |
| T6 | 8 428 | 8 431 | **12,52** | 110,1 | 0,00 | 89,52 | - | - | 0,00 | 0,00 | - |
| T7 | 9 461 | 9 463 | **11,02** | 110,1 | 0,00 | 90,52 | - | - | 0,00 | 0,00 | - |
| T8 | 10 335 | 10 338 | **9,77** | 110,1 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 165 | 7 168 | **14,53** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,64** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: O Lomarakennus O (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 567 | 17 569 | **2,43** | 108,9 | 0,00 | 95,89 | - | - | 0,00 | 0,00 | - |
| 10 | 19 459 | 19 460 | **1,10** | 108,9 | 0,00 | 96,78 | - | - | 0,00 | 0,00 | - |
| 100 | 12 075 | 12 077 | **2,12** | 106,0 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 101 | 12 689 | 12 690 | **1,53** | 106,0 | 0,00 | 93,07 | - | - | 0,00 | 0,00 | - |
| 102 | 11 269 | 11 271 | **2,95** | 106,0 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| 103 | 10 554 | 10 556 | **3,78** | 106,0 | 0,00 | 91,47 | - | - | 0,00 | 0,00 | - |
| 104 | 9 878 | 9 880 | **4,60** | 106,0 | 0,00 | 90,90 | - | - | 0,00 | 0,00 | - |
| 105 | 10 049 | 10 051 | **4,40** | 106,0 | 0,00 | 91,04 | - | - | 0,00 | 0,00 | - |
| 106 | 9 416 | 9 417 | **5,20** | 106,0 | 0,00 | 90,48 | - | - | 0,00 | 0,00 | - |
| 107 | 10 735 | 10 736 | **3,59** | 106,0 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| 108 | 11 750 | 11 751 | **2,46** | 106,0 | 0,00 | 92,40 | - | - | 0,00 | 0,00 | - |
| 109 | 11 044 | 11 046 | **3,20** | 106,0 | 0,00 | 91,86 | - | - | 0,00 | 0,00 | - |
| 11 | 18 664 | 18 665 | **1,74** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 110 | 11 559 | 11 560 | **2,64** | 106,0 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| 111 | 8 837 | 8 839 | **5,87** | 106,0 | 0,00 | 89,93 | - | - | 0,00 | 0,00 | - |
| 112 | 9 713 | 9 715 | **4,77** | 106,0 | 0,00 | 90,75 | - | - | 0,00 | 0,00 | - |
| 12 | 18 234 | 18 235 | **1,98** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 13 | 19 634 | 19 635 | **1,07** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 14 | 22 272 | 22 273 | **-0,64** | 108,9 | 0,00 | 97,96 | - | - | 0,00 | 0,00 | - |
| 15 | 19 159 | 19 161 | **1,34** | 108,9 | 0,00 | 96,65 | - | - | 0,00 | 0,00 | - |
| 16 | 20 207 | 20 209 | **0,65** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 17 | 20 514 | 20 516 | **0,51** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 18 | 21 397 | 21 398 | **-0,05** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 19 | 21 256 | 21 257 | **-0,01** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 2 | 18 479 | 18 481 | **1,80** | 108,9 | 0,00 | 96,33 | - | - | 0,00 | 0,00 | - |
| 20 | 22 940 | 22 941 | **-1,02** | 108,9 | 0,00 | 98,21 | - | - | 0,00 | 0,00 | - |
| 21 | 22 107 | 22 108 | **-0,53** | 108,9 | 0,00 | 97,89 | - | - | 0,00 | 0,00 | - |
| 22 | 23 726 | 23 727 | **-1,40** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |
| 23 | 23 964 | 23 966 | **-1,59** | 108,9 | 0,00 | 98,59 | - | - | 0,00 | 0,00 | - |
| 24 | 21 202 | 21 203 | **0,00** | 108,9 | 0,00 | 97,53 | - | - | 0,00 | 0,00 | - |
| 25 | 23 708 | 23 709 | **-1,46** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 24 700 | 24 701 | **-1,93** | 108,9 | 0,00 | 98,85 | - | - | 0,00 | 0,00 | - |
| 27 | 24 644 | 24 645 | **-1,97** | 108,9 | 0,00 | 98,83 | - | - | 0,00 | 0,00 | - |
| 28 | 22 982 | 22 983 | **-1,04** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 29 | 22 178 | 22 179 | **-0,52** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 3 | 18 086 | 18 088 | **2,03** | 108,9 | 0,00 | 96,15 | - | - | 0,00 | 0,00 | - |
| 30 | 20 285 | 20 287 | **0,57** | 108,9 | 0,00 | 97,14 | - | - | 0,00 | 0,00 | - |
| 31 | 22 987 | 22 988 | **-1,05** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 4 | 18 960 | 18 961 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 5 | 19 899 | 19 901 | **0,81** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 6 | 17 542 | 17 544 | **2,42** | 108,9 | 0,00 | 95,88 | - | - | 0,00 | 0,00 | - |
| 7 | 17 612 | 17 613 | **2,46** | 108,9 | 0,00 | 95,92 | - | - | 0,00 | 0,00 | - |
| 71 | 14 097 | 14 098 | **0,18** | 106,0 | 0,00 | 93,98 | - | - | 0,00 | 0,00 | - |
| 72 | 13 565 | 13 567 | **0,65** | 106,0 | 0,00 | 93,65 | - | - | 0,00 | 0,00 | - |
| 73 | 12 930 | 12 931 | **1,23** | 106,0 | 0,00 | 93,23 | - | - | 0,00 | 0,00 | - |
| 74 | 14 614 | 14 616 | **-0,26** | 106,0 | 0,00 | 94,30 | - | - | 0,00 | 0,00 | - |
| 75 | 15 309 | 15 310 | **-0,82** | 106,0 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| 76 | 16 060 | 16 061 | **-1,39** | 106,0 | 0,00 | 95,12 | - | - | 0,00 | 0,00 | - |
| 77 | 14 822 | 14 824 | **-0,40** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 78 | 16 082 | 16 084 | **-1,41** | 106,0 | 0,00 | 95,13 | - | - | 0,00 | 0,00 | - |
| 79 | 16 714 | 16 715 | **-1,88** | 106,0 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 8 | 18 478 | 18 480 | **1,76** | 108,9 | 0,00 | 96,33 | - | - | 0,00 | 0,00 | - |
| 80 | 15 274 | 15 275 | **-0,77** | 106,0 | 0,00 | 94,68 | - | - | 0,00 | 0,00 | - |
| 81 | 14 111 | 14 112 | **0,20** | 106,0 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |
| 82 | 13 043 | 13 044 | **1,16** | 106,0 | 0,00 | 93,31 | - | - | 0,00 | 0,00 | - |
| 83 | 13 104 | 13 105 | **1,10** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 84 | 14 501 | 14 502 | **-0,11** | 106,0 | 0,00 | 94,23 | - | - | 0,00 | 0,00 | - |
| 85 | 14 187 | 14 189 | **0,16** | 106,0 | 0,00 | 94,04 | - | - | 0,00 | 0,00 | - |
| 86 | 12 318 | 12 319 | **1,84** | 106,0 | 0,00 | 92,81 | - | - | 0,00 | 0,00 | - |
| 87 | 11 705 | 11 706 | **2,46** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 88 | 10 537 | 10 539 | **3,73** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 89 | 9 827 | 9 829 | **4,58** | 106,0 | 0,00 | 90,85 | - | - | 0,00 | 0,00 | - |
| 9 | 20 732 | 20 734 | **0,29** | 108,9 | 0,00 | 97,33 | - | - | 0,00 | 0,00 | - |
| 90 | 9 299 | 9 301 | **5,25** | 106,0 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| 91 | 10 184 | 10 186 | **4,15** | 106,0 | 0,00 | 91,16 | - | - | 0,00 | 0,00 | - |
| 92 | 11 129 | 11 130 | **3,07** | 106,0 | 0,00 | 91,93 | - | - | 0,00 | 0,00 | - |
| 93 | 10 798 | 10 800 | **3,42** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 94 | 11 374 | 11 375 | **2,79** | 106,0 | 0,00 | 92,12 | - | - | 0,00 | 0,00 | - |
| 95 | 11 811 | 11 812 | **2,33** | 106,0 | 0,00 | 92,45 | - | - | 0,00 | 0,00 | - |
| 96 | 12 361 | 12 362 | **1,78** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 97 | 10 467 | 10 468 | **3,85** | 106,0 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| 98 | 11 015 | 11 017 | **3,22** | 106,0 | 0,00 | 91,84 | - | - | 0,00 | 0,00 | - |
| 99 | 11 642 | 11 644 | **2,54** | 106,0 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| T1 | 8 734 | 8 737 | **12,50** | 110,1 | 0,00 | 89,83 | - | - | 0,00 | 0,00 | - |
| T10 | 8 587 | 8 589 | **12,36** | 110,1 | 0,00 | 89,68 | - | - | 0,00 | 0,00 | - |
| T11 | 10 009 | 10 011 | **10,24** | 110,1 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| T12 | 7 286 | 7 289 | **14,33** | 110,1 | 0,00 | 88,25 | - | - | 0,00 | 0,00 | - |
| T13 | 7 719 | 7 722 | **13,24** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T14 | 8 854 | 8 857 | **11,51** | 110,1 | 0,00 | 89,95 | - | - | 0,00 | 0,00 | - |
| T15 | 9 872 | 9 875 | **10,08** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| T16 | 6 565 | 6 569 | **15,10** | 110,1 | 0,00 | 87,35 | - | - | 0,00 | 0,00 | - |
| T17 | 8 105 | 8 108 | **12,47** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T18 | 9 182 | 9 185 | **10,87** | 110,1 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| T19 | 6 045 | 6 048 | **15,94** | 110,1 | 0,00 | 86,63 | - | - | 0,00 | 0,00 | - |
| T2 | 8 844 | 8 846 | **12,35** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T20 | 7 163 | 7 166 | **13,71** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| T21 | 8 658 | 8 661 | **11,35** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T22 | 6 343 | 6 347 | **15,19** | 110,1 | 0,00 | 87,05 | - | - | 0,00 | 0,00 | - |
| T23 | 7 391 | 7 394 | **13,31** | 110,1 | 0,00 | 88,38 | - | - | 0,00 | 0,00 | - |
| T24 | 9 097 | 9 099 | **10,72** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T25 | 6 711 | 6 714 | **14,45** | 110,1 | 0,00 | 87,54 | - | - | 0,00 | 0,00 | - |
| T26 | 7 659 | 7 662 | **12,86** | 110,1 | 0,00 | 88,69 | - | - | 0,00 | 0,00 | - |
| T27 | 8 913 | 8 916 | **10,97** | 110,1 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| T28 | 6 703 | 6 707 | **14,46** | 110,1 | 0,00 | 87,53 | - | - | 0,00 | 0,00 | - |
| T29 | 8 039 | 8 042 | **12,26** | 110,1 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T3 | 7 936 | 7 939 | **13,68** | 110,1 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| T30 | 3 457 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T31 | 2 287 | 2 297 | **28,54** | 110,1 | 0,00 | 78,22 | - | - | 0,00 | 0,00 | - |
| T32 | 4 529 | 4 534 | **19,76** | 110,1 | 0,00 | 84,13 | - | - | 0,00 | 0,00 | - |
| T33 | 3 575 | 3 582 | **22,90** | 110,1 | 0,00 | 82,08 | - | - | 0,00 | 0,00 | - |
| T34 | 2 431 | 2 440 | **27,79** | 110,1 | 0,00 | 78,75 | - | - | 0,00 | 0,00 | - |
| T35 | 2 381 | 2 391 | **28,04** | 110,1 | 0,00 | 78,57 | - | - | 0,00 | 0,00 | - |
| T36 | 5 166 | 5 171 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T37 | 4 584 | 4 589 | **19,60** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T38 | 3 706 | 3 712 | **22,43** | 110,1 | 0,00 | 82,39 | - | - | 0,00 | 0,00 | - |
| T39 | 5 070 | 5 075 | **18,24** | 110,1 | 0,00 | 85,11 | - | - | 0,00 | 0,00 | - |
| T4 | 8 664 | 8 667 | **12,54** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T5 | 7 204 | 7 207 | **14,81** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T6 | 8 368 | 8 371 | **12,80** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T7 | 9 401 | 9 403 | **11,32** | 110,1 | 0,00 | 90,47 | - | - | 0,00 | 0,00 | - |
| T8 | 10 274 | 10 276 | **10,11** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T9 | 7 106 | 7 109 | **14,84** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,51** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuonkangas_melu ja varjot_1.w2r (11)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)
**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:** VESTAS V172-7.2 7200 250.0 !O!
**Noise:** V172 - 7,2 MW PO7200 STE + 2dB

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Vestas | 15.11.2022 | USER | 29.11.2022 14.53 |

DMS no.: 0128-4336_00

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 225,0 | 8,0 | 108,9 | No | 92,4 | 100,0 | 103,3 | 103,5 | 101,9 | 97,4 | 89,9 | 79,2 |

**WTG:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 214,0 | 8,0 | 110,1 | No | 91,5 | 100,2 | 104,1 | 105,0 | 103,7 | 99,3 | 91,6 | 80,8 |

**WTG:** NORDEX N149/4.0-4.5 4500 180.0 !O!
**Noise:** Serrations Mode 00 - 106.0 dB(A) octave data only

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| F008_271_A13_R01 | 30.6.2017 | USER | 10.11.2022 10.32 |

Mode available on request

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 190,0 | 8,0 | 106,0 | No | 88,0 | 94,0 | 98,0 | 100,0 | 101,0 | 98,0 | 91,0 | 83,0 |

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

## Noise sensitive area: A Lomarakennus A (Syvälahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: C Lomarakennus C (Mutalahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: D Lomarakennus D (Mutaniemi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: E Asuinrakennus E (Alanko)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: F Asuinrakennus F (Joensuu)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: G Asuinrakennus G (Heiniaho)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: H Asuinrakennus H (Mäkelä)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: I Lomarakennus I
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: K Asuinrakennus K (Takalo)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: N Lomarakennus N (Kuusela)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: O Lomarakennus O (Kuusela)

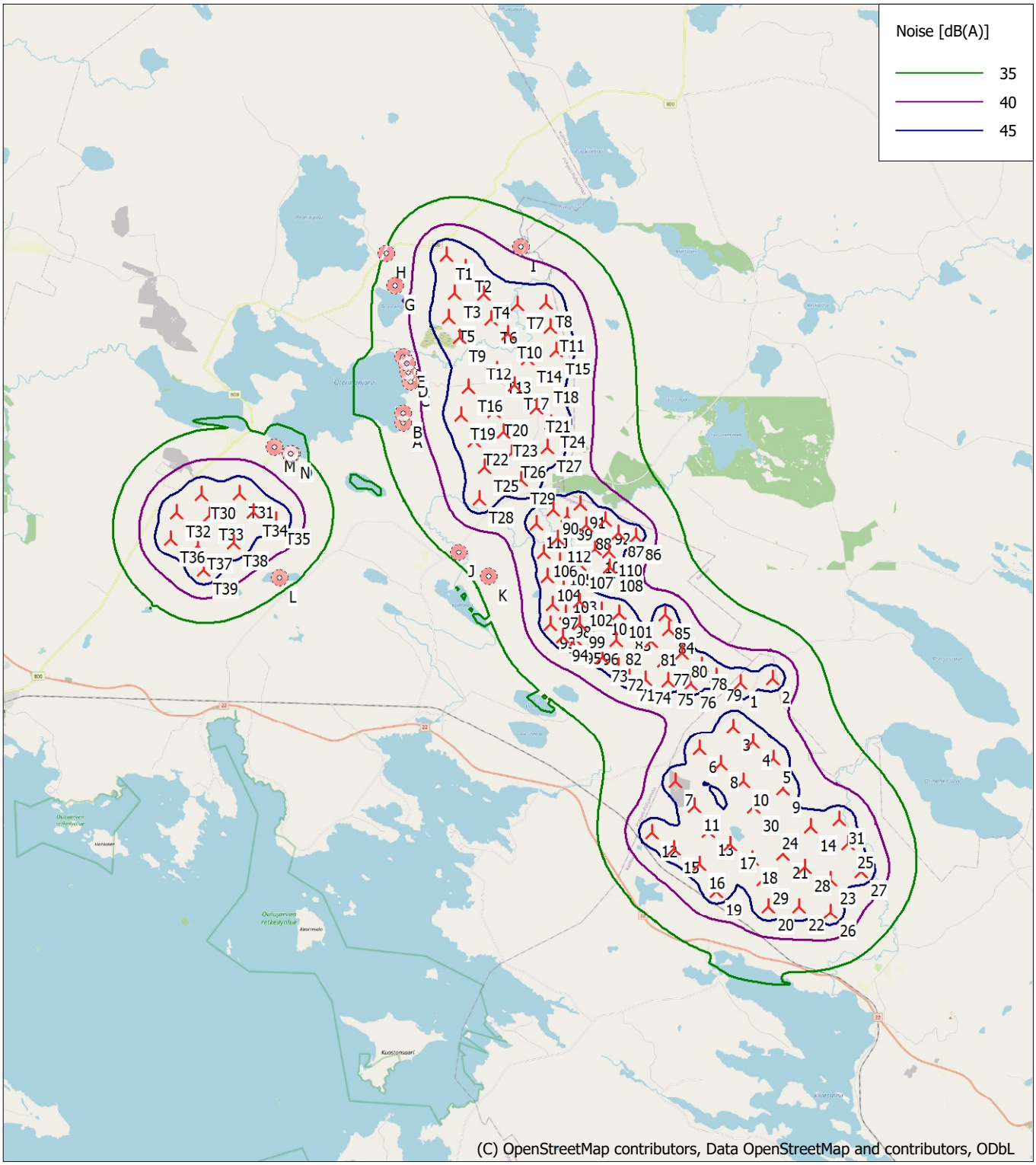
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 18.49/3.5.584

# DECIBEL - Map 8,0 m/s

**Calculation:** Haarasuonkangas_VE1_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas




Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 510 789 North: 7 163 440

New WTG  Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

## Liite 8. Melun yhteismallinnuksen tulokset VE2

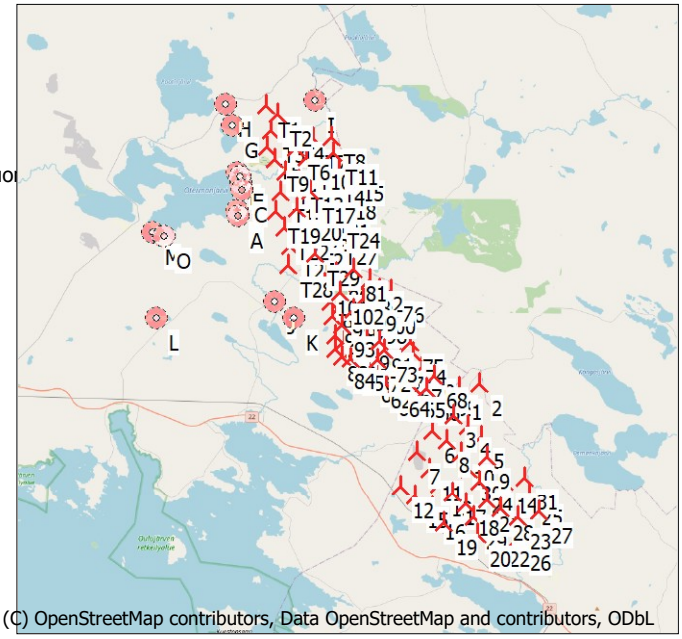
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Calculated:
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# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuo
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




## WTGs

| | East | North | Z [m] | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated [kW] | Noise data Rotor diameter [m] | Hub height [m] | Creator | Name | Wind speed [m/s] | LwA,ref [dB(A)] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 100 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 101 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 102 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 61 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 62 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 63 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 64 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 65 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 66 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 67 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 68 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 69 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 70 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 71 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 72 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 73 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 74 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 75 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 76 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 77 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 78 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 79 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Main Result

## Calculation: Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | Wind speed | LwA,ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 80 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 81 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 82 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 83 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 84 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 85 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 86 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 87 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 88 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 89 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0 ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 108,9 |
| 90 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 91 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 92 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 93 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 94 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 95 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 96 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 97 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 98 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| 99 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 1... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 106,0 |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 720... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 110,1 |

# Calculation Results

## Sound level

| Noise sensitive area | | | | | | Demands | Sound level | |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z | Immission height | Noise | From WTGs | Distance to noise demand |
| | | | | [m] | [m] | [dB(A)] | [dB(A)] | [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 40,0 | 37,2 | 665 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 40,0 | 37,3 | 649 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 40,0 | 38,5 | 378 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 40,0 | 38,4 | 421 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 40,0 | 38,4 | 408 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 40,0 | 38,1 | 473 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 40,0 | 37,4 | 570 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 40,0 | 35,2 | 976 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 40,0 | 38,7 | 322 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 40,0 | 35,8 | 948 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 40,0 | 36,4 | 966 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 40,0 | 26,6 | 6 399 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 40,0 | 28,3 | 5 254 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 40,0 | 28,3 | 4 755 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 40,0 | 28,5 | 4 686 |

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9.5.2023 19.07/3.5.584

# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14841 | 15043 | 15555 | 15832 | 16100 | 16350 | 18351 | 19383 | 16989 | 10816 | 9530 | 16500 | 18226 | 17629 | 17567 |
| 10 | 17232 | 17467 | 18116 | 18417 | 18710 | 18968 | 21130 | 22204 | 20165 | 12731 | 11401 | 17677 | 20098 | 19514 | 19459 |
| 100 | 8450 | 8631 | 9089 | 9361 | 9626 | 9875 | 11904 | 12958 | 11047 | 5208 | 4254 | 11513 | 12222 | 11625 | 11559 |
| 101 | 5792 | 5996 | 6570 | 6868 | 7160 | 7417 | 9634 | 10736 | 9635 | 2849 | 2455 | 9132 | 9499 | 8904 | 8837 |
| 102 | 6696 | 6896 | 7446 | 7737 | 8023 | 8279 | 10449 | 11539 | 10184 | 3475 | 2754 | 9806 | 10376 | 9779 | 9713 |
| 11 | 16785 | 17040 | 17781 | 18096 | 18406 | 18666 | 20940 | 22042 | 20393 | 12069 | 10755 | 16528 | 19284 | 18715 | 18664 |
| 12 | 16716 | 16987 | 17809 | 18134 | 18455 | 18716 | 21074 | 22195 | 20906 | 11863 | 10596 | 15748 | 18831 | 18280 | 18234 |
| 13 | 17797 | 18053 | 18799 | 19114 | 19424 | 19684 | 21958 | 23061 | 21386 | 13066 | 11756 | 17412 | 20250 | 19684 | 19634 |
| 14 | 19986 | 20215 | 20832 | 21126 | 21413 | 21669 | 23776 | 24834 | 22562 | 15537 | 14207 | 20455 | 22912 | 22327 | 22272 |
| 15 | 17585 | 17853 | 18659 | 18982 | 19301 | 19562 | 21901 | 23018 | 21618 | 12753 | 11475 | 16689 | 19759 | 19206 | 19159 |
| 16 | 18564 | 18829 | 19614 | 19935 | 20250 | 20512 | 22827 | 23939 | 22411 | 13759 | 12470 | 17765 | 20810 | 20255 | 20207 |
| 17 | 18634 | 18887 | 19618 | 19931 | 20239 | 20499 | 22753 | 23851 | 22080 | 13928 | 12614 | 18305 | 21133 | 20565 | 20514 |
| 18 | 19479 | 19729 | 20447 | 20757 | 21062 | 21322 | 23558 | 24650 | 22793 | 14795 | 13478 | 19197 | 22016 | 21447 | 21397 |
| 19 | 19633 | 19898 | 20682 | 21002 | 21318 | 21579 | 23891 | 25002 | 23435 | 14825 | 13538 | 18758 | 21856 | 21303 | 21256 |
| 2 | 15625 | 15815 | 16273 | 16539 | 16796 | 17041 | 18961 | 19969 | 17355 | 11759 | 10494 | 17541 | 19141 | 18542 | 18479 |
| 20 | 21146 | 21401 | 22141 | 22455 | 22763 | 23023 | 25280 | 26378 | 24561 | 16409 | 15102 | 20564 | 23550 | 22989 | 22940 |
| 21 | 20039 | 20281 | 20958 | 21262 | 21560 | 21818 | 24002 | 25081 | 23038 | 15441 | 14115 | 20046 | 22735 | 22159 | 22107 |
| 22 | 21801 | 22049 | 22754 | 23063 | 23365 | 23625 | 25839 | 26925 | 24943 | 17129 | 15810 | 21464 | 24344 | 23776 | 23726 |
| 23 | 21818 | 22054 | 22702 | 23001 | 23293 | 23550 | 25691 | 26757 | 24542 | 17275 | 15946 | 21938 | 24596 | 24018 | 23964 |
| 24 | 19052 | 19290 | 19950 | 20251 | 20546 | 20804 | 22971 | 24046 | 21972 | 14503 | 13174 | 19263 | 21835 | 21255 | 21202 |
| 25 | 21363 | 21587 | 22180 | 22470 | 22751 | 23006 | 25075 | 26122 | 23715 | 16962 | 15633 | 21917 | 24349 | 23763 | 23708 |
| 26 | 22677 | 22919 | 23596 | 23900 | 24197 | 24455 | 26631 | 27707 | 25584 | 18060 | 16736 | 22518 | 25323 | 24751 | 24700 |
| 27 | 22360 | 22587 | 23193 | 23486 | 23770 | 24025 | 26109 | 27159 | 24772 | 17914 | 16584 | 22757 | 25282 | 24699 | 24644 |
| 28 | 20882 | 21122 | 21786 | 22088 | 22383 | 22641 | 24806 | 25880 | 23759 | 16307 | 14979 | 20931 | 23611 | 23035 | 22982 |
| 29 | 20297 | 20549 | 21271 | 21582 | 21888 | 22148 | 24387 | 25480 | 23617 | 15598 | 14283 | 19914 | 22795 | 22228 | 22178 |
| 3 | 15627 | 15848 | 16441 | 16733 | 17016 | 17271 | 19371 | 20431 | 18265 | 11315 | 9994 | 16648 | 18737 | 18145 | 18086 |
| 30 | 18129 | 18367 | 19031 | 19333 | 19629 | 19887 | 22062 | 23140 | 21115 | 13581 | 12252 | 18388 | 20920 | 20339 | 20285 |
| 31 | 20570 | 20789 | 21364 | 21651 | 21930 | 22183 | 24231 | 25272 | 22826 | 16227 | 14900 | 21305 | 23633 | 23044 | 22987 |
| 4 | 16498 | 16718 | 17304 | 17594 | 17876 | 18130 | 20215 | 21270 | 19032 | 12190 | 10868 | 17482 | 19610 | 19018 | 18960 |
| 5 | 17439 | 17658 | 18238 | 18527 | 18807 | 19061 | 21132 | 22182 | 19878 | 13130 | 11807 | 18378 | 20548 | 19957 | 19899 |
| 6 | 15344 | 15583 | 16254 | 16559 | 16857 | 17115 | 19313 | 20399 | 18535 | 10815 | 9484 | 15818 | 18181 | 17597 | 17542 |
| 61 | 11839 | 12081 | 12772 | 13080 | 13384 | 13643 | 15885 | 16984 | 15421 | 7339 | 6011 | 12678 | 14743 | 14154 | 14097 |
| 62 | 11301 | 11543 | 12239 | 12549 | 12853 | 13113 | 15365 | 16466 | 14966 | 6804 | 5477 | 12203 | 14213 | 13623 | 13565 |
| 63 | 10704 | 10950 | 11665 | 11978 | 12286 | 12546 | 14822 | 15929 | 14551 | 6172 | 4843 | 11585 | 13577 | 12987 | 12930 |
| 64 | 12280 | 12516 | 13179 | 13484 | 13782 | 14041 | 16250 | 17340 | 15644 | 7848 | 6523 | 13244 | 15263 | 14672 | 14614 |
| 65 | 12868 | 13096 | 13721 | 14019 | 14310 | 14567 | 16728 | 17806 | 15930 | 8536 | 7219 | 14016 | 15961 | 15368 | 15309 |
| 66 | 13535 | 13755 | 14347 | 14639 | 14923 | 15179 | 17293 | 18359 | 16319 | 9288 | 7977 | 14820 | 16714 | 16119 | 16060 |
| 67 | 12280 | 12501 | 13102 | 13396 | 13684 | 13940 | 16076 | 17149 | 15235 | 8053 | 6751 | 13693 | 15478 | 14882 | 14822 |
| 68 | 13397 | 13605 | 14145 | 14428 | 14703 | 14955 | 17007 | 18056 | 15854 | 9330 | 8045 | 15048 | 16741 | 16143 | 16082 |
| 69 | 14038 | 14245 | 14782 | 15065 | 15338 | 15590 | 17631 | 18677 | 16417 | 9956 | 8666 | 15628 | 17372 | 16775 | 16714 |
| 7 | 15707 | 15962 | 16705 | 17020 | 17330 | 17591 | 19869 | 20974 | 19379 | 10999 | 9683 | 15555 | 18235 | 17663 | 17612 |
| 70 | 12592 | 12802 | 13353 | 13638 | 13916 | 14169 | 16242 | 17298 | 15192 | 8526 | 7246 | 14291 | 15933 | 15335 | 15274 |
| 71 | 11494 | 11712 | 12299 | 12591 | 12877 | 13132 | 15261 | 16334 | 14441 | 7356 | 6073 | 13134 | 14769 | 14171 | 14111 |
| 72 | 10603 | 10836 | 11492 | 11796 | 12095 | 12353 | 14569 | 15663 | 14086 | 6271 | 4964 | 11944 | 13697 | 13102 | 13043 |
| 73 | 10505 | 10726 | 11335 | 11631 | 11921 | 12178 | 14343 | 15425 | 13696 | 6354 | 5079 | 12198 | 13763 | 13165 | 13104 |
| 74 | 11721 | 11925 | 12453 | 12735 | 13009 | 13261 | 15316 | 16368 | 14264 | 7790 | 6543 | 13706 | 15162 | 14563 | 14501 |
| 75 | 11329 | 11526 | 12030 | 12308 | 12578 | 12828 | 14860 | 15907 | 13767 | 7517 | 6301 | 13526 | 14850 | 14251 | 14187 |
| 76 | 8996 | 9149 | 9491 | 9740 | 9980 | 10220 | 12094 | 13107 | 10806 | 6182 | 5309 | 12510 | 12977 | 12386 | 12318 |
| 77 | 8413 | 8572 | 8943 | 9199 | 9447 | 9690 | 11617 | 12646 | 10516 | 5584 | 4749 | 11915 | 12365 | 11772 | 11705 |
| 78 | 7276 | 7444 | 7863 | 8130 | 8391 | 8638 | 10656 | 11711 | 9914 | 4522 | 3830 | 10845 | 11197 | 10605 | 10537 |
| 79 | 6548 | 6718 | 7154 | 7426 | 7691 | 7941 | 10001 | 11069 | 9468 | 3979 | 3457 | 10265 | 10486 | 9895 | 9827 |
| 8 | 16261 | 16497 | 17156 | 17458 | 17754 | 18012 | 20190 | 21270 | 19312 | 11749 | 10419 | 16730 | 19118 | 18533 | 18478 |
| 80 | 6013 | 6186 | 6641 | 6917 | 7188 | 7440 | 9539 | 10616 | 9186 | 3599 | 3233 | 9832 | 9956 | 9367 | 9299 |
| 81 | 6757 | 6905 | 7253 | 7507 | 7755 | 7999 | 9956 | 10999 | 9150 | 4542 | 4063 | 10793 | 10838 | 10253 | 10184 |
| 82 | 7770 | 7923 | 8276 | 8530 | 8776 | 9018 | 10944 | 11975 | 9920 | 5187 | 4480 | 11509 | 11786 | 11197 | 11129 |
| 83 | 8694 | 8953 | 9734 | 10056 | 10375 | 10636 | 12990 | 14113 | 13174 | 4047 | 2717 | 9588 | 11445 | 10855 | 10798 |
| 84 | 9275 | 9533 | 10304 | 10625 | 10942 | 11203 | 13544 | 14665 | 13629 | 4631 | 3301 | 10070 | 12019 | 11430 | 11374 |
| 85 | 9632 | 9884 | 10629 | 10946 | 11259 | 11520 | 13834 | 14949 | 13779 | 5054 | 3725 | 10542 | 12458 | 11868 | 11811 |
| 86 | 10061 | 10304 | 11009 | 11321 | 11627 | 11888 | 14159 | 15266 | 13911 | 5590 | 4269 | 11168 | 13012 | 12419 | 12361 |
| 87 | 8164 | 8414 | 9156 | 9474 | 9788 | 10049 | 12373 | 13492 | 12475 | 3695 | 2393 | 9541 | 11121 | 10526 | 10467 |
| 88 | 8690 | 8936 | 9660 | 9975 | 10286 | 10547 | 12850 | 13964 | 12822 | 4242 | 2936 | 10030 | 11669 | 11074 | 11015 |
| 89 | 9303 | 9547 | 10254 | 10567 | 10875 | 11135 | 13417 | 14526 | 13260 | 4869 | 3557 | 10585 | 12295 | 11701 | 11642 |
| 9 | 18381 | 18607 | 19214 | 19507 | 19792 | 20047 | 22149 | 23206 | 20958 | 13980 | 12651 | 19046 | 21376 | 20789 | 20732 |
| 90 | 9485 | 9710 | 10340 | 10640 | 10935 | 11193 | 13393 | 14485 | 12936 | 5336 | 4079 | 11272 | 12734 | 12136 | 12075 |
| 91 | 10019 | 10237 | 10830 | 11124 | 11412 | 11669 | 13822 | 14903 | 13178 | 5965 | 4719 | 11917 | 13350 | 12751 | 12689 |
| 92 | 8745 | 8978 | 9643 | 9950 | 10252 | 10511 | 12757 | 13860 | 12517 | 4524 | 3269 | 10487 | 11928 | 11330 | 11269 |

To be continued on next page...

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# DECIBEL - Main Result

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 8012 | 8247 | 8925 | 9234 | 9538 | 9798 | 12065 | 13173 | 11964 | 3832 | 2618 | 9901 | 11214 | 10615 | 10554 |
| 94 | 7332 | 7570 | 8265 | 8577 | 8885 | 9145 | 11438 | 12551 | 11493 | 3186 | 2038 | 9346 | 10539 | 9940 | 9878 |
| 95 | 7264 | 7483 | 8101 | 8402 | 8698 | 8957 | 11180 | 12280 | 11007 | 3510 | 2516 | 9784 | 10713 | 10113 | 10049 |
| 96 | 6650 | 6875 | 7521 | 7827 | 8128 | 8388 | 10648 | 11756 | 10666 | 2929 | 2062 | 9240 | 10079 | 9480 | 9416 |
| 97 | 7868 | 8076 | 8648 | 8941 | 9228 | 9484 | 11649 | 12736 | 11231 | 4206 | 3174 | 10466 | 11398 | 10799 | 10735 |
| 98 | 8760 | 8953 | 9454 | 9734 | 10006 | 10258 | 12329 | 13392 | 11552 | 5261 | 4211 | 11512 | 12413 | 11815 | 11750 |
| 99 | 7965 | 8152 | 8636 | 8913 | 9184 | 9436 | 11505 | 12570 | 10808 | 4706 | 3789 | 11020 | 11707 | 11110 | 11044 |
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

| | |
|---|---|
| LWA,ref: | Sound pressure level at WTG |
| K: | Pure tone |
| Dc: | Directivity correction |
| Adiv: | the attenuation due to geometrical divergence |
| Aatm: | the attenuation due to atmospheric absorption |
| Agr: | the attenuation due to ground effect |
| Abar: | the attenuation due to a barrier |
| Amisc: | the attenuation due to miscellaneous other effects |
| Cmet: | Meteorological correction |

## Calculation Results

### Noise sensitive area: A Lomarakennus A (Syvälahti)

Wind speed: 8,0 m/s
**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 841 | 14 843 | **4,53** | 108,9 | 0,00 | 94,43 | - | - | 0,00 | 0,00 | - |
| 10 | 17 232 | 17 233 | **2,64** | 108,9 | 0,00 | 95,73 | - | - | 0,00 | 0,00 | - |
| 100 | 8 450 | 8 452 | **6,38** | 106,0 | 0,00 | 89,54 | - | - | 0,00 | 0,00 | - |
| 101 | 5 792 | 5 795 | **10,89** | 106,0 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| 102 | 6 696 | 6 698 | **9,17** | 106,0 | 0,00 | 87,52 | - | - | 0,00 | 0,00 | - |
| 11 | 16 785 | 16 786 | **2,98** | 108,9 | 0,00 | 95,50 | - | - | 0,00 | 0,00 | - |
| 12 | 16 716 | 16 717 | **3,06** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 13 | 17 797 | 17 798 | **2,24** | 108,9 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 14 | 19 986 | 19 988 | **0,76** | 108,9 | 0,00 | 97,02 | - | - | 0,00 | 0,00 | - |
| 15 | 17 585 | 17 587 | **2,40** | 108,9 | 0,00 | 95,90 | - | - | 0,00 | 0,00 | - |
| 16 | 18 564 | 18 566 | **1,70** | 108,9 | 0,00 | 96,37 | - | - | 0,00 | 0,00 | - |
| 17 | 18 634 | 18 636 | **1,66** | 108,9 | 0,00 | 96,41 | - | - | 0,00 | 0,00 | - |
| 18 | 19 479 | 19 480 | **1,11** | 108,9 | 0,00 | 96,79 | - | - | 0,00 | 0,00 | - |
| 19 | 19 633 | 19 634 | **0,99** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 2 | 15 625 | 15 627 | **3,88** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 20 | 21 146 | 21 147 | **0,03** | 108,9 | 0,00 | 97,51 | - | - | 0,00 | 0,00 | - |
| 21 | 20 039 | 20 041 | **0,72** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 22 | 21 801 | 21 802 | **-0,34** | 108,9 | 0,00 | 97,77 | - | - | 0,00 | 0,00 | - |
| 23 | 21 818 | 21 820 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 24 | 19 052 | 19 053 | **1,37** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 25 | 21 363 | 21 364 | **-0,10** | 108,9 | 0,00 | 97,59 | - | - | 0,00 | 0,00 | - |
| 26 | 22 677 | 22 678 | **-0,88** | 108,9 | 0,00 | 98,11 | - | - | 0,00 | 0,00 | - |
| 27 | 22 360 | 22 361 | **-0,69** | 108,9 | 0,00 | 97,99 | - | - | 0,00 | 0,00 | - |
| 28 | 20 882 | 20 884 | **0,19** | 108,9 | 0,00 | 97,40 | - | - | 0,00 | 0,00 | - |
| 29 | 20 297 | 20 298 | **0,56** | 108,9 | 0,00 | 97,15 | - | - | 0,00 | 0,00 | - |
| 3 | 15 627 | 15 629 | **3,87** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 30 | 18 129 | 18 131 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 31 | 20 570 | 20 571 | **0,39** | 108,9 | 0,00 | 97,27 | - | - | 0,00 | 0,00 | - |
| 4 | 16 498 | 16 500 | **3,19** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 5 | 17 439 | 17 441 | **2,49** | 108,9 | 0,00 | 95,83 | - | - | 0,00 | 0,00 | - |
| 6 | 15 344 | 15 346 | **4,10** | 108,9 | 0,00 | 94,72 | - | - | 0,00 | 0,00 | - |
| 61 | 11 839 | 11 841 | **2,30** | 106,0 | 0,00 | 92,47 | - | - | 0,00 | 0,00 | - |
| 62 | 11 301 | 11 302 | **2,87** | 106,0 | 0,00 | 92,06 | - | - | 0,00 | 0,00 | - |
| 63 | 10 704 | 10 706 | **3,52** | 106,0 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| 64 | 12 280 | 12 281 | **1,86** | 106,0 | 0,00 | 92,78 | - | - | 0,00 | 0,00 | - |
| 65 | 12 868 | 12 870 | **1,29** | 106,0 | 0,00 | 93,19 | - | - | 0,00 | 0,00 | - |
| 66 | 13 535 | 13 536 | **0,67** | 106,0 | 0,00 | 93,63 | - | - | 0,00 | 0,00 | - |
| 67 | 12 280 | 12 281 | **1,86** | 106,0 | 0,00 | 92,78 | - | - | 0,00 | 0,00 | - |
| 68 | 13 397 | 13 398 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 69 | 14 038 | 14 039 | **0,23** | 106,0 | 0,00 | 93,95 | - | - | 0,00 | 0,00 | - |
| 7 | 15 707 | 15 708 | **3,82** | 108,9 | 0,00 | 94,92 | - | - | 0,00 | 0,00 | - |
| 70 | 12 592 | 12 593 | **1,55** | 106,0 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| 71 | 11 494 | 11 496 | **2,66** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | 10 603 | 10 605 | **3,64** | 106,0 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 73 | 10 505 | 10 507 | **3,75** | 106,0 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| 74 | 11 721 | 11 723 | **2,43** | 106,0 | 0,00 | 92,38 | - | - | 0,00 | 0,00 | - |
| 75 | 11 329 | 11 330 | **2,84** | 106,0 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 76 | 8 996 | 8 998 | **5,63** | 106,0 | 0,00 | 90,08 | - | - | 0,00 | 0,00 | - |
| 77 | 8 413 | 8 415 | **6,44** | 106,0 | 0,00 | 89,50 | - | - | 0,00 | 0,00 | - |
| 78 | 7 276 | 7 278 | **8,18** | 106,0 | 0,00 | 88,24 | - | - | 0,00 | 0,00 | - |
| 79 | 6 548 | 6 550 | **9,44** | 106,0 | 0,00 | 87,33 | - | - | 0,00 | 0,00 | - |
| 8 | 16 261 | 16 262 | **3,38** | 108,9 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 80 | 6 013 | 6 016 | **10,44** | 106,0 | 0,00 | 86,59 | - | - | 0,00 | 0,00 | - |
| 81 | 6 757 | 6 760 | **9,06** | 106,0 | 0,00 | 87,60 | - | - | 0,00 | 0,00 | - |
| 82 | 7 770 | 7 772 | **7,39** | 106,0 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| 83 | 8 694 | 8 695 | **6,04** | 106,0 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| 84 | 9 275 | 9 277 | **5,26** | 106,0 | 0,00 | 90,35 | - | - | 0,00 | 0,00 | - |
| 85 | 9 632 | 9 634 | **4,82** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 86 | 10 061 | 10 062 | **4,28** | 106,0 | 0,00 | 91,05 | - | - | 0,00 | 0,00 | - |
| 87 | 8 164 | 8 166 | **6,80** | 106,0 | 0,00 | 89,24 | - | - | 0,00 | 0,00 | - |
| 88 | 8 690 | 8 692 | **6,05** | 106,0 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| 89 | 9 303 | 9 305 | **5,22** | 106,0 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| 9 | 18 381 | 18 383 | **1,83** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 90 | 9 485 | 9 487 | **4,99** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 91 | 10 019 | 10 021 | **4,33** | 106,0 | 0,00 | 91,02 | - | - | 0,00 | 0,00 | - |
| 92 | 8 745 | 8 747 | **5,97** | 106,0 | 0,00 | 89,84 | - | - | 0,00 | 0,00 | - |
| 93 | 8 012 | 8 015 | **7,02** | 106,0 | 0,00 | 89,08 | - | - | 0,00 | 0,00 | - |
| 94 | 7 332 | 7 334 | **8,09** | 106,0 | 0,00 | 88,31 | - | - | 0,00 | 0,00 | - |
| 95 | 7 264 | 7 266 | **8,20** | 106,0 | 0,00 | 88,23 | - | - | 0,00 | 0,00 | - |
| 96 | 6 650 | 6 653 | **9,25** | 106,0 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| 97 | 7 868 | 7 870 | **7,24** | 106,0 | 0,00 | 88,92 | - | - | 0,00 | 0,00 | - |
| 98 | 8 760 | 8 762 | **5,95** | 106,0 | 0,00 | 89,85 | - | - | 0,00 | 0,00 | - |
| 99 | 7 965 | 7 967 | **7,09** | 106,0 | 0,00 | 89,03 | - | - | 0,00 | 0,00 | - |
| T1 | 6 000 | 6 004 | **15,94** | 110,1 | 0,00 | 86,57 | - | - | 0,00 | 0,00 | - |
| T10 | 4 760 | 4 765 | **19,09** | 110,1 | 0,00 | 84,56 | - | - | 0,00 | 0,00 | - |
| T11 | 6 091 | 6 094 | **15,72** | 110,1 | 0,00 | 86,70 | - | - | 0,00 | 0,00 | - |
| T12 | 3 465 | 3 471 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T13 | 3 747 | 3 753 | **22,28** | 110,1 | 0,00 | 82,49 | - | - | 0,00 | 0,00 | - |
| T14 | 4 867 | 4 872 | **18,79** | 110,1 | 0,00 | 84,75 | - | - | 0,00 | 0,00 | - |
| T15 | 5 872 | 5 876 | **16,22** | 110,1 | 0,00 | 86,38 | - | - | 0,00 | 0,00 | - |
| T16 | 2 570 | 2 579 | **27,10** | 110,1 | 0,00 | 79,23 | - | - | 0,00 | 0,00 | - |
| T17 | 4 073 | 4 079 | **21,18** | 110,1 | 0,00 | 83,21 | - | - | 0,00 | 0,00 | - |
| T18 | 5 148 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T19 | 2 022 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 802 | 5 806 | **16,39** | 110,1 | 0,00 | 86,28 | - | - | 0,00 | 0,00 | - |
| T20 | 3 148 | 3 155 | **24,55** | 110,1 | 0,00 | 80,98 | - | - | 0,00 | 0,00 | - |
| T21 | 4 649 | 4 654 | **19,41** | 110,1 | 0,00 | 84,36 | - | - | 0,00 | 0,00 | - |
| T22 | 2 516 | 2 525 | **27,37** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T23 | 3 482 | 3 489 | **23,24** | 110,1 | 0,00 | 81,85 | - | - | 0,00 | 0,00 | - |
| T24 | 5 142 | 5 147 | **18,04** | 110,1 | 0,00 | 85,23 | - | - | 0,00 | 0,00 | - |
| T25 | 3 207 | 3 214 | **24,31** | 110,1 | 0,00 | 81,14 | - | - | 0,00 | 0,00 | - |
| T26 | 3 916 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 5 092 | 5 096 | **18,18** | 110,1 | 0,00 | 85,14 | - | - | 0,00 | 0,00 | - |
| T28 | 3 716 | 3 722 | **22,40** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T29 | 4 551 | 4 556 | **19,70** | 110,1 | 0,00 | 84,17 | - | - | 0,00 | 0,00 | - |
| T3 | 4 836 | 4 841 | **18,88** | 110,1 | 0,00 | 84,70 | - | - | 0,00 | 0,00 | - |
| T4 | 5 263 | 5 268 | **17,73** | 110,1 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |
| T5 | 3 967 | 3 973 | **21,53** | 110,1 | 0,00 | 82,98 | - | - | 0,00 | 0,00 | - |
| T6 | 4 724 | 4 729 | **19,19** | 110,1 | 0,00 | 84,50 | - | - | 0,00 | 0,00 | - |
| T7 | 5 704 | 5 708 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T8 | 6 472 | 6 476 | **14,87** | 110,1 | 0,00 | 87,23 | - | - | 0,00 | 0,00 | - |
| T9 | 3 559 | 3 565 | **22,96** | 110,1 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,17** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 043 | 15 045 | **4,36** | 108,9 | 0,00 | 94,55 | - | - | 0,00 | 0,00 | - |
| 10 | 17 467 | 17 468 | **2,47** | 108,9 | 0,00 | 95,84 | - | - | 0,00 | 0,00 | - |
| 100 | 8 631 | 8 633 | **6,13** | 106,0 | 0,00 | 89,72 | - | - | 0,00 | 0,00 | - |
| 101 | 5 996 | 5 998 | **10,48** | 106,0 | 0,00 | 86,56 | - | - | 0,00 | 0,00 | - |
| 102 | 6 896 | 6 899 | **8,82** | 106,0 | 0,00 | 87,78 | - | - | 0,00 | 0,00 | - |
| 11 | 17 040 | 17 041 | **2,79** | 108,9 | 0,00 | 95,63 | - | - | 0,00 | 0,00 | - |
| 12 | 16 987 | 16 988 | **2,86** | 108,9 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 13 | 18 053 | 18 054 | **2,06** | 108,9 | 0,00 | 96,13 | - | - | 0,00 | 0,00 | - |
| 14 | 20 215 | 20 216 | **0,61** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 15 | 17 853 | 17 855 | **2,20** | 108,9 | 0,00 | 96,04 | - | - | 0,00 | 0,00 | - |
| 16 | 18 829 | 18 830 | **1,52** | 108,9 | 0,00 | 96,50 | - | - | 0,00 | 0,00 | - |
| 17 | 18 887 | 18 889 | **1,49** | 108,9 | 0,00 | 96,52 | - | - | 0,00 | 0,00 | - |
| 18 | 19 729 | 19 731 | **0,94** | 108,9 | 0,00 | 96,90 | - | - | 0,00 | 0,00 | - |
| 19 | 19 898 | 19 899 | **0,81** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 2 | 15 815 | 15 817 | **3,72** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 20 | 21 401 | 21 403 | **-0,12** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 21 | 20 281 | 20 282 | **0,57** | 108,9 | 0,00 | 97,14 | - | - | 0,00 | 0,00 | - |
| 22 | 22 049 | 22 050 | **-0,49** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 23 | 22 054 | 22 056 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 24 | 19 290 | 19 291 | **1,21** | 108,9 | 0,00 | 96,71 | - | - | 0,00 | 0,00 | - |
| 25 | 21 587 | 21 588 | **-0,24** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 26 | 22 919 | 22 920 | **-1,01** | 108,9 | 0,00 | 98,20 | - | - | 0,00 | 0,00 | - |
| 27 | 22 587 | 22 588 | **-0,82** | 108,9 | 0,00 | 98,08 | - | - | 0,00 | 0,00 | - |
| 28 | 21 122 | 21 123 | **0,05** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 29 | 20 549 | 20 550 | **0,40** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 3 | 15 848 | 15 850 | **3,70** | 108,9 | 0,00 | 95,00 | - | - | 0,00 | 0,00 | - |
| 30 | 18 367 | 18 369 | **1,84** | 108,9 | 0,00 | 96,28 | - | - | 0,00 | 0,00 | - |
| 31 | 20 789 | 20 791 | **0,25** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 4 | 16 718 | 16 720 | **3,03** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 5 | 17 658 | 17 660 | **2,34** | 108,9 | 0,00 | 95,94 | - | - | 0,00 | 0,00 | - |
| 6 | 15 583 | 15 585 | **3,91** | 108,9 | 0,00 | 94,85 | - | - | 0,00 | 0,00 | - |
| 61 | 12 081 | 12 082 | **2,06** | 106,0 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 62 | 11 543 | 11 545 | **2,61** | 106,0 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| 63 | 10 950 | 10 952 | **3,25** | 106,0 | 0,00 | 91,79 | - | - | 0,00 | 0,00 | - |
| 64 | 12 516 | 12 517 | **1,63** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 65 | 13 096 | 13 097 | **1,08** | 106,0 | 0,00 | 93,34 | - | - | 0,00 | 0,00 | - |
| 66 | 13 755 | 13 756 | **0,48** | 106,0 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 67 | 12 501 | 12 503 | **1,64** | 106,0 | 0,00 | 92,94 | - | - | 0,00 | 0,00 | - |
| 68 | 13 605 | 13 606 | **0,61** | 106,0 | 0,00 | 93,67 | - | - | 0,00 | 0,00 | - |
| 69 | 14 245 | 14 247 | **0,05** | 106,0 | 0,00 | 94,07 | - | - | 0,00 | 0,00 | - |
| 7 | 15 962 | 15 963 | **3,62** | 108,9 | 0,00 | 95,06 | - | - | 0,00 | 0,00 | - |
| 70 | 12 802 | 12 803 | **1,35** | 106,0 | 0,00 | 93,15 | - | - | 0,00 | 0,00 | - |
| 71 | 11 712 | 11 713 | **2,43** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 72 | 10 836 | 10 838 | **3,38** | 106,0 | 0,00 | 91,70 | - | - | 0,00 | 0,00 | - |
| 73 | 10 726 | 10 728 | **3,50** | 106,0 | 0,00 | 91,61 | - | - | 0,00 | 0,00 | - |
| 74 | 11 925 | 11 926 | **2,24** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 75 | 11 526 | 11 527 | **2,63** | 106,0 | 0,00 | 92,23 | - | - | 0,00 | 0,00 | - |
| 76 | 9 149 | 9 151 | **5,42** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 77 | 8 572 | 8 574 | **6,21** | 106,0 | 0,00 | 89,66 | - | - | 0,00 | 0,00 | - |
| 78 | 7 444 | 7 447 | **7,91** | 106,0 | 0,00 | 88,44 | - | - | 0,00 | 0,00 | - |
| 79 | 6 718 | 6 721 | **9,13** | 106,0 | 0,00 | 87,55 | - | - | 0,00 | 0,00 | - |
| 8 | 16 497 | 16 499 | **3,19** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 80 | 6 186 | 6 189 | **10,11** | 106,0 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| 81 | 6 905 | 6 908 | **8,80** | 106,0 | 0,00 | 87,79 | - | - | 0,00 | 0,00 | - |
| 82 | 7 923 | 7 925 | **7,16** | 106,0 | 0,00 | 88,98 | - | - | 0,00 | 0,00 | - |
| 83 | 8 953 | 8 954 | **5,69** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 84 | 9 533 | 9 534 | **4,93** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 85 | 9 884 | 9 886 | **4,50** | 106,0 | 0,00 | 90,90 | - | - | 0,00 | 0,00 | - |
| 86 | 10 304 | 10 306 | **3,99** | 106,0 | 0,00 | 91,26 | - | - | 0,00 | 0,00 | - |
| 87 | 8 414 | 8 416 | **6,44** | 106,0 | 0,00 | 89,50 | - | - | 0,00 | 0,00 | - |
| 88 | 8 936 | 8 938 | **5,71** | 106,0 | 0,00 | 90,02 | - | - | 0,00 | 0,00 | - |
| 89 | 9 547 | 9 548 | **4,91** | 106,0 | 0,00 | 90,60 | - | - | 0,00 | 0,00 | - |
| 9 | 18 607 | 18 609 | **1,67** | 108,9 | 0,00 | 96,39 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 9 710 | 9 712 | **4,70** | 106,0 | 0,00 | 90,75 | - | - | 0,00 | 0,00 | - |
| 91 | 10 237 | 10 238 | **4,07** | 106,0 | 0,00 | 91,20 | - | - | 0,00 | 0,00 | - |
| 92 | 8 978 | 8 980 | **5,65** | 106,0 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| 93 | 8 247 | 8 249 | **6,68** | 106,0 | 0,00 | 89,33 | - | - | 0,00 | 0,00 | - |
| 94 | 7 570 | 7 572 | **7,71** | 106,0 | 0,00 | 88,58 | - | - | 0,00 | 0,00 | - |
| 95 | 7 483 | 7 485 | **7,84** | 106,0 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| 96 | 6 875 | 6 877 | **8,86** | 106,0 | 0,00 | 87,75 | - | - | 0,00 | 0,00 | - |
| 97 | 8 076 | 8 078 | **6,93** | 106,0 | 0,00 | 89,15 | - | - | 0,00 | 0,00 | - |
| 98 | 8 953 | 8 955 | **5,69** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 99 | 8 152 | 8 154 | **6,82** | 106,0 | 0,00 | 89,23 | - | - | 0,00 | 0,00 | - |
| T1 | 5 708 | 5 712 | **16,64** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T10 | 4 581 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T11 | 5 943 | 5 947 | **16,06** | 110,1 | 0,00 | 86,49 | - | - | 0,00 | 0,00 | - |
| T12 | 3 277 | 3 284 | **24,03** | 110,1 | 0,00 | 81,33 | - | - | 0,00 | 0,00 | - |
| T13 | 3 619 | 3 625 | **22,74** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T14 | 4 750 | 4 755 | **19,12** | 110,1 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |
| T15 | 5 764 | 5 769 | **16,48** | 110,1 | 0,00 | 86,22 | - | - | 0,00 | 0,00 | - |
| T16 | 2 455 | 2 465 | **27,67** | 110,1 | 0,00 | 78,84 | - | - | 0,00 | 0,00 | - |
| T17 | 4 001 | 4 007 | **21,42** | 110,1 | 0,00 | 83,06 | - | - | 0,00 | 0,00 | - |
| T18 | 5 082 | 5 088 | **18,20** | 110,1 | 0,00 | 85,13 | - | - | 0,00 | 0,00 | - |
| T19 | 2 021 | 2 033 | **30,02** | 110,1 | 0,00 | 77,16 | - | - | 0,00 | 0,00 | - |
| T2 | 5 525 | 5 530 | **17,06** | 110,1 | 0,00 | 85,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 143 | 3 151 | **24,56** | 110,1 | 0,00 | 80,97 | - | - | 0,00 | 0,00 | - |
| T21 | 4 641 | 4 646 | **19,43** | 110,1 | 0,00 | 84,34 | - | - | 0,00 | 0,00 | - |
| T22 | 2 624 | 2 633 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T23 | 3 542 | 3 549 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T24 | 5 168 | 5 172 | **17,98** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T25 | 3 380 | 3 387 | **23,63** | 110,1 | 0,00 | 81,60 | - | - | 0,00 | 0,00 | - |
| T26 | 4 026 | 4 032 | **21,34** | 110,1 | 0,00 | 83,11 | - | - | 0,00 | 0,00 | - |
| T27 | 5 168 | 5 173 | **17,97** | 110,1 | 0,00 | 85,27 | - | - | 0,00 | 0,00 | - |
| T28 | 3 949 | 3 955 | **21,59** | 110,1 | 0,00 | 82,94 | - | - | 0,00 | 0,00 | - |
| T29 | 4 707 | 4 712 | **19,24** | 110,1 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| T3 | 4 558 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T4 | 5 014 | 5 019 | **18,39** | 110,1 | 0,00 | 85,01 | - | - | 0,00 | 0,00 | - |
| T5 | 3 694 | 3 700 | **22,47** | 110,1 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| T6 | 4 506 | 4 511 | **19,83** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T7 | 5 500 | 5 504 | **17,12** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T8 | 6 292 | 6 296 | **15,27** | 110,1 | 0,00 | 86,98 | - | - | 0,00 | 0,00 | - |
| T9 | 3 317 | 3 323 | **23,88** | 110,1 | 0,00 | 81,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,28** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: C Lomarakennus C (Mutalahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 555 | 15 557 | **3,93** | 108,9 | 0,00 | 94,84 | - | - | 0,00 | 0,00 | - |
| 10 | 18 116 | 18 118 | **2,17** | 108,9 | 0,00 | 96,16 | - | - | 0,00 | 0,00 | - |
| 100 | 9 089 | 9 091 | **5,50** | 106,0 | 0,00 | 90,17 | - | - | 0,00 | 0,00 | - |
| 101 | 6 570 | 6 573 | **9,54** | 106,0 | 0,00 | 87,36 | - | - | 0,00 | 0,00 | - |
| 102 | 7 446 | 7 448 | **7,99** | 106,0 | 0,00 | 88,44 | - | - | 0,00 | 0,00 | - |
| 11 | 17 781 | 17 783 | **2,55** | 108,9 | 0,00 | 96,00 | - | - | 0,00 | 0,00 | - |
| 12 | 17 809 | 17 810 | **2,63** | 108,9 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 13 | 18 799 | 18 800 | **1,83** | 108,9 | 0,00 | 96,48 | - | - | 0,00 | 0,00 | - |
| 14 | 20 832 | 20 833 | **0,32** | 108,9 | 0,00 | 97,38 | - | - | 0,00 | 0,00 | - |
| 15 | 18 659 | 18 660 | **2,01** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 16 | 19 614 | 19 615 | **1,34** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 17 | 19 618 | 19 619 | **1,26** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 18 | 20 447 | 20 448 | **0,73** | 108,9 | 0,00 | 97,21 | - | - | 0,00 | 0,00 | - |
| 19 | 20 682 | 20 683 | **0,64** | 108,9 | 0,00 | 97,31 | - | - | 0,00 | 0,00 | - |
| 2 | 16 273 | 16 275 | **3,37** | 108,9 | 0,00 | 95,23 | - | - | 0,00 | 0,00 | - |
| 20 | 22 141 | 22 142 | **-0,32** | 108,9 | 0,00 | 97,90 | - | - | 0,00 | 0,00 | - |
| 21 | 20 958 | 20 959 | **0,32** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 22 754 | 22 755 | **-0,72** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 23 | 22 702 | 22 703 | **-0,77** | 108,9 | 0,00 | 98,12 | - | - | 0,00 | 0,00 | - |
| 24 | 19 950 | 19 951 | **0,93** | 108,9 | 0,00 | 97,00 | - | - | 0,00 | 0,00 | - |
| 25 | 22 180 | 22 181 | **-0,52** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 26 | 23 596 | 23 597 | **-1,24** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 27 | 23 193 | 23 195 | **-1,10** | 108,9 | 0,00 | 98,31 | - | - | 0,00 | 0,00 | - |
| 28 | 21 786 | 21 787 | **-0,21** | 108,9 | 0,00 | 97,76 | - | - | 0,00 | 0,00 | - |
| 29 | 21 271 | 21 272 | **0,19** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |
| 3 | 16 441 | 16 443 | **3,32** | 108,9 | 0,00 | 95,32 | - | - | 0,00 | 0,00 | - |
| 30 | 19 031 | 19 032 | **1,55** | 108,9 | 0,00 | 96,59 | - | - | 0,00 | 0,00 | - |
| 31 | 21 364 | 21 366 | **-0,06** | 108,9 | 0,00 | 97,59 | - | - | 0,00 | 0,00 | - |
| 4 | 17 304 | 17 306 | **2,68** | 108,9 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 5 | 18 238 | 18 240 | **1,99** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 6 | 16 254 | 16 256 | **3,59** | 108,9 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 61 | 12 772 | 12 773 | **1,62** | 106,0 | 0,00 | 93,13 | - | - | 0,00 | 0,00 | - |
| 62 | 12 239 | 12 240 | **2,15** | 106,0 | 0,00 | 92,76 | - | - | 0,00 | 0,00 | - |
| 63 | 11 665 | 11 666 | **2,77** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 64 | 13 179 | 13 180 | **1,19** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 65 | 13 721 | 13 722 | **0,64** | 106,0 | 0,00 | 93,75 | - | - | 0,00 | 0,00 | - |
| 66 | 14 347 | 14 348 | **0,05** | 106,0 | 0,00 | 94,14 | - | - | 0,00 | 0,00 | - |
| 67 | 13 102 | 13 103 | **1,17** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 68 | 14 145 | 14 146 | **0,14** | 106,0 | 0,00 | 94,01 | - | - | 0,00 | 0,00 | - |
| 69 | 14 782 | 14 784 | **-0,40** | 106,0 | 0,00 | 94,40 | - | - | 0,00 | 0,00 | - |
| 7 | 16 705 | 16 706 | **3,35** | 108,9 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 70 | 13 353 | 13 354 | **0,86** | 106,0 | 0,00 | 93,51 | - | - | 0,00 | 0,00 | - |
| 71 | 12 299 | 12 300 | **1,93** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| 72 | 11 492 | 11 494 | **2,86** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |
| 73 | 11 335 | 11 336 | **2,96** | 106,0 | 0,00 | 92,09 | - | - | 0,00 | 0,00 | - |
| 74 | 12 453 | 12 454 | **1,69** | 106,0 | 0,00 | 92,91 | - | - | 0,00 | 0,00 | - |
| 75 | 12 030 | 12 032 | **2,11** | 106,0 | 0,00 | 92,61 | - | - | 0,00 | 0,00 | - |
| 76 | 9 491 | 9 493 | **4,98** | 106,0 | 0,00 | 90,55 | - | - | 0,00 | 0,00 | - |
| 77 | 8 943 | 8 945 | **5,70** | 106,0 | 0,00 | 90,03 | - | - | 0,00 | 0,00 | - |
| 78 | 7 863 | 7 865 | **7,25** | 106,0 | 0,00 | 88,91 | - | - | 0,00 | 0,00 | - |
| 79 | 7 154 | 7 156 | **8,38** | 106,0 | 0,00 | 88,09 | - | - | 0,00 | 0,00 | - |
| 8 | 17 156 | 17 158 | **2,88** | 108,9 | 0,00 | 95,69 | - | - | 0,00 | 0,00 | - |
| 80 | 6 641 | 6 643 | **9,27** | 106,0 | 0,00 | 87,45 | - | - | 0,00 | 0,00 | - |
| 81 | 7 253 | 7 255 | **8,22** | 106,0 | 0,00 | 88,21 | - | - | 0,00 | 0,00 | - |
| 82 | 8 276 | 8 279 | **6,63** | 106,0 | 0,00 | 89,36 | - | - | 0,00 | 0,00 | - |
| 83 | 9 734 | 9 735 | **5,10** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 84 | 10 304 | 10 306 | **4,39** | 106,0 | 0,00 | 91,26 | - | - | 0,00 | 0,00 | - |
| 85 | 10 629 | 10 630 | **3,96** | 106,0 | 0,00 | 91,53 | - | - | 0,00 | 0,00 | - |
| 86 | 11 009 | 11 010 | **3,47** | 106,0 | 0,00 | 91,84 | - | - | 0,00 | 0,00 | - |
| 87 | 9 156 | 9 158 | **5,79** | 106,0 | 0,00 | 90,24 | - | - | 0,00 | 0,00 | - |
| 88 | 9 660 | 9 662 | **5,10** | 106,0 | 0,00 | 90,70 | - | - | 0,00 | 0,00 | - |
| 89 | 10 254 | 10 256 | **4,35** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 9 | 19 214 | 19 215 | **1,35** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |
| 90 | 10 340 | 10 341 | **4,11** | 106,0 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| 91 | 10 830 | 10 831 | **3,49** | 106,0 | 0,00 | 91,69 | - | - | 0,00 | 0,00 | - |
| 92 | 9 643 | 9 645 | **5,03** | 106,0 | 0,00 | 90,69 | - | - | 0,00 | 0,00 | - |
| 93 | 8 925 | 8 927 | **6,00** | 106,0 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| 94 | 8 265 | 8 267 | **6,96** | 106,0 | 0,00 | 89,35 | - | - | 0,00 | 0,00 | - |
| 95 | 8 101 | 8 103 | **7,07** | 106,0 | 0,00 | 89,17 | - | - | 0,00 | 0,00 | - |
| 96 | 7 521 | 7 523 | **8,03** | 106,0 | 0,00 | 88,53 | - | - | 0,00 | 0,00 | - |
| 97 | 8 648 | 8 650 | **6,21** | 106,0 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| 98 | 9 454 | 9 456 | **5,03** | 106,0 | 0,00 | 90,51 | - | - | 0,00 | 0,00 | - |
| 99 | 8 636 | 8 638 | **6,12** | 106,0 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| T1 | 4 594 | 4 600 | **19,57** | 110,1 | 0,00 | 84,25 | - | - | 0,00 | 0,00 | - |
| T10 | 3 787 | 3 794 | **22,14** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T11 | 5 236 | 5 240 | **17,80** | 110,1 | 0,00 | 85,39 | - | - | 0,00 | 0,00 | - |
| T12 | 2 497 | 2 506 | **27,46** | 110,1 | 0,00 | 78,98 | - | - | 0,00 | 0,00 | - |
| T13 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T14 | 4 173 | 4 179 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T15 | 5 198 | 5 203 | **17,89** | 110,1 | 0,00 | 85,33 | - | - | 0,00 | 0,00 | - |
| T16 | 2 032 | 2 044 | **29,96** | 110,1 | 0,00 | 77,21 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T17 | 3 622 | 3 629 | **22,73** | 110,1 | 0,00 | 82,19 | - | - | 0,00 | 0,00 | - |
| T18 | 4 686 | 4 692 | **19,30** | 110,1 | 0,00 | 84,43 | - | - | 0,00 | 0,00 | - |
| T19 | 2 097 | 2 108 | **29,58** | 110,1 | 0,00 | 77,48 | - | - | 0,00 | 0,00 | - |
| T2 | 4 431 | 4 437 | **20,05** | 110,1 | 0,00 | 83,94 | - | - | 0,00 | 0,00 | - |
| T20 | 3 066 | 3 074 | **24,88** | 110,1 | 0,00 | 80,75 | - | - | 0,00 | 0,00 | - |
| T21 | 4 469 | 4 475 | **19,94** | 110,1 | 0,00 | 84,01 | - | - | 0,00 | 0,00 | - |
| T22 | 2 986 | 2 994 | **25,22** | 110,1 | 0,00 | 80,52 | - | - | 0,00 | 0,00 | - |
| T23 | 3 668 | 3 675 | **22,56** | 110,1 | 0,00 | 82,30 | - | - | 0,00 | 0,00 | - |
| T24 | 5 099 | 5 104 | **18,16** | 110,1 | 0,00 | 85,16 | - | - | 0,00 | 0,00 | - |
| T25 | 3 912 | 3 917 | **21,88** | 110,1 | 0,00 | 82,86 | - | - | 0,00 | 0,00 | - |
| T26 | 4 304 | 4 310 | **20,45** | 110,1 | 0,00 | 83,69 | - | - | 0,00 | 0,00 | - |
| T27 | 5 286 | 5 290 | **17,67** | 110,1 | 0,00 | 85,47 | - | - | 0,00 | 0,00 | - |
| T28 | 4 677 | 4 682 | **19,80** | 110,1 | 0,00 | 84,41 | - | - | 0,00 | 0,00 | - |
| T29 | 5 129 | 5 133 | **18,08** | 110,1 | 0,00 | 85,21 | - | - | 0,00 | 0,00 | - |
| T3 | 3 465 | 3 472 | **23,31** | 110,1 | 0,00 | 81,81 | - | - | 0,00 | 0,00 | - |
| T4 | 3 990 | 3 996 | **21,45** | 110,1 | 0,00 | 83,03 | - | - | 0,00 | 0,00 | - |
| T5 | 2 614 | 2 623 | **26,89** | 110,1 | 0,00 | 79,38 | - | - | 0,00 | 0,00 | - |
| T6 | 3 581 | 3 588 | **22,88** | 110,1 | 0,00 | 82,10 | - | - | 0,00 | 0,00 | - |
| T7 | 4 606 | 4 611 | **19,54** | 110,1 | 0,00 | 84,28 | - | - | 0,00 | 0,00 | - |
| T8 | 5 469 | 5 474 | **17,20** | 110,1 | 0,00 | 85,77 | - | - | 0,00 | 0,00 | - |
| T9 | 2 335 | 2 344 | **28,29** | 110,1 | 0,00 | 78,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,54** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: D Lomarakennus D (Mutaniemi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 832 | 15 834 | **3,71** | 108,9 | 0,00 | 94,99 | - | - | 0,00 | 0,00 | - |
| 10 | 18 417 | 18 418 | **1,80** | 108,9 | 0,00 | 96,30 | - | - | 0,00 | 0,00 | - |
| 100 | 9 361 | 9 363 | **5,15** | 106,0 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| 101 | 6 868 | 6 870 | **8,87** | 106,0 | 0,00 | 87,74 | - | - | 0,00 | 0,00 | - |
| 102 | 7 737 | 7 739 | **7,44** | 106,0 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| 11 | 18 096 | 18 098 | **2,02** | 108,9 | 0,00 | 96,15 | - | - | 0,00 | 0,00 | - |
| 12 | 18 134 | 18 135 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 13 | 19 114 | 19 115 | **1,33** | 108,9 | 0,00 | 96,63 | - | - | 0,00 | 0,00 | - |
| 14 | 21 126 | 21 128 | **0,04** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 15 | 18 982 | 18 983 | **1,42** | 108,9 | 0,00 | 96,57 | - | - | 0,00 | 0,00 | - |
| 16 | 19 935 | 19 936 | **0,80** | 108,9 | 0,00 | 96,99 | - | - | 0,00 | 0,00 | - |
| 17 | 19 931 | 19 933 | **0,79** | 108,9 | 0,00 | 96,99 | - | - | 0,00 | 0,00 | - |
| 18 | 20 757 | 20 759 | **0,30** | 108,9 | 0,00 | 97,34 | - | - | 0,00 | 0,00 | - |
| 19 | 21 002 | 21 004 | **0,12** | 108,9 | 0,00 | 97,45 | - | - | 0,00 | 0,00 | - |
| 2 | 16 539 | 16 541 | **3,16** | 108,9 | 0,00 | 95,37 | - | - | 0,00 | 0,00 | - |
| 20 | 22 455 | 22 456 | **-0,75** | 108,9 | 0,00 | 98,03 | - | - | 0,00 | 0,00 | - |
| 21 | 21 262 | 21 263 | **-0,04** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 22 | 23 063 | 23 064 | **-1,10** | 108,9 | 0,00 | 98,26 | - | - | 0,00 | 0,00 | - |
| 23 | 23 001 | 23 002 | **-1,06** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 24 | 20 251 | 20 253 | **0,59** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 25 | 22 470 | 22 471 | **-0,75** | 108,9 | 0,00 | 98,03 | - | - | 0,00 | 0,00 | - |
| 26 | 23 900 | 23 901 | **-1,56** | 108,9 | 0,00 | 98,57 | - | - | 0,00 | 0,00 | - |
| 27 | 23 486 | 23 487 | **-1,33** | 108,9 | 0,00 | 98,42 | - | - | 0,00 | 0,00 | - |
| 28 | 22 088 | 22 089 | **-0,53** | 108,9 | 0,00 | 97,88 | - | - | 0,00 | 0,00 | - |
| 29 | 21 582 | 21 584 | **-0,22** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 3 | 16 733 | 16 735 | **3,03** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 30 | 19 333 | 19 335 | **1,18** | 108,9 | 0,00 | 96,73 | - | - | 0,00 | 0,00 | - |
| 31 | 21 651 | 21 653 | **-0,27** | 108,9 | 0,00 | 97,71 | - | - | 0,00 | 0,00 | - |
| 4 | 17 594 | 17 596 | **2,39** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 5 | 18 527 | 18 528 | **1,73** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 6 | 16 559 | 16 560 | **3,15** | 108,9 | 0,00 | 95,38 | - | - | 0,00 | 0,00 | - |
| 61 | 13 080 | 13 082 | **1,09** | 106,0 | 0,00 | 93,33 | - | - | 0,00 | 0,00 | - |
| 62 | 12 549 | 12 550 | **1,59** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 63 | 11 978 | 11 979 | **2,16** | 106,0 | 0,00 | 92,57 | - | - | 0,00 | 0,00 | - |
| 64 | 13 484 | 13 485 | **0,72** | 106,0 | 0,00 | 93,60 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 14 019 | 14 020 | **0,25** | 106,0 | 0,00 | 93,94 | - | - | 0,00 | 0,00 | - |
| 66 | 14 639 | 14 640 | **-0,27** | 106,0 | 0,00 | 94,31 | - | - | 0,00 | 0,00 | - |
| 67 | 13 396 | 13 398 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 68 | 14 428 | 14 429 | **-0,10** | 106,0 | 0,00 | 94,18 | - | - | 0,00 | 0,00 | - |
| 69 | 15 065 | 15 066 | **-0,63** | 106,0 | 0,00 | 94,56 | - | - | 0,00 | 0,00 | - |
| 7 | 17 020 | 17 022 | **2,80** | 108,9 | 0,00 | 95,62 | - | - | 0,00 | 0,00 | - |
| 70 | 13 638 | 13 639 | **0,58** | 106,0 | 0,00 | 93,70 | - | - | 0,00 | 0,00 | - |
| 71 | 12 591 | 12 593 | **1,56** | 106,0 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| 72 | 11 796 | 11 798 | **2,35** | 106,0 | 0,00 | 92,44 | - | - | 0,00 | 0,00 | - |
| 73 | 11 631 | 11 633 | **2,52** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 74 | 12 735 | 12 736 | **1,42** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 75 | 12 308 | 12 309 | **1,83** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| 76 | 9 740 | 9 742 | **4,67** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 77 | 9 199 | 9 201 | **5,36** | 106,0 | 0,00 | 90,28 | - | - | 0,00 | 0,00 | - |
| 78 | 8 130 | 8 132 | **6,85** | 106,0 | 0,00 | 89,20 | - | - | 0,00 | 0,00 | - |
| 79 | 7 426 | 7 428 | **7,94** | 106,0 | 0,00 | 88,42 | - | - | 0,00 | 0,00 | - |
| 8 | 17 458 | 17 460 | **2,48** | 108,9 | 0,00 | 95,84 | - | - | 0,00 | 0,00 | - |
| 80 | 6 917 | 6 920 | **8,78** | 106,0 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| 81 | 7 507 | 7 510 | **7,80** | 106,0 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| 82 | 8 530 | 8 532 | **6,27** | 106,0 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| 83 | 10 056 | 10 058 | **4,29** | 106,0 | 0,00 | 91,05 | - | - | 0,00 | 0,00 | - |
| 84 | 10 625 | 10 627 | **3,63** | 106,0 | 0,00 | 91,53 | - | - | 0,00 | 0,00 | - |
| 85 | 10 946 | 10 947 | **3,25** | 106,0 | 0,00 | 91,79 | - | - | 0,00 | 0,00 | - |
| 86 | 11 321 | 11 322 | **2,85** | 106,0 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 87 | 9 474 | 9 476 | **5,00** | 106,0 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |
| 88 | 9 975 | 9 977 | **4,38** | 106,0 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| 89 | 10 567 | 10 569 | **3,68** | 106,0 | 0,00 | 91,48 | - | - | 0,00 | 0,00 | - |
| 9 | 19 507 | 19 508 | **1,07** | 108,9 | 0,00 | 96,80 | - | - | 0,00 | 0,00 | - |
| 90 | 10 640 | 10 642 | **3,60** | 106,0 | 0,00 | 91,54 | - | - | 0,00 | 0,00 | - |
| 91 | 11 124 | 11 126 | **3,06** | 106,0 | 0,00 | 91,93 | - | - | 0,00 | 0,00 | - |
| 92 | 9 950 | 9 952 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 93 | 9 234 | 9 236 | **5,31** | 106,0 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| 94 | 8 577 | 8 579 | **6,20** | 106,0 | 0,00 | 89,67 | - | - | 0,00 | 0,00 | - |
| 95 | 8 402 | 8 405 | **6,45** | 106,0 | 0,00 | 89,49 | - | - | 0,00 | 0,00 | - |
| 96 | 7 827 | 7 829 | **7,30** | 106,0 | 0,00 | 88,87 | - | - | 0,00 | 0,00 | - |
| 97 | 8 941 | 8 943 | **5,70** | 106,0 | 0,00 | 90,03 | - | - | 0,00 | 0,00 | - |
| 98 | 9 734 | 9 735 | **4,68** | 106,0 | 0,00 | 90,77 | - | - | 0,00 | 0,00 | - |
| 99 | 8 913 | 8 915 | **5,74** | 106,0 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| T1 | 4 300 | 4 306 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T10 | 3 720 | 3 726 | **22,38** | 110,1 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| T11 | 5 193 | 5 197 | **17,91** | 110,1 | 0,00 | 85,32 | - | - | 0,00 | 0,00 | - |
| T12 | 2 460 | 2 469 | **27,65** | 110,1 | 0,00 | 78,85 | - | - | 0,00 | 0,00 | - |
| T13 | 3 088 | 3 096 | **24,79** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T14 | 4 192 | 4 198 | **20,80** | 110,1 | 0,00 | 83,46 | - | - | 0,00 | 0,00 | - |
| T15 | 5 211 | 5 216 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T16 | 2 157 | 2 168 | **29,24** | 110,1 | 0,00 | 77,72 | - | - | 0,00 | 0,00 | - |
| T17 | 3 717 | 3 724 | **22,39** | 110,1 | 0,00 | 82,42 | - | - | 0,00 | 0,00 | - |
| T18 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T19 | 2 348 | 2 358 | **28,22** | 110,1 | 0,00 | 78,45 | - | - | 0,00 | 0,00 | - |
| T2 | 4 172 | 4 178 | **20,86** | 110,1 | 0,00 | 83,42 | - | - | 0,00 | 0,00 | - |
| T20 | 3 258 | 3 265 | **24,10** | 110,1 | 0,00 | 81,28 | - | - | 0,00 | 0,00 | - |
| T21 | 4 615 | 4 621 | **19,51** | 110,1 | 0,00 | 84,29 | - | - | 0,00 | 0,00 | - |
| T22 | 3 268 | 3 276 | **24,06** | 110,1 | 0,00 | 81,31 | - | - | 0,00 | 0,00 | - |
| T23 | 3 898 | 3 904 | **21,76** | 110,1 | 0,00 | 82,83 | - | - | 0,00 | 0,00 | - |
| T24 | 5 268 | 5 273 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T25 | 4 212 | 4 217 | **20,74** | 110,1 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| T26 | 4 559 | 4 564 | **19,68** | 110,1 | 0,00 | 84,19 | - | - | 0,00 | 0,00 | - |
| T27 | 5 499 | 5 503 | **17,13** | 110,1 | 0,00 | 85,81 | - | - | 0,00 | 0,00 | - |
| T28 | 4 999 | 5 003 | **18,43** | 110,1 | 0,00 | 84,99 | - | - | 0,00 | 0,00 | - |
| T29 | 5 405 | 5 409 | **17,36** | 110,1 | 0,00 | 85,66 | - | - | 0,00 | 0,00 | - |
| T3 | 3 209 | 3 216 | **24,30** | 110,1 | 0,00 | 81,15 | - | - | 0,00 | 0,00 | - |
| T4 | 3 792 | 3 798 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| T5 | 2 378 | 2 387 | **28,06** | 110,1 | 0,00 | 78,56 | - | - | 0,00 | 0,00 | - |
| T6 | 3 448 | 3 455 | **23,37** | 110,1 | 0,00 | 81,77 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T7 | 4 482 | 4 487 | **19,90** | 110,1 | 0,00 | 84,04 | - | - | 0,00 | 0,00 | - |
| T8 | 5 374 | 5 378 | **17,44** | 110,1 | 0,00 | 85,61 | - | - | 0,00 | 0,00 | - |
| T9 | 2 185 | 2 195 | **29,09** | 110,1 | 0,00 | 77,83 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,39** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: E Asuinrakennus E (Alanko)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 100 | 16 102 | **3,50** | 108,9 | 0,00 | 95,14 | - | - | 0,00 | 0,00 | - |
| 10 | 18 710 | 18 712 | **1,60** | 108,9 | 0,00 | 96,44 | - | - | 0,00 | 0,00 | - |
| 100 | 9 626 | 9 628 | **4,81** | 106,0 | 0,00 | 90,67 | - | - | 0,00 | 0,00 | - |
| 101 | 7 160 | 7 162 | **8,37** | 106,0 | 0,00 | 88,10 | - | - | 0,00 | 0,00 | - |
| 102 | 8 023 | 8 025 | **7,01** | 106,0 | 0,00 | 89,09 | - | - | 0,00 | 0,00 | - |
| 11 | 18 406 | 18 407 | **1,81** | 108,9 | 0,00 | 96,30 | - | - | 0,00 | 0,00 | - |
| 12 | 18 455 | 18 457 | **1,78** | 108,9 | 0,00 | 96,32 | - | - | 0,00 | 0,00 | - |
| 13 | 19 424 | 19 425 | **1,12** | 108,9 | 0,00 | 96,77 | - | - | 0,00 | 0,00 | - |
| 14 | 21 413 | 21 414 | **-0,12** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 15 | 19 301 | 19 303 | **1,21** | 108,9 | 0,00 | 96,71 | - | - | 0,00 | 0,00 | - |
| 16 | 20 250 | 20 252 | **0,59** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 17 | 20 239 | 20 240 | **0,60** | 108,9 | 0,00 | 97,12 | - | - | 0,00 | 0,00 | - |
| 18 | 21 062 | 21 063 | **0,11** | 108,9 | 0,00 | 97,47 | - | - | 0,00 | 0,00 | - |
| 19 | 21 318 | 21 319 | **-0,07** | 108,9 | 0,00 | 97,58 | - | - | 0,00 | 0,00 | - |
| 2 | 16 796 | 16 798 | **2,97** | 108,9 | 0,00 | 95,51 | - | - | 0,00 | 0,00 | - |
| 20 | 22 763 | 22 764 | **-0,93** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 21 | 21 560 | 21 561 | **-0,22** | 108,9 | 0,00 | 97,67 | - | - | 0,00 | 0,00 | - |
| 22 | 23 365 | 23 366 | **-1,27** | 108,9 | 0,00 | 98,37 | - | - | 0,00 | 0,00 | - |
| 23 | 23 293 | 23 294 | **-1,23** | 108,9 | 0,00 | 98,34 | - | - | 0,00 | 0,00 | - |
| 24 | 20 546 | 20 547 | **0,40** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 25 | 22 751 | 22 753 | **-0,92** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 26 | 24 197 | 24 198 | **-1,73** | 108,9 | 0,00 | 98,68 | - | - | 0,00 | 0,00 | - |
| 27 | 23 770 | 23 771 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 28 | 22 383 | 22 384 | **-0,71** | 108,9 | 0,00 | 98,00 | - | - | 0,00 | 0,00 | - |
| 29 | 21 888 | 21 889 | **-0,40** | 108,9 | 0,00 | 97,80 | - | - | 0,00 | 0,00 | - |
| 3 | 17 016 | 17 018 | **2,81** | 108,9 | 0,00 | 95,62 | - | - | 0,00 | 0,00 | - |
| 30 | 19 629 | 19 630 | **0,99** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 31 | 21 930 | 21 931 | **-0,44** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 4 | 17 876 | 17 878 | **2,18** | 108,9 | 0,00 | 96,05 | - | - | 0,00 | 0,00 | - |
| 5 | 18 807 | 18 809 | **1,53** | 108,9 | 0,00 | 96,49 | - | - | 0,00 | 0,00 | - |
| 6 | 16 857 | 16 858 | **2,92** | 108,9 | 0,00 | 95,54 | - | - | 0,00 | 0,00 | - |
| 61 | 13 384 | 13 385 | **0,81** | 106,0 | 0,00 | 93,53 | - | - | 0,00 | 0,00 | - |
| 62 | 12 853 | 12 854 | **1,30** | 106,0 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| 63 | 12 286 | 12 287 | **1,85** | 106,0 | 0,00 | 92,79 | - | - | 0,00 | 0,00 | - |
| 64 | 13 782 | 13 783 | **0,45** | 106,0 | 0,00 | 93,79 | - | - | 0,00 | 0,00 | - |
| 65 | 14 310 | 14 311 | **0,00** | 106,0 | 0,00 | 94,11 | - | - | 0,00 | 0,00 | - |
| 66 | 14 923 | 14 925 | **-0,50** | 106,0 | 0,00 | 94,48 | - | - | 0,00 | 0,00 | - |
| 67 | 13 684 | 13 685 | **0,54** | 106,0 | 0,00 | 93,72 | - | - | 0,00 | 0,00 | - |
| 68 | 14 703 | 14 704 | **-0,33** | 106,0 | 0,00 | 94,35 | - | - | 0,00 | 0,00 | - |
| 69 | 15 338 | 15 340 | **-0,85** | 106,0 | 0,00 | 94,72 | - | - | 0,00 | 0,00 | - |
| 7 | 17 330 | 17 331 | **2,57** | 108,9 | 0,00 | 95,78 | - | - | 0,00 | 0,00 | - |
| 70 | 13 916 | 13 917 | **0,34** | 106,0 | 0,00 | 93,87 | - | - | 0,00 | 0,00 | - |
| 71 | 12 877 | 12 878 | **1,31** | 106,0 | 0,00 | 93,20 | - | - | 0,00 | 0,00 | - |
| 72 | 12 095 | 12 096 | **2,04** | 106,0 | 0,00 | 92,65 | - | - | 0,00 | 0,00 | - |
| 73 | 11 921 | 11 923 | **2,22** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 74 | 13 009 | 13 010 | **1,16** | 106,0 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| 75 | 12 578 | 12 579 | **1,57** | 106,0 | 0,00 | 92,99 | - | - | 0,00 | 0,00 | - |
| 76 | 9 980 | 9 982 | **4,37** | 106,0 | 0,00 | 90,98 | - | - | 0,00 | 0,00 | - |
| 77 | 9 447 | 9 449 | **5,04** | 106,0 | 0,00 | 90,51 | - | - | 0,00 | 0,00 | - |
| 78 | 8 391 | 8 393 | **6,47** | 106,0 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| 79 | 7 691 | 7 694 | **7,51** | 106,0 | 0,00 | 88,72 | - | - | 0,00 | 0,00 | - |
| 8 | 17 754 | 17 755 | **2,27** | 108,9 | 0,00 | 95,99 | - | - | 0,00 | 0,00 | - |
| 80 | 7 188 | 7 191 | **8,32** | 106,0 | 0,00 | 88,14 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 81 | 7 755 | 7 758 | **7,42** | 106,0 | 0,00 | 88,79 | - | - | 0,00 | 0,00 | - |
| 82 | 8 776 | 8 778 | **5,93** | 106,0 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| 83 | 10 375 | 10 377 | **3,91** | 106,0 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| 84 | 10 942 | 10 944 | **3,27** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 85 | 11 259 | 11 260 | **2,91** | 106,0 | 0,00 | 92,03 | - | - | 0,00 | 0,00 | - |
| 86 | 11 627 | 11 629 | **2,52** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 87 | 9 788 | 9 790 | **4,61** | 106,0 | 0,00 | 90,82 | - | - | 0,00 | 0,00 | - |
| 88 | 10 286 | 10 288 | **4,01** | 106,0 | 0,00 | 91,25 | - | - | 0,00 | 0,00 | - |
| 89 | 10 875 | 10 876 | **3,33** | 106,0 | 0,00 | 91,73 | - | - | 0,00 | 0,00 | - |
| 9 | 19 792 | 19 794 | **0,89** | 108,9 | 0,00 | 96,93 | - | - | 0,00 | 0,00 | - |
| 90 | 10 935 | 10 937 | **3,27** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 91 | 11 412 | 11 414 | **2,75** | 106,0 | 0,00 | 92,15 | - | - | 0,00 | 0,00 | - |
| 92 | 10 252 | 10 253 | **4,05** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 93 | 9 538 | 9 540 | **4,92** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 94 | 8 885 | 8 887 | **5,78** | 106,0 | 0,00 | 89,97 | - | - | 0,00 | 0,00 | - |
| 95 | 8 698 | 8 700 | **6,03** | 106,0 | 0,00 | 89,79 | - | - | 0,00 | 0,00 | - |
| 96 | 8 128 | 8 130 | **6,85** | 106,0 | 0,00 | 89,20 | - | - | 0,00 | 0,00 | - |
| 97 | 9 228 | 9 230 | **5,32** | 106,0 | 0,00 | 90,30 | - | - | 0,00 | 0,00 | - |
| 98 | 10 006 | 10 008 | **4,34** | 106,0 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| 99 | 9 184 | 9 186 | **5,38** | 106,0 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| T1 | 3 999 | 4 006 | **21,42** | 110,1 | 0,00 | 83,05 | - | - | 0,00 | 0,00 | - |
| T10 | 3 660 | 3 666 | **22,60** | 110,1 | 0,00 | 82,28 | - | - | 0,00 | 0,00 | - |
| T11 | 5 149 | 5 153 | **18,03** | 110,1 | 0,00 | 85,24 | - | - | 0,00 | 0,00 | - |
| T12 | 2 446 | 2 455 | **27,72** | 110,1 | 0,00 | 78,80 | - | - | 0,00 | 0,00 | - |
| T13 | 3 142 | 3 149 | **24,57** | 110,1 | 0,00 | 80,96 | - | - | 0,00 | 0,00 | - |
| T14 | 4 216 | 4 221 | **20,72** | 110,1 | 0,00 | 83,51 | - | - | 0,00 | 0,00 | - |
| T15 | 5 224 | 5 228 | **17,83** | 110,1 | 0,00 | 85,37 | - | - | 0,00 | 0,00 | - |
| T16 | 2 307 | 2 317 | **28,43** | 110,1 | 0,00 | 78,30 | - | - | 0,00 | 0,00 | - |
| T17 | 3 820 | 3 826 | **22,03** | 110,1 | 0,00 | 82,66 | - | - | 0,00 | 0,00 | - |
| T18 | 4 841 | 4 846 | **18,86** | 110,1 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| T19 | 2 607 | 2 616 | **26,93** | 110,1 | 0,00 | 79,35 | - | - | 0,00 | 0,00 | - |
| T2 | 3 906 | 3 913 | **21,73** | 110,1 | 0,00 | 82,85 | - | - | 0,00 | 0,00 | - |
| T20 | 3 456 | 3 463 | **23,34** | 110,1 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| T21 | 4 763 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T22 | 3 551 | 3 558 | **22,99** | 110,1 | 0,00 | 82,02 | - | - | 0,00 | 0,00 | - |
| T23 | 4 128 | 4 134 | **21,00** | 110,1 | 0,00 | 83,33 | - | - | 0,00 | 0,00 | - |
| T24 | 5 435 | 5 439 | **17,29** | 110,1 | 0,00 | 85,71 | - | - | 0,00 | 0,00 | - |
| T25 | 4 509 | 4 514 | **19,82** | 110,1 | 0,00 | 84,09 | - | - | 0,00 | 0,00 | - |
| T26 | 4 811 | 4 816 | **18,95** | 110,1 | 0,00 | 84,65 | - | - | 0,00 | 0,00 | - |
| T27 | 5 709 | 5 713 | **16,61** | 110,1 | 0,00 | 86,14 | - | - | 0,00 | 0,00 | - |
| T28 | 5 318 | 5 322 | **17,58** | 110,1 | 0,00 | 85,52 | - | - | 0,00 | 0,00 | - |
| T29 | 5 677 | 5 680 | **16,69** | 110,1 | 0,00 | 86,09 | - | - | 0,00 | 0,00 | - |
| T3 | 2 950 | 2 958 | **25,37** | 110,1 | 0,00 | 80,42 | - | - | 0,00 | 0,00 | - |
| T4 | 3 593 | 3 599 | **22,84** | 110,1 | 0,00 | 82,12 | - | - | 0,00 | 0,00 | - |
| T5 | 2 149 | 2 159 | **29,29** | 110,1 | 0,00 | 77,68 | - | - | 0,00 | 0,00 | - |
| T6 | 3 322 | 3 329 | **23,85** | 110,1 | 0,00 | 81,45 | - | - | 0,00 | 0,00 | - |
| T7 | 4 358 | 4 363 | **20,28** | 110,1 | 0,00 | 83,80 | - | - | 0,00 | 0,00 | - |
| T8 | 5 275 | 5 280 | **17,69** | 110,1 | 0,00 | 85,45 | - | - | 0,00 | 0,00 | - |
| T9 | 2 057 | 2 068 | **29,82** | 110,1 | 0,00 | 77,31 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,40** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: F Asuinrakennus F (Joensuu)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 350 | 16 352 | **3,31** | 108,9 | 0,00 | 95,27 | - | - | 0,00 | 0,00 | - |
| 10 | 18 968 | 18 969 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 100 | 9 875 | 9 877 | **4,50** | 106,0 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| 101 | 7 417 | 7 420 | **7,95** | 106,0 | 0,00 | 88,41 | - | - | 0,00 | 0,00 | - |
| 102 | 8 279 | 8 281 | **6,63** | 106,0 | 0,00 | 89,36 | - | - | 0,00 | 0,00 | - |
| 11 | 18 666 | 18 668 | **1,63** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 12 | 18 716 | 18 718 | **1,60** | 108,9 | 0,00 | 96,45 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 19 684 | 19 686 | **0,95** | 108,9 | 0,00 | 96,88 | - | - | 0,00 | 0,00 | - |
| 14 | 21 669 | 21 670 | **-0,27** | 108,9 | 0,00 | 97,72 | - | - | 0,00 | 0,00 | - |
| 15 | 19 562 | 19 564 | **1,04** | 108,9 | 0,00 | 96,83 | - | - | 0,00 | 0,00 | - |
| 16 | 20 512 | 20 513 | **0,43** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 17 | 20 499 | 20 500 | **0,43** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 18 | 21 322 | 21 323 | **-0,05** | 108,9 | 0,00 | 97,58 | - | - | 0,00 | 0,00 | - |
| 19 | 21 579 | 21 580 | **-0,23** | 108,9 | 0,00 | 97,68 | - | - | 0,00 | 0,00 | - |
| 2 | 17 041 | 17 043 | **2,78** | 108,9 | 0,00 | 95,63 | - | - | 0,00 | 0,00 | - |
| 20 | 23 023 | 23 024 | **-1,07** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 21 | 21 818 | 21 819 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 22 | 23 625 | 23 626 | **-1,41** | 108,9 | 0,00 | 98,47 | - | - | 0,00 | 0,00 | - |
| 23 | 23 550 | 23 551 | **-1,37** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 24 | 20 804 | 20 805 | **0,24** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 25 | 23 006 | 23 007 | **-1,06** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 26 | 24 455 | 24 456 | **-1,86** | 108,9 | 0,00 | 98,77 | - | - | 0,00 | 0,00 | - |
| 27 | 24 025 | 24 026 | **-1,63** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 28 | 22 641 | 22 642 | **-0,86** | 108,9 | 0,00 | 98,10 | - | - | 0,00 | 0,00 | - |
| 29 | 22 148 | 22 149 | **-0,56** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 3 | 17 271 | 17 273 | **2,62** | 108,9 | 0,00 | 95,75 | - | - | 0,00 | 0,00 | - |
| 30 | 19 887 | 19 888 | **0,82** | 108,9 | 0,00 | 96,97 | - | - | 0,00 | 0,00 | - |
| 31 | 22 183 | 22 184 | **-0,59** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 4 | 18 130 | 18 132 | **2,00** | 108,9 | 0,00 | 96,17 | - | - | 0,00 | 0,00 | - |
| 5 | 19 061 | 19 063 | **1,36** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 6 | 17 115 | 17 117 | **2,73** | 108,9 | 0,00 | 95,67 | - | - | 0,00 | 0,00 | - |
| 61 | 13 643 | 13 644 | **0,58** | 106,0 | 0,00 | 93,70 | - | - | 0,00 | 0,00 | - |
| 62 | 13 113 | 13 114 | **1,06** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 63 | 12 546 | 12 547 | **1,60** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 64 | 14 041 | 14 042 | **0,23** | 106,0 | 0,00 | 93,95 | - | - | 0,00 | 0,00 | - |
| 65 | 14 567 | 14 568 | **-0,22** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 66 | 15 179 | 15 180 | **-0,71** | 106,0 | 0,00 | 94,63 | - | - | 0,00 | 0,00 | - |
| 67 | 13 940 | 13 941 | **0,32** | 106,0 | 0,00 | 93,89 | - | - | 0,00 | 0,00 | - |
| 68 | 14 955 | 14 957 | **-0,54** | 106,0 | 0,00 | 94,50 | - | - | 0,00 | 0,00 | - |
| 69 | 15 590 | 15 592 | **-1,05** | 106,0 | 0,00 | 94,86 | - | - | 0,00 | 0,00 | - |
| 7 | 17 591 | 17 592 | **2,38** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 70 | 14 169 | 14 170 | **0,12** | 106,0 | 0,00 | 94,03 | - | - | 0,00 | 0,00 | - |
| 71 | 13 132 | 13 134 | **1,06** | 106,0 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 72 | 12 353 | 12 355 | **1,79** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 73 | 12 178 | 12 179 | **1,96** | 106,0 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| 74 | 13 261 | 13 262 | **0,92** | 106,0 | 0,00 | 93,45 | - | - | 0,00 | 0,00 | - |
| 75 | 12 828 | 12 830 | **1,33** | 106,0 | 0,00 | 93,16 | - | - | 0,00 | 0,00 | - |
| 76 | 10 220 | 10 222 | **4,09** | 106,0 | 0,00 | 91,19 | - | - | 0,00 | 0,00 | - |
| 77 | 9 690 | 9 691 | **4,73** | 106,0 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| 78 | 8 638 | 8 640 | **6,12** | 106,0 | 0,00 | 89,73 | - | - | 0,00 | 0,00 | - |
| 79 | 7 941 | 7 943 | **7,13** | 106,0 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| 8 | 18 012 | 18 013 | **2,08** | 108,9 | 0,00 | 96,11 | - | - | 0,00 | 0,00 | - |
| 80 | 7 440 | 7 442 | **7,91** | 106,0 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| 81 | 7 999 | 8 001 | **7,04** | 106,0 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| 82 | 9 018 | 9 020 | **5,60** | 106,0 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| 83 | 10 636 | 10 638 | **3,61** | 106,0 | 0,00 | 91,54 | - | - | 0,00 | 0,00 | - |
| 84 | 11 203 | 11 205 | **2,99** | 106,0 | 0,00 | 91,99 | - | - | 0,00 | 0,00 | - |
| 85 | 11 520 | 11 521 | **2,63** | 106,0 | 0,00 | 92,23 | - | - | 0,00 | 0,00 | - |
| 86 | 11 888 | 11 889 | **2,25** | 106,0 | 0,00 | 92,50 | - | - | 0,00 | 0,00 | - |
| 87 | 10 049 | 10 051 | **4,29** | 106,0 | 0,00 | 91,04 | - | - | 0,00 | 0,00 | - |
| 88 | 10 547 | 10 548 | **3,70** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 89 | 11 135 | 11 137 | **3,05** | 106,0 | 0,00 | 91,94 | - | - | 0,00 | 0,00 | - |
| 9 | 20 047 | 20 049 | **0,73** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 90 | 11 193 | 11 195 | **2,98** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 91 | 11 669 | 11 670 | **2,48** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 92 | 10 511 | 10 513 | **3,74** | 106,0 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| 93 | 9 798 | 9 800 | **4,60** | 106,0 | 0,00 | 90,82 | - | - | 0,00 | 0,00 | - |
| 94 | 9 145 | 9 147 | **5,43** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 95 | 8 957 | 8 959 | **5,68** | 106,0 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| 96 | 8 388 | 8 390 | **6,47** | 106,0 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| 97 | 9 484 | 9 486 | **4,99** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | 10 258 | 10 260 | **4,04** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 99 | 9 436 | 9 437 | **5,05** | 106,0 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| T1 | 3 835 | 3 841 | **21,98** | 110,1 | 0,00 | 82,69 | - | - | 0,00 | 0,00 | - |
| T10 | 3 727 | 3 733 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T11 | 5 222 | 5 227 | **17,83** | 110,1 | 0,00 | 85,36 | - | - | 0,00 | 0,00 | - |
| T12 | 2 557 | 2 565 | **27,17** | 110,1 | 0,00 | 79,18 | - | - | 0,00 | 0,00 | - |
| T13 | 3 291 | 3 297 | **23,98** | 110,1 | 0,00 | 81,36 | - | - | 0,00 | 0,00 | - |
| T14 | 4 340 | 4 345 | **20,34** | 110,1 | 0,00 | 83,76 | - | - | 0,00 | 0,00 | - |
| T15 | 5 338 | 5 342 | **17,53** | 110,1 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| T16 | 2 514 | 2 523 | **27,38** | 110,1 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| T17 | 3 995 | 4 001 | **21,44** | 110,1 | 0,00 | 83,04 | - | - | 0,00 | 0,00 | - |
| T18 | 4 998 | 5 003 | **18,43** | 110,1 | 0,00 | 84,98 | - | - | 0,00 | 0,00 | - |
| T19 | 2 857 | 2 865 | **25,78** | 110,1 | 0,00 | 80,14 | - | - | 0,00 | 0,00 | - |
| T2 | 3 786 | 3 793 | **22,15** | 110,1 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T20 | 3 682 | 3 688 | **22,52** | 110,1 | 0,00 | 82,34 | - | - | 0,00 | 0,00 | - |
| T21 | 4 960 | 4 965 | **18,53** | 110,1 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |
| T22 | 3 807 | 3 813 | **22,08** | 110,1 | 0,00 | 82,63 | - | - | 0,00 | 0,00 | - |
| T23 | 4 366 | 4 372 | **20,25** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T24 | 5 642 | 5 646 | **16,77** | 110,1 | 0,00 | 86,03 | - | - | 0,00 | 0,00 | - |
| T25 | 4 768 | 4 773 | **19,07** | 110,1 | 0,00 | 84,58 | - | - | 0,00 | 0,00 | - |
| T26 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,09 | - | - | 0,00 | 0,00 | - |
| T27 | 5 936 | 5 940 | **16,07** | 110,1 | 0,00 | 86,48 | - | - | 0,00 | 0,00 | - |
| T28 | 5 579 | 5 583 | **16,93** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T29 | 5 929 | 5 933 | **16,09** | 110,1 | 0,00 | 86,46 | - | - | 0,00 | 0,00 | - |
| T3 | 2 843 | 2 851 | **25,84** | 110,1 | 0,00 | 80,10 | - | - | 0,00 | 0,00 | - |
| T4 | 3 543 | 3 550 | **23,02** | 110,1 | 0,00 | 82,00 | - | - | 0,00 | 0,00 | - |
| T5 | 2 081 | 2 091 | **29,68** | 110,1 | 0,00 | 77,41 | - | - | 0,00 | 0,00 | - |
| T6 | 3 339 | 3 345 | **23,79** | 110,1 | 0,00 | 81,49 | - | - | 0,00 | 0,00 | - |
| T7 | 4 371 | 4 376 | **20,24** | 110,1 | 0,00 | 83,82 | - | - | 0,00 | 0,00 | - |
| T8 | 5 307 | 5 312 | **17,61** | 110,1 | 0,00 | 85,50 | - | - | 0,00 | 0,00 | - |
| T9 | 2 087 | 2 097 | **29,65** | 110,1 | 0,00 | 77,43 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,09** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: G Asuinrakennus G (Heiniaho)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 351 | 18 352 | **1,85** | 108,9 | 0,00 | 96,27 | - | - | 0,00 | 0,00 | - |
| 10 | 21 130 | 21 131 | **0,05** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 100 | 11 904 | 11 905 | **2,25** | 106,0 | 0,00 | 92,51 | - | - | 0,00 | 0,00 | - |
| 101 | 9 634 | 9 636 | **4,84** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 102 | 10 449 | 10 450 | **3,85** | 106,0 | 0,00 | 91,38 | - | - | 0,00 | 0,00 | - |
| 11 | 20 940 | 20 941 | **0,17** | 108,9 | 0,00 | 97,42 | - | - | 0,00 | 0,00 | - |
| 12 | 21 074 | 21 075 | **0,09** | 108,9 | 0,00 | 97,48 | - | - | 0,00 | 0,00 | - |
| 13 | 21 958 | 21 959 | **-0,45** | 108,9 | 0,00 | 97,83 | - | - | 0,00 | 0,00 | - |
| 14 | 23 776 | 23 777 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 15 | 21 901 | 21 902 | **-0,41** | 108,9 | 0,00 | 97,81 | - | - | 0,00 | 0,00 | - |
| 16 | 22 827 | 22 828 | **-0,95** | 108,9 | 0,00 | 98,17 | - | - | 0,00 | 0,00 | - |
| 17 | 22 753 | 22 754 | **-0,91** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 18 | 23 558 | 23 559 | **-1,35** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 19 | 23 891 | 23 892 | **-1,55** | 108,9 | 0,00 | 98,57 | - | - | 0,00 | 0,00 | - |
| 2 | 18 961 | 18 963 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 20 | 25 280 | 25 281 | **-2,30** | 108,9 | 0,00 | 99,06 | - | - | 0,00 | 0,00 | - |
| 21 | 24 002 | 24 003 | **-1,61** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 22 | 25 839 | 25 840 | **-2,59** | 108,9 | 0,00 | 99,25 | - | - | 0,00 | 0,00 | - |
| 23 | 25 691 | 25 692 | **-2,51** | 108,9 | 0,00 | 99,20 | - | - | 0,00 | 0,00 | - |
| 24 | 22 971 | 22 972 | **-1,04** | 108,9 | 0,00 | 98,22 | - | - | 0,00 | 0,00 | - |
| 25 | 25 075 | 25 076 | **-2,19** | 108,9 | 0,00 | 98,99 | - | - | 0,00 | 0,00 | - |
| 26 | 26 631 | 26 632 | **-2,99** | 108,9 | 0,00 | 99,51 | - | - | 0,00 | 0,00 | - |
| 27 | 26 109 | 26 110 | **-2,73** | 108,9 | 0,00 | 99,34 | - | - | 0,00 | 0,00 | - |
| 28 | 24 806 | 24 807 | **-2,05** | 108,9 | 0,00 | 98,89 | - | - | 0,00 | 0,00 | - |
| 29 | 24 387 | 24 388 | **-1,80** | 108,9 | 0,00 | 98,74 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 19 371 | 19 373 | **1,16** | 108,9 | 0,00 | 96,74 | - | - | 0,00 | 0,00 | - |
| 30 | 22 062 | 22 063 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 31 | 24 231 | 24 232 | **-1,74** | 108,9 | 0,00 | 98,69 | - | - | 0,00 | 0,00 | - |
| 4 | 20 215 | 20 217 | **0,62** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 5 | 21 132 | 21 134 | **0,04** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 6 | 19 313 | 19 315 | **1,22** | 108,9 | 0,00 | 96,72 | - | - | 0,00 | 0,00 | - |
| 61 | 15 885 | 15 886 | **-1,26** | 106,0 | 0,00 | 95,02 | - | - | 0,00 | 0,00 | - |
| 62 | 15 365 | 15 366 | **-0,86** | 106,0 | 0,00 | 94,73 | - | - | 0,00 | 0,00 | - |
| 63 | 14 822 | 14 823 | **-0,41** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 64 | 16 250 | 16 251 | **-1,54** | 106,0 | 0,00 | 95,22 | - | - | 0,00 | 0,00 | - |
| 65 | 16 728 | 16 729 | **-1,90** | 106,0 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 66 | 17 293 | 17 294 | **-2,31** | 106,0 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 67 | 16 076 | 16 078 | **-1,41** | 106,0 | 0,00 | 95,12 | - | - | 0,00 | 0,00 | - |
| 68 | 17 007 | 17 008 | **-2,11** | 106,0 | 0,00 | 95,61 | - | - | 0,00 | 0,00 | - |
| 69 | 17 631 | 17 632 | **-2,55** | 106,0 | 0,00 | 95,93 | - | - | 0,00 | 0,00 | - |
| 7 | 19 869 | 19 870 | **0,85** | 108,9 | 0,00 | 96,96 | - | - | 0,00 | 0,00 | - |
| 70 | 16 242 | 16 243 | **-1,54** | 106,0 | 0,00 | 95,21 | - | - | 0,00 | 0,00 | - |
| 71 | 15 261 | 15 263 | **-0,78** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 72 | 14 569 | 14 570 | **-0,21** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 73 | 14 343 | 14 344 | **-0,01** | 106,0 | 0,00 | 94,13 | - | - | 0,00 | 0,00 | - |
| 74 | 15 316 | 15 317 | **-0,83** | 106,0 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| 75 | 14 860 | 14 861 | **-0,46** | 106,0 | 0,00 | 94,44 | - | - | 0,00 | 0,00 | - |
| 76 | 12 094 | 12 096 | **2,05** | 106,0 | 0,00 | 92,65 | - | - | 0,00 | 0,00 | - |
| 77 | 11 617 | 11 619 | **2,54** | 106,0 | 0,00 | 92,30 | - | - | 0,00 | 0,00 | - |
| 78 | 10 656 | 10 658 | **3,59** | 106,0 | 0,00 | 91,55 | - | - | 0,00 | 0,00 | - |
| 79 | 10 001 | 10 003 | **4,37** | 106,0 | 0,00 | 91,00 | - | - | 0,00 | 0,00 | - |
| 8 | 20 190 | 20 191 | **0,64** | 108,9 | 0,00 | 97,10 | - | - | 0,00 | 0,00 | - |
| 80 | 9 539 | 9 540 | **4,95** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 81 | 9 956 | 9 958 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 82 | 10 944 | 10 946 | **3,26** | 106,0 | 0,00 | 91,78 | - | - | 0,00 | 0,00 | - |
| 83 | 12 990 | 12 991 | **1,21** | 106,0 | 0,00 | 93,27 | - | - | 0,00 | 0,00 | - |
| 84 | 13 544 | 13 545 | **0,69** | 106,0 | 0,00 | 93,64 | - | - | 0,00 | 0,00 | - |
| 85 | 13 834 | 13 835 | **0,43** | 106,0 | 0,00 | 93,82 | - | - | 0,00 | 0,00 | - |
| 86 | 14 159 | 14 160 | **0,15** | 106,0 | 0,00 | 94,02 | - | - | 0,00 | 0,00 | - |
| 87 | 12 373 | 12 375 | **1,79** | 106,0 | 0,00 | 92,85 | - | - | 0,00 | 0,00 | - |
| 88 | 12 850 | 12 851 | **1,33** | 106,0 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| 89 | 13 417 | 13 418 | **0,80** | 106,0 | 0,00 | 93,55 | - | - | 0,00 | 0,00 | - |
| 9 | 22 149 | 22 150 | **-0,56** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 90 | 13 393 | 13 394 | **0,82** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 91 | 13 822 | 13 824 | **0,43** | 106,0 | 0,00 | 93,81 | - | - | 0,00 | 0,00 | - |
| 92 | 12 757 | 12 759 | **1,42** | 106,0 | 0,00 | 93,12 | - | - | 0,00 | 0,00 | - |
| 93 | 12 065 | 12 067 | **2,10** | 106,0 | 0,00 | 92,63 | - | - | 0,00 | 0,00 | - |
| 94 | 11 438 | 11 439 | **2,75** | 106,0 | 0,00 | 92,17 | - | - | 0,00 | 0,00 | - |
| 95 | 11 180 | 11 182 | **3,02** | 106,0 | 0,00 | 91,97 | - | - | 0,00 | 0,00 | - |
| 96 | 10 648 | 10 650 | **3,62** | 106,0 | 0,00 | 91,55 | - | - | 0,00 | 0,00 | - |
| 97 | 11 649 | 11 651 | **2,54** | 106,0 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |
| 98 | 12 329 | 12 330 | **1,82** | 106,0 | 0,00 | 92,82 | - | - | 0,00 | 0,00 | - |
| 99 | 11 505 | 11 506 | **2,67** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| T1 | 2 060 | 2 071 | **29,79** | 110,1 | 0,00 | 77,33 | - | - | 0,00 | 0,00 | - |
| T10 | 4 264 | 4 269 | **20,57** | 110,1 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| T11 | 5 583 | 5 587 | **16,92** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T12 | 3 725 | 3 731 | **22,36** | 110,1 | 0,00 | 82,44 | - | - | 0,00 | 0,00 | - |
| T13 | 4 582 | 4 586 | **19,61** | 110,1 | 0,00 | 84,23 | - | - | 0,00 | 0,00 | - |
| T14 | 5 269 | 5 274 | **17,71** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T15 | 6 057 | 6 061 | **15,79** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T16 | 4 379 | 4 384 | **20,25** | 110,1 | 0,00 | 83,84 | - | - | 0,00 | 0,00 | - |
| T17 | 5 410 | 5 414 | **17,35** | 110,1 | 0,00 | 85,67 | - | - | 0,00 | 0,00 | - |
| T18 | 6 152 | 6 157 | **15,58** | 110,1 | 0,00 | 86,79 | - | - | 0,00 | 0,00 | - |
| T19 | 5 065 | 5 069 | **18,30** | 110,1 | 0,00 | 85,10 | - | - | 0,00 | 0,00 | - |
| T2 | 2 521 | 2 531 | **27,34** | 110,1 | 0,00 | 79,07 | - | - | 0,00 | 0,00 | - |
| T20 | 5 581 | 5 585 | **16,94** | 110,1 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| T21 | 6 500 | 6 504 | **14,81** | 110,1 | 0,00 | 87,26 | - | - | 0,00 | 0,00 | - |
| T22 | 6 055 | 6 059 | **15,84** | 110,1 | 0,00 | 86,65 | - | - | 0,00 | 0,00 | - |
| T23 | 6 358 | 6 361 | **15,14** | 110,1 | 0,00 | 87,07 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 7 236 | 7 239 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T25 | 7 055 | 7 058 | **13,88** | 110,1 | 0,00 | 87,97 | - | - | 0,00 | 0,00 | - |
| T26 | 7 119 | 7 122 | **13,75** | 110,1 | 0,00 | 88,05 | - | - | 0,00 | 0,00 | - |
| T27 | 7 745 | 7 748 | **12,69** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T28 | 7 962 | 7 964 | **12,41** | 110,1 | 0,00 | 89,02 | - | - | 0,00 | 0,00 | - |
| T29 | 8 064 | 8 066 | **12,23** | 110,1 | 0,00 | 89,13 | - | - | 0,00 | 0,00 | - |
| T3 | 2 071 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T4 | 3 074 | 3 081 | **24,85** | 110,1 | 0,00 | 80,77 | - | - | 0,00 | 0,00 | - |
| T5 | 2 163 | 2 173 | **29,21** | 110,1 | 0,00 | 77,74 | - | - | 0,00 | 0,00 | - |
| T6 | 3 538 | 3 545 | **23,04** | 110,1 | 0,00 | 81,99 | - | - | 0,00 | 0,00 | - |
| T7 | 4 299 | 4 304 | **20,46** | 110,1 | 0,00 | 83,68 | - | - | 0,00 | 0,00 | - |
| T8 | 5 266 | 5 270 | **17,72** | 110,1 | 0,00 | 85,44 | - | - | 0,00 | 0,00 | - |
| T9 | 2 879 | 2 887 | **25,69** | 110,1 | 0,00 | 80,21 | - | - | 0,00 | 0,00 | - |
| Sum | | | **37,38** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: H Asuinrakennus H (Mäkelä)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 19 383 | 19 385 | **1,15** | 108,9 | 0,00 | 96,75 | - | - | 0,00 | 0,00 | - |
| 10 | 22 204 | 22 205 | **-0,60** | 108,9 | 0,00 | 97,93 | - | - | 0,00 | 0,00 | - |
| 100 | 12 958 | 12 959 | **1,20** | 106,0 | 0,00 | 93,25 | - | - | 0,00 | 0,00 | - |
| 101 | 10 736 | 10 738 | **3,49** | 106,0 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| 102 | 11 539 | 11 540 | **2,61** | 106,0 | 0,00 | 92,24 | - | - | 0,00 | 0,00 | - |
| 11 | 22 042 | 22 043 | **-0,51** | 108,9 | 0,00 | 97,87 | - | - | 0,00 | 0,00 | - |
| 12 | 22 195 | 22 197 | **-0,59** | 108,9 | 0,00 | 97,93 | - | - | 0,00 | 0,00 | - |
| 13 | 23 061 | 23 062 | **-1,10** | 108,9 | 0,00 | 98,26 | - | - | 0,00 | 0,00 | - |
| 14 | 24 834 | 24 835 | **-2,07** | 108,9 | 0,00 | 98,90 | - | - | 0,00 | 0,00 | - |
| 15 | 23 018 | 23 020 | **-1,07** | 108,9 | 0,00 | 98,24 | - | - | 0,00 | 0,00 | - |
| 16 | 23 939 | 23 940 | **-1,58** | 108,9 | 0,00 | 98,58 | - | - | 0,00 | 0,00 | - |
| 17 | 23 851 | 23 852 | **-1,54** | 108,9 | 0,00 | 98,55 | - | - | 0,00 | 0,00 | - |
| 18 | 24 650 | 24 651 | **-1,95** | 108,9 | 0,00 | 98,84 | - | - | 0,00 | 0,00 | - |
| 19 | 25 002 | 25 003 | **-2,16** | 108,9 | 0,00 | 98,96 | - | - | 0,00 | 0,00 | - |
| 2 | 19 969 | 19 971 | **0,77** | 108,9 | 0,00 | 97,01 | - | - | 0,00 | 0,00 | - |
| 20 | 26 378 | 26 379 | **-2,87** | 108,9 | 0,00 | 99,43 | - | - | 0,00 | 0,00 | - |
| 21 | 25 081 | 25 082 | **-2,20** | 108,9 | 0,00 | 98,99 | - | - | 0,00 | 0,00 | - |
| 22 | 26 925 | 26 926 | **-3,14** | 108,9 | 0,00 | 99,60 | - | - | 0,00 | 0,00 | - |
| 23 | 26 757 | 26 758 | **-3,06** | 108,9 | 0,00 | 99,55 | - | - | 0,00 | 0,00 | - |
| 24 | 24 046 | 24 047 | **-1,64** | 108,9 | 0,00 | 98,62 | - | - | 0,00 | 0,00 | - |
| 25 | 26 122 | 26 123 | **-2,74** | 108,9 | 0,00 | 99,34 | - | - | 0,00 | 0,00 | - |
| 26 | 27 707 | 27 708 | **-3,52** | 108,9 | 0,00 | 99,85 | - | - | 0,00 | 0,00 | - |
| 27 | 27 159 | 27 160 | **-3,26** | 108,9 | 0,00 | 99,68 | - | - | 0,00 | 0,00 | - |
| 28 | 25 880 | 25 881 | **-2,61** | 108,9 | 0,00 | 99,26 | - | - | 0,00 | 0,00 | - |
| 29 | 25 480 | 25 481 | **-2,39** | 108,9 | 0,00 | 99,12 | - | - | 0,00 | 0,00 | - |
| 3 | 20 431 | 20 432 | **0,47** | 108,9 | 0,00 | 97,21 | - | - | 0,00 | 0,00 | - |
| 30 | 23 140 | 23 141 | **-1,14** | 108,9 | 0,00 | 98,29 | - | - | 0,00 | 0,00 | - |
| 31 | 25 272 | 25 273 | **-2,30** | 108,9 | 0,00 | 99,05 | - | - | 0,00 | 0,00 | - |
| 4 | 21 270 | 21 271 | **-0,04** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |
| 5 | 22 182 | 22 183 | **-0,59** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 6 | 20 399 | 20 400 | **0,50** | 108,9 | 0,00 | 97,19 | - | - | 0,00 | 0,00 | - |
| 61 | 16 984 | 16 985 | **-2,10** | 106,0 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 62 | 16 466 | 16 467 | **-1,72** | 106,0 | 0,00 | 95,33 | - | - | 0,00 | 0,00 | - |
| 63 | 15 929 | 15 930 | **-1,31** | 106,0 | 0,00 | 95,04 | - | - | 0,00 | 0,00 | - |
| 64 | 17 340 | 17 341 | **-2,35** | 106,0 | 0,00 | 95,78 | - | - | 0,00 | 0,00 | - |
| 65 | 17 806 | 17 807 | **-2,68** | 106,0 | 0,00 | 96,01 | - | - | 0,00 | 0,00 | - |
| 66 | 18 359 | 18 360 | **-3,06** | 106,0 | 0,00 | 96,28 | - | - | 0,00 | 0,00 | - |
| 67 | 17 149 | 17 150 | **-2,22** | 106,0 | 0,00 | 95,69 | - | - | 0,00 | 0,00 | - |
| 68 | 18 056 | 18 057 | **-2,85** | 106,0 | 0,00 | 96,13 | - | - | 0,00 | 0,00 | - |
| 69 | 18 677 | 18 678 | **-3,27** | 106,0 | 0,00 | 96,43 | - | - | 0,00 | 0,00 | - |
| 7 | 20 974 | 20 975 | **0,14** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |
| 70 | 17 298 | 17 299 | **-2,32** | 106,0 | 0,00 | 95,76 | - | - | 0,00 | 0,00 | - |
| 71 | 16 334 | 16 334 | **-1,62** | 106,0 | 0,00 | 95,26 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | 15 663 | 15 664 | **-1,11** | 106,0 | 0,00 | 94,90 | - | - | 0,00 | 0,00 | - |
| 73 | 15 425 | 15 426 | **-0,92** | 106,0 | 0,00 | 94,76 | - | - | 0,00 | 0,00 | - |
| 74 | 16 368 | 16 369 | **-1,65** | 106,0 | 0,00 | 95,28 | - | - | 0,00 | 0,00 | - |
| 75 | 15 907 | 15 908 | **-1,30** | 106,0 | 0,00 | 95,03 | - | - | 0,00 | 0,00 | - |
| 76 | 13 107 | 13 108 | **1,07** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 77 | 12 646 | 12 647 | **1,50** | 106,0 | 0,00 | 93,04 | - | - | 0,00 | 0,00 | - |
| 78 | 11 711 | 11 713 | **2,43** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 79 | 11 069 | 11 070 | **3,12** | 106,0 | 0,00 | 91,88 | - | - | 0,00 | 0,00 | - |
| 8 | 21 270 | 21 271 | **-0,04** | 108,9 | 0,00 | 97,56 | - | - | 0,00 | 0,00 | - |
| 80 | 10 616 | 10 618 | **3,62** | 106,0 | 0,00 | 91,52 | - | - | 0,00 | 0,00 | - |
| 81 | 10 999 | 11 001 | **3,19** | 106,0 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 82 | 11 975 | 11 976 | **2,16** | 106,0 | 0,00 | 92,57 | - | - | 0,00 | 0,00 | - |
| 83 | 14 113 | 14 114 | **0,19** | 106,0 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |
| 84 | 14 665 | 14 666 | **-0,30** | 106,0 | 0,00 | 94,33 | - | - | 0,00 | 0,00 | - |
| 85 | 14 949 | 14 950 | **-0,54** | 106,0 | 0,00 | 94,49 | - | - | 0,00 | 0,00 | - |
| 86 | 15 266 | 15 267 | **-0,79** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 87 | 13 492 | 13 493 | **0,72** | 106,0 | 0,00 | 93,60 | - | - | 0,00 | 0,00 | - |
| 88 | 13 964 | 13 965 | **0,29** | 106,0 | 0,00 | 93,90 | - | - | 0,00 | 0,00 | - |
| 89 | 14 526 | 14 527 | **-0,19** | 106,0 | 0,00 | 94,24 | - | - | 0,00 | 0,00 | - |
| 9 | 23 206 | 23 208 | **-1,18** | 108,9 | 0,00 | 98,31 | - | - | 0,00 | 0,00 | - |
| 90 | 14 485 | 14 486 | **-0,15** | 106,0 | 0,00 | 94,22 | - | - | 0,00 | 0,00 | - |
| 91 | 14 903 | 14 904 | **-0,50** | 106,0 | 0,00 | 94,47 | - | - | 0,00 | 0,00 | - |
| 92 | 13 860 | 13 861 | **0,39** | 106,0 | 0,00 | 93,84 | - | - | 0,00 | 0,00 | - |
| 93 | 13 173 | 13 175 | **1,00** | 106,0 | 0,00 | 93,39 | - | - | 0,00 | 0,00 | - |
| 94 | 12 551 | 12 552 | **1,59** | 106,0 | 0,00 | 92,97 | - | - | 0,00 | 0,00 | - |
| 95 | 12 280 | 12 282 | **1,86** | 106,0 | 0,00 | 92,79 | - | - | 0,00 | 0,00 | - |
| 96 | 11 756 | 11 758 | **2,39** | 106,0 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 97 | 12 736 | 12 737 | **1,43** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 98 | 13 392 | 13 393 | **0,80** | 106,0 | 0,00 | 93,54 | - | - | 0,00 | 0,00 | - |
| 99 | 12 570 | 12 571 | **1,57** | 106,0 | 0,00 | 92,99 | - | - | 0,00 | 0,00 | - |
| T1 | 2 090 | 2 102 | **29,62** | 110,1 | 0,00 | 77,45 | - | - | 0,00 | 0,00 | - |
| T10 | 5 057 | 5 061 | **18,27** | 110,1 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| T11 | 6 241 | 6 244 | **15,38** | 110,1 | 0,00 | 86,91 | - | - | 0,00 | 0,00 | - |
| T12 | 4 712 | 4 716 | **19,23** | 110,1 | 0,00 | 84,47 | - | - | 0,00 | 0,00 | - |
| T13 | 5 551 | 5 555 | **17,00** | 110,1 | 0,00 | 85,89 | - | - | 0,00 | 0,00 | - |
| T14 | 6 120 | 6 123 | **15,65** | 110,1 | 0,00 | 86,74 | - | - | 0,00 | 0,00 | - |
| T15 | 6 813 | 6 816 | **14,24** | 110,1 | 0,00 | 87,67 | - | - | 0,00 | 0,00 | - |
| T16 | 5 460 | 5 464 | **17,22** | 110,1 | 0,00 | 85,75 | - | - | 0,00 | 0,00 | - |
| T17 | 6 379 | 6 383 | **15,08** | 110,1 | 0,00 | 87,10 | - | - | 0,00 | 0,00 | - |
| T18 | 7 035 | 7 038 | **13,85** | 110,1 | 0,00 | 87,95 | - | - | 0,00 | 0,00 | - |
| T19 | 6 182 | 6 186 | **15,52** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T2 | 2 797 | 2 805 | **26,05** | 110,1 | 0,00 | 79,96 | - | - | 0,00 | 0,00 | - |
| T20 | 6 647 | 6 650 | **14,54** | 110,1 | 0,00 | 87,46 | - | - | 0,00 | 0,00 | - |
| T21 | 7 475 | 7 478 | **13,12** | 110,1 | 0,00 | 88,48 | - | - | 0,00 | 0,00 | - |
| T22 | 7 173 | 7 176 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T23 | 7 432 | 7 435 | **13,19** | 110,1 | 0,00 | 88,43 | - | - | 0,00 | 0,00 | - |
| T24 | 8 212 | 8 214 | **11,96** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T25 | 8 175 | 8 177 | **12,02** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T26 | 8 201 | 8 203 | **11,97** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T27 | 8 768 | 8 770 | **11,14** | 110,1 | 0,00 | 89,86 | - | - | 0,00 | 0,00 | - |
| T28 | 9 092 | 9 094 | **10,73** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T29 | 9 154 | 9 157 | **10,60** | 110,1 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| T3 | 2 728 | 2 736 | **26,36** | 110,1 | 0,00 | 79,74 | - | - | 0,00 | 0,00 | - |
| T4 | 3 644 | 3 650 | **22,65** | 110,1 | 0,00 | 82,25 | - | - | 0,00 | 0,00 | - |
| T5 | 3 094 | 3 100 | **24,77** | 110,1 | 0,00 | 80,83 | - | - | 0,00 | 0,00 | - |
| T6 | 4 292 | 4 297 | **20,49** | 110,1 | 0,00 | 83,66 | - | - | 0,00 | 0,00 | - |
| T7 | 4 883 | 4 887 | **18,75** | 110,1 | 0,00 | 84,78 | - | - | 0,00 | 0,00 | - |
| T8 | 5 791 | 5 795 | **16,41** | 110,1 | 0,00 | 86,26 | - | - | 0,00 | 0,00 | - |
| T9 | 3 860 | 3 866 | **21,89** | 110,1 | 0,00 | 82,74 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,20** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

## Noise sensitive area: I Lomarakennus I

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 989 | 16 990 | **2,82** | 108,9 | 0,00 | 95,60 | - | - | 0,00 | 0,00 | - |
| 10 | 20 165 | 20 166 | **0,64** | 108,9 | 0,00 | 97,09 | - | - | 0,00 | 0,00 | - |
| 100 | 11 047 | 11 048 | **3,14** | 106,0 | 0,00 | 91,87 | - | - | 0,00 | 0,00 | - |
| 101 | 9 635 | 9 637 | **4,80** | 106,0 | 0,00 | 90,68 | - | - | 0,00 | 0,00 | - |
| 102 | 10 184 | 10 185 | **4,13** | 106,0 | 0,00 | 91,16 | - | - | 0,00 | 0,00 | - |
| 11 | 20 393 | 20 394 | **0,50** | 108,9 | 0,00 | 97,19 | - | - | 0,00 | 0,00 | - |
| 12 | 20 906 | 20 907 | **0,18** | 108,9 | 0,00 | 97,41 | - | - | 0,00 | 0,00 | - |
| 13 | 21 386 | 21 387 | **-0,11** | 108,9 | 0,00 | 97,60 | - | - | 0,00 | 0,00 | - |
| 14 | 22 562 | 22 563 | **-0,81** | 108,9 | 0,00 | 98,07 | - | - | 0,00 | 0,00 | - |
| 15 | 21 618 | 21 619 | **-0,25** | 108,9 | 0,00 | 97,70 | - | - | 0,00 | 0,00 | - |
| 16 | 22 411 | 22 412 | **-0,72** | 108,9 | 0,00 | 98,01 | - | - | 0,00 | 0,00 | - |
| 17 | 22 080 | 22 081 | **-0,53** | 108,9 | 0,00 | 97,88 | - | - | 0,00 | 0,00 | - |
| 18 | 22 793 | 22 794 | **-0,94** | 108,9 | 0,00 | 98,16 | - | - | 0,00 | 0,00 | - |
| 19 | 23 435 | 23 436 | **-1,31** | 108,9 | 0,00 | 98,40 | - | - | 0,00 | 0,00 | - |
| 2 | 17 355 | 17 357 | **2,55** | 108,9 | 0,00 | 95,79 | - | - | 0,00 | 0,00 | - |
| 20 | 24 561 | 24 562 | **-1,91** | 108,9 | 0,00 | 98,81 | - | - | 0,00 | 0,00 | - |
| 21 | 23 038 | 23 039 | **-1,08** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 22 | 24 943 | 24 944 | **-2,13** | 108,9 | 0,00 | 98,94 | - | - | 0,00 | 0,00 | - |
| 23 | 24 542 | 24 543 | **-1,91** | 108,9 | 0,00 | 98,80 | - | - | 0,00 | 0,00 | - |
| 24 | 21 972 | 21 973 | **-0,46** | 108,9 | 0,00 | 97,84 | - | - | 0,00 | 0,00 | - |
| 25 | 23 715 | 23 716 | **-1,46** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |
| 26 | 25 584 | 25 585 | **-2,46** | 108,9 | 0,00 | 99,16 | - | - | 0,00 | 0,00 | - |
| 27 | 24 772 | 24 773 | **-2,03** | 108,9 | 0,00 | 98,88 | - | - | 0,00 | 0,00 | - |
| 28 | 23 759 | 23 760 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 29 | 23 617 | 23 618 | **-1,41** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 3 | 18 265 | 18 267 | **1,91** | 108,9 | 0,00 | 96,23 | - | - | 0,00 | 0,00 | - |
| 30 | 21 115 | 21 116 | **0,05** | 108,9 | 0,00 | 97,49 | - | - | 0,00 | 0,00 | - |
| 31 | 22 826 | 22 827 | **-0,96** | 108,9 | 0,00 | 98,17 | - | - | 0,00 | 0,00 | - |
| 4 | 19 032 | 19 033 | **1,38** | 108,9 | 0,00 | 96,59 | - | - | 0,00 | 0,00 | - |
| 5 | 19 878 | 19 879 | **0,83** | 108,9 | 0,00 | 96,97 | - | - | 0,00 | 0,00 | - |
| 6 | 18 535 | 18 536 | **1,72** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 61 | 15 421 | 15 422 | **-0,92** | 106,0 | 0,00 | 94,76 | - | - | 0,00 | 0,00 | - |
| 62 | 14 966 | 14 967 | **-0,55** | 106,0 | 0,00 | 94,50 | - | - | 0,00 | 0,00 | - |
| 63 | 14 551 | 14 552 | **-0,21** | 106,0 | 0,00 | 94,26 | - | - | 0,00 | 0,00 | - |
| 64 | 15 644 | 15 645 | **-1,09** | 106,0 | 0,00 | 94,89 | - | - | 0,00 | 0,00 | - |
| 65 | 15 930 | 15 931 | **-1,31** | 106,0 | 0,00 | 95,04 | - | - | 0,00 | 0,00 | - |
| 66 | 16 319 | 16 320 | **-1,61** | 106,0 | 0,00 | 95,25 | - | - | 0,00 | 0,00 | - |
| 67 | 15 235 | 15 236 | **-0,77** | 106,0 | 0,00 | 94,66 | - | - | 0,00 | 0,00 | - |
| 68 | 15 854 | 15 855 | **-1,26** | 106,0 | 0,00 | 95,00 | - | - | 0,00 | 0,00 | - |
| 69 | 16 417 | 16 418 | **-1,68** | 106,0 | 0,00 | 95,31 | - | - | 0,00 | 0,00 | - |
| 7 | 19 379 | 19 380 | **1,15** | 108,9 | 0,00 | 96,75 | - | - | 0,00 | 0,00 | - |
| 70 | 15 192 | 15 193 | **-0,73** | 106,0 | 0,00 | 94,63 | - | - | 0,00 | 0,00 | - |
| 71 | 14 441 | 14 442 | **-0,12** | 106,0 | 0,00 | 94,19 | - | - | 0,00 | 0,00 | - |
| 72 | 14 086 | 14 087 | **0,19** | 106,0 | 0,00 | 93,98 | - | - | 0,00 | 0,00 | - |
| 73 | 13 696 | 13 697 | **0,53** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 74 | 14 264 | 14 266 | **0,03** | 106,0 | 0,00 | 94,09 | - | - | 0,00 | 0,00 | - |
| 75 | 13 767 | 13 768 | **0,47** | 106,0 | 0,00 | 93,78 | - | - | 0,00 | 0,00 | - |
| 76 | 10 806 | 10 807 | **3,41** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 77 | 10 516 | 10 518 | **3,74** | 106,0 | 0,00 | 91,44 | - | - | 0,00 | 0,00 | - |
| 78 | 9 914 | 9 916 | **4,45** | 106,0 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| 79 | 9 468 | 9 470 | **5,01** | 106,0 | 0,00 | 90,53 | - | - | 0,00 | 0,00 | - |
| 8 | 19 312 | 19 313 | **1,20** | 108,9 | 0,00 | 96,72 | - | - | 0,00 | 0,00 | - |
| 80 | 9 186 | 9 188 | **5,38** | 106,0 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| 81 | 9 150 | 9 152 | **5,42** | 106,0 | 0,00 | 90,23 | - | - | 0,00 | 0,00 | - |
| 82 | 9 920 | 9 921 | **4,45** | 106,0 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| 83 | 13 174 | 13 175 | **1,00** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 84 | 13 629 | 13 630 | **0,59** | 106,0 | 0,00 | 93,69 | - | - | 0,00 | 0,00 | - |
| 85 | 13 779 | 13 780 | **0,46** | 106,0 | 0,00 | 93,79 | - | - | 0,00 | 0,00 | - |
| 86 | 13 911 | 13 912 | **0,34** | 106,0 | 0,00 | 93,87 | - | - | 0,00 | 0,00 | - |
| 87 | 12 475 | 12 477 | **1,67** | 106,0 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| 88 | 12 822 | 12 824 | **1,33** | 106,0 | 0,00 | 93,16 | - | - | 0,00 | 0,00 | - |
| 89 | 13 260 | 13 261 | **0,93** | 106,0 | 0,00 | 93,45 | - | - | 0,00 | 0,00 | - |
| 9 | 20 958 | 20 960 | **0,15** | 108,9 | 0,00 | 97,43 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 12 936 | 12 937 | **1,22** | 106,0 | 0,00 | 93,24 | - | - | 0,00 | 0,00 | - |
| 91 | 13 178 | 13 179 | **1,00** | 106,0 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 92 | 12 517 | 12 518 | **1,64** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 93 | 11 964 | 11 965 | **2,17** | 106,0 | 0,00 | 92,56 | - | - | 0,00 | 0,00 | - |
| 94 | 11 493 | 11 494 | **2,66** | 106,0 | 0,00 | 92,21 | - | - | 0,00 | 0,00 | - |
| 95 | 11 007 | 11 009 | **3,19** | 106,0 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 96 | 10 666 | 10 668 | **3,57** | 106,0 | 0,00 | 91,56 | - | - | 0,00 | 0,00 | - |
| 97 | 11 231 | 11 233 | **2,94** | 106,0 | 0,00 | 92,01 | - | - | 0,00 | 0,00 | - |
| 98 | 11 552 | 11 553 | **2,60** | 106,0 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| 99 | 10 808 | 10 809 | **3,41** | 106,0 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| T1 | 2 625 | 2 634 | **26,84** | 110,1 | 0,00 | 79,41 | - | - | 0,00 | 0,00 | - |
| T10 | 3 049 | 3 056 | **24,96** | 110,1 | 0,00 | 80,70 | - | - | 0,00 | 0,00 | - |
| T11 | 2 945 | 2 952 | **25,40** | 110,1 | 0,00 | 80,40 | - | - | 0,00 | 0,00 | - |
| T12 | 4 055 | 4 059 | **21,25** | 110,1 | 0,00 | 83,17 | - | - | 0,00 | 0,00 | - |
| T13 | 4 315 | 4 320 | **20,41** | 110,1 | 0,00 | 83,71 | - | - | 0,00 | 0,00 | - |
| T14 | 3 870 | 3 876 | **21,86** | 110,1 | 0,00 | 82,77 | - | - | 0,00 | 0,00 | - |
| T15 | 3 806 | 3 813 | **22,08** | 110,1 | 0,00 | 82,62 | - | - | 0,00 | 0,00 | - |
| T16 | 5 213 | 5 217 | **17,86** | 110,1 | 0,00 | 85,35 | - | - | 0,00 | 0,00 | - |
| T17 | 4 798 | 4 802 | **18,99** | 110,1 | 0,00 | 84,63 | - | - | 0,00 | 0,00 | - |
| T18 | 4 661 | 4 667 | **19,37** | 110,1 | 0,00 | 84,38 | - | - | 0,00 | 0,00 | - |
| T19 | 6 200 | 6 203 | **15,47** | 110,1 | 0,00 | 86,85 | - | - | 0,00 | 0,00 | - |
| T2 | 2 072 | 2 082 | **29,73** | 110,1 | 0,00 | 77,37 | - | - | 0,00 | 0,00 | - |
| T20 | 5 814 | 5 818 | **16,36** | 110,1 | 0,00 | 86,30 | - | - | 0,00 | 0,00 | - |
| T21 | 5 603 | 5 607 | **16,87** | 110,1 | 0,00 | 85,97 | - | - | 0,00 | 0,00 | - |
| T22 | 6 929 | 6 932 | **14,04** | 110,1 | 0,00 | 87,82 | - | - | 0,00 | 0,00 | - |
| T23 | 6 481 | 6 485 | **14,86** | 110,1 | 0,00 | 87,24 | - | - | 0,00 | 0,00 | - |
| T24 | 6 187 | 6 190 | **15,50** | 110,1 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| T25 | 7 771 | 7 773 | **12,64** | 110,1 | 0,00 | 88,81 | - | - | 0,00 | 0,00 | - |
| T26 | 7 177 | 7 179 | **13,61** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T27 | 7 019 | 7 022 | **13,88** | 110,1 | 0,00 | 87,93 | - | - | 0,00 | 0,00 | - |
| T28 | 8 851 | 8 853 | **11,02** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T29 | 8 087 | 8 089 | **12,15** | 110,1 | 0,00 | 89,16 | - | - | 0,00 | 0,00 | - |
| T3 | 2 832 | 2 840 | **25,89** | 110,1 | 0,00 | 80,07 | - | - | 0,00 | 0,00 | - |
| T4 | 2 100 | 2 111 | **29,57** | 110,1 | 0,00 | 77,49 | - | - | 0,00 | 0,00 | - |
| T5 | 3 534 | 3 539 | **23,06** | 110,1 | 0,00 | 81,98 | - | - | 0,00 | 0,00 | - |
| T6 | 2 703 | 2 711 | **26,48** | 110,1 | 0,00 | 79,66 | - | - | 0,00 | 0,00 | - |
| T7 | 1 994 | 2 005 | **30,19** | 110,1 | 0,00 | 77,04 | - | - | 0,00 | 0,00 | - |
| T8 | 2 093 | 2 104 | **29,61** | 110,1 | 0,00 | 77,46 | - | - | 0,00 | 0,00 | - |
| T9 | 3 792 | 3 797 | **22,13** | 110,1 | 0,00 | 82,59 | - | - | 0,00 | 0,00 | - |
| Sum | | | **38,66** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10 816 | 10 819 | **8,41** | 108,9 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| 10 | 12 731 | 12 733 | **6,42** | 108,9 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 100 | 5 208 | 5 212 | **12,37** | 106,0 | 0,00 | 85,34 | - | - | 0,00 | 0,00 | - |
| 101 | 2 849 | 2 856 | **20,51** | 106,0 | 0,00 | 80,11 | - | - | 0,00 | 0,00 | - |
| 102 | 3 475 | 3 480 | **17,87** | 106,0 | 0,00 | 81,83 | - | - | 0,00 | 0,00 | - |
| 11 | 12 069 | 12 072 | **7,07** | 108,9 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 12 | 11 863 | 11 865 | **7,30** | 108,9 | 0,00 | 92,49 | - | - | 0,00 | 0,00 | - |
| 13 | 13 066 | 13 069 | **6,10** | 108,9 | 0,00 | 93,32 | - | - | 0,00 | 0,00 | - |
| 14 | 15 537 | 15 539 | **3,95** | 108,9 | 0,00 | 94,83 | - | - | 0,00 | 0,00 | - |
| 15 | 12 753 | 12 755 | **6,42** | 108,9 | 0,00 | 93,11 | - | - | 0,00 | 0,00 | - |
| 16 | 13 759 | 13 761 | **5,50** | 108,9 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 17 | 13 928 | 13 930 | **5,31** | 108,9 | 0,00 | 93,88 | - | - | 0,00 | 0,00 | - |
| 18 | 14 795 | 14 797 | **4,56** | 108,9 | 0,00 | 94,40 | - | - | 0,00 | 0,00 | - |
| 19 | 14 825 | 14 827 | **4,56** | 108,9 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 2 | 11 759 | 11 762 | **7,39** | 108,9 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 20 | 16 409 | 16 411 | **3,26** | 108,9 | 0,00 | 95,30 | - | - | 0,00 | 0,00 | - |
| 21 | 15 441 | 15 443 | **4,02** | 108,9 | 0,00 | 94,77 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 17 129 | 17 130 | **2,73** | 108,9 | 0,00 | 95,68 | - | - | 0,00 | 0,00 | - |
| 23 | 17 275 | 17 277 | **2,61** | 108,9 | 0,00 | 95,75 | - | - | 0,00 | 0,00 | - |
| 24 | 14 503 | 14 505 | **4,81** | 108,9 | 0,00 | 94,23 | - | - | 0,00 | 0,00 | - |
| 25 | 16 962 | 16 964 | **2,84** | 108,9 | 0,00 | 95,59 | - | - | 0,00 | 0,00 | - |
| 26 | 18 060 | 18 062 | **2,05** | 108,9 | 0,00 | 96,14 | - | - | 0,00 | 0,00 | - |
| 27 | 17 914 | 17 916 | **2,15** | 108,9 | 0,00 | 96,06 | - | - | 0,00 | 0,00 | - |
| 28 | 16 307 | 16 309 | **3,34** | 108,9 | 0,00 | 95,25 | - | - | 0,00 | 0,00 | - |
| 29 | 15 598 | 15 599 | **3,90** | 108,9 | 0,00 | 94,86 | - | - | 0,00 | 0,00 | - |
| 3 | 11 315 | 11 319 | **7,86** | 108,9 | 0,00 | 92,08 | - | - | 0,00 | 0,00 | - |
| 30 | 13 581 | 13 584 | **5,62** | 108,9 | 0,00 | 93,66 | - | - | 0,00 | 0,00 | - |
| 31 | 16 227 | 16 229 | **3,40** | 108,9 | 0,00 | 95,21 | - | - | 0,00 | 0,00 | - |
| 4 | 12 190 | 12 192 | **6,95** | 108,9 | 0,00 | 92,72 | - | - | 0,00 | 0,00 | - |
| 5 | 13 130 | 13 133 | **6,04** | 108,9 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 6 | 10 815 | 10 817 | **8,41** | 108,9 | 0,00 | 91,68 | - | - | 0,00 | 0,00 | - |
| 61 | 7 339 | 7 342 | **8,08** | 106,0 | 0,00 | 88,32 | - | - | 0,00 | 0,00 | - |
| 62 | 6 804 | 6 807 | **8,98** | 106,0 | 0,00 | 87,66 | - | - | 0,00 | 0,00 | - |
| 63 | 6 172 | 6 174 | **10,14** | 106,0 | 0,00 | 86,81 | - | - | 0,00 | 0,00 | - |
| 64 | 7 848 | 7 850 | **7,27** | 106,0 | 0,00 | 88,90 | - | - | 0,00 | 0,00 | - |
| 65 | 8 536 | 8 539 | **6,26** | 106,0 | 0,00 | 89,63 | - | - | 0,00 | 0,00 | - |
| 66 | 9 288 | 9 290 | **5,26** | 106,0 | 0,00 | 90,36 | - | - | 0,00 | 0,00 | - |
| 67 | 8 053 | 8 056 | **6,98** | 106,0 | 0,00 | 89,12 | - | - | 0,00 | 0,00 | - |
| 68 | 9 330 | 9 332 | **5,19** | 106,0 | 0,00 | 90,40 | - | - | 0,00 | 0,00 | - |
| 69 | 9 956 | 9 959 | **4,41** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 7 | 10 999 | 11 001 | **8,20** | 108,9 | 0,00 | 91,83 | - | - | 0,00 | 0,00 | - |
| 70 | 8 526 | 8 528 | **6,28** | 106,0 | 0,00 | 89,62 | - | - | 0,00 | 0,00 | - |
| 71 | 7 356 | 7 358 | **8,05** | 106,0 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| 72 | 6 271 | 6 274 | **9,96** | 106,0 | 0,00 | 86,95 | - | - | 0,00 | 0,00 | - |
| 73 | 6 354 | 6 357 | **9,79** | 106,0 | 0,00 | 87,06 | - | - | 0,00 | 0,00 | - |
| 74 | 7 790 | 7 792 | **7,36** | 106,0 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| 75 | 7 517 | 7 520 | **7,79** | 106,0 | 0,00 | 88,52 | - | - | 0,00 | 0,00 | - |
| 76 | 6 182 | 6 185 | **10,12** | 106,0 | 0,00 | 86,83 | - | - | 0,00 | 0,00 | - |
| 77 | 5 584 | 5 587 | **11,40** | 106,0 | 0,00 | 85,94 | - | - | 0,00 | 0,00 | - |
| 78 | 4 522 | 4 526 | **14,29** | 106,0 | 0,00 | 84,11 | - | - | 0,00 | 0,00 | - |
| 79 | 3 979 | 3 984 | **16,04** | 106,0 | 0,00 | 83,01 | - | - | 0,00 | 0,00 | - |
| 8 | 11 749 | 11 752 | **7,40** | 108,9 | 0,00 | 92,40 | - | - | 0,00 | 0,00 | - |
| 80 | 3 599 | 3 604 | **17,40** | 106,0 | 0,00 | 82,14 | - | - | 0,00 | 0,00 | - |
| 81 | 4 542 | 4 547 | **14,23** | 106,0 | 0,00 | 84,15 | - | - | 0,00 | 0,00 | - |
| 82 | 5 187 | 5 191 | **12,41** | 106,0 | 0,00 | 85,31 | - | - | 0,00 | 0,00 | - |
| 83 | 4 047 | 4 052 | **15,81** | 106,0 | 0,00 | 83,15 | - | - | 0,00 | 0,00 | - |
| 84 | 4 631 | 4 635 | **13,97** | 106,0 | 0,00 | 84,32 | - | - | 0,00 | 0,00 | - |
| 85 | 5 054 | 5 058 | **12,77** | 106,0 | 0,00 | 85,08 | - | - | 0,00 | 0,00 | - |
| 86 | 5 590 | 5 594 | **11,38** | 106,0 | 0,00 | 85,95 | - | - | 0,00 | 0,00 | - |
| 87 | 3 695 | 3 700 | **17,08** | 106,0 | 0,00 | 82,36 | - | - | 0,00 | 0,00 | - |
| 88 | 4 242 | 4 247 | **15,19** | 106,0 | 0,00 | 83,56 | - | - | 0,00 | 0,00 | - |
| 89 | 4 869 | 4 873 | **13,29** | 106,0 | 0,00 | 84,76 | - | - | 0,00 | 0,00 | - |
| 9 | 13 980 | 13 982 | **5,26** | 108,9 | 0,00 | 93,91 | - | - | 0,00 | 0,00 | - |
| 90 | 5 336 | 5 339 | **12,02** | 106,0 | 0,00 | 85,55 | - | - | 0,00 | 0,00 | - |
| 91 | 5 965 | 5 968 | **10,54** | 106,0 | 0,00 | 86,52 | - | - | 0,00 | 0,00 | - |
| 92 | 4 524 | 4 529 | **14,29** | 106,0 | 0,00 | 84,12 | - | - | 0,00 | 0,00 | - |
| 93 | 3 832 | 3 837 | **16,55** | 106,0 | 0,00 | 82,68 | - | - | 0,00 | 0,00 | - |
| 94 | 3 186 | 3 191 | **19,04** | 106,0 | 0,00 | 81,08 | - | - | 0,00 | 0,00 | - |
| 95 | 3 510 | 3 515 | **17,74** | 106,0 | 0,00 | 81,92 | - | - | 0,00 | 0,00 | - |
| 96 | 2 929 | 2 935 | **20,15** | 106,0 | 0,00 | 80,35 | - | - | 0,00 | 0,00 | - |
| 97 | 4 206 | 4 211 | **15,28** | 106,0 | 0,00 | 83,49 | - | - | 0,00 | 0,00 | - |
| 98 | 5 261 | 5 264 | **12,22** | 106,0 | 0,00 | 85,43 | - | - | 0,00 | 0,00 | - |
| 99 | 4 706 | 4 710 | **13,77** | 106,0 | 0,00 | 84,46 | - | - | 0,00 | 0,00 | - |
| T1 | 10 347 | 10 350 | **9,04** | 110,1 | 0,00 | 91,30 | - | - | 0,00 | 0,00 | - |
| T10 | 7 801 | 7 804 | **12,59** | 110,1 | 0,00 | 88,85 | - | - | 0,00 | 0,00 | - |
| T11 | 8 471 | 8 474 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T12 | 6 911 | 6 915 | **14,07** | 110,1 | 0,00 | 87,80 | - | - | 0,00 | 0,00 | - |
| T13 | 6 530 | 6 534 | **14,75** | 110,1 | 0,00 | 87,30 | - | - | 0,00 | 0,00 | - |
| T14 | 7 173 | 7 177 | **13,62** | 110,1 | 0,00 | 88,12 | - | - | 0,00 | 0,00 | - |
| T15 | 7 793 | 7 797 | **12,60** | 110,1 | 0,00 | 88,84 | - | - | 0,00 | 0,00 | - |
| T16 | 5 758 | 5 762 | **16,49** | 110,1 | 0,00 | 86,21 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T17 | 6 144 | 6 149 | **15,59** | 110,1 | 0,00 | 86,78 | - | - | 0,00 | 0,00 | - |
| T18 | 6 738 | 6 742 | **14,37** | 110,1 | 0,00 | 87,58 | - | - | 0,00 | 0,00 | - |
| T19 | 4 792 | 4 798 | **19,00** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T2 | 9 915 | 9 918 | **9,59** | 110,1 | 0,00 | 90,93 | - | - | 0,00 | 0,00 | - |
| T20 | 5 038 | 5 043 | **18,32** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T21 | 5 719 | 5 724 | **16,58** | 110,1 | 0,00 | 86,15 | - | - | 0,00 | 0,00 | - |
| T22 | 3 932 | 3 939 | **21,65** | 110,1 | 0,00 | 82,91 | - | - | 0,00 | 0,00 | - |
| T23 | 4 449 | 4 455 | **20,00** | 110,1 | 0,00 | 83,98 | - | - | 0,00 | 0,00 | - |
| T24 | 5 551 | 5 556 | **16,99** | 110,1 | 0,00 | 85,90 | - | - | 0,00 | 0,00 | - |
| T25 | 3 090 | 3 098 | **24,78** | 110,1 | 0,00 | 80,82 | - | - | 0,00 | 0,00 | - |
| T26 | 3 915 | 3 922 | **21,70** | 110,1 | 0,00 | 82,87 | - | - | 0,00 | 0,00 | - |
| T27 | 4 795 | 4 800 | **18,99** | 110,1 | 0,00 | 84,62 | - | - | 0,00 | 0,00 | - |
| T28 | 2 023 | 2 035 | **30,01** | 110,1 | 0,00 | 77,17 | - | - | 0,00 | 0,00 | - |
| T29 | 3 336 | 3 343 | **23,80** | 110,1 | 0,00 | 81,48 | - | - | 0,00 | 0,00 | - |
| T3 | 9 032 | 9 035 | **10,77** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T4 | 9 042 | 9 045 | **10,75** | 110,1 | 0,00 | 90,13 | - | - | 0,00 | 0,00 | - |
| T5 | 8 186 | 8 189 | **12,00** | 110,1 | 0,00 | 89,26 | - | - | 0,00 | 0,00 | - |
| T6 | 8 213 | 8 216 | **11,95** | 110,1 | 0,00 | 89,29 | - | - | 0,00 | 0,00 | - |
| T7 | 8 871 | 8 874 | **10,99** | 110,1 | 0,00 | 89,96 | - | - | 0,00 | 0,00 | - |
| T8 | 9 214 | 9 217 | **10,51** | 110,1 | 0,00 | 90,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 502 | 7 505 | **13,07** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **35,82** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: K Asuinrakennus K (Takalo)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9 530 | 9 534 | **9,94** | 108,9 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 10 | 11 401 | 11 403 | **7,77** | 108,9 | 0,00 | 92,14 | - | - | 0,00 | 0,00 | - |
| 100 | 4 254 | 4 259 | **15,13** | 106,0 | 0,00 | 83,59 | - | - | 0,00 | 0,00 | - |
| 101 | 2 455 | 2 463 | **22,45** | 106,0 | 0,00 | 78,83 | - | - | 0,00 | 0,00 | - |
| 102 | 2 754 | 2 761 | **20,96** | 106,0 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| 11 | 10 755 | 10 758 | **8,47** | 108,9 | 0,00 | 91,63 | - | - | 0,00 | 0,00 | - |
| 12 | 10 596 | 10 599 | **8,69** | 108,9 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 13 | 11 756 | 11 758 | **7,39** | 108,9 | 0,00 | 92,41 | - | - | 0,00 | 0,00 | - |
| 14 | 14 207 | 14 209 | **5,06** | 108,9 | 0,00 | 94,05 | - | - | 0,00 | 0,00 | - |
| 15 | 11 475 | 11 478 | **7,73** | 108,9 | 0,00 | 92,20 | - | - | 0,00 | 0,00 | - |
| 16 | 12 470 | 12 472 | **6,70** | 108,9 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| 17 | 12 614 | 12 616 | **6,53** | 108,9 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| 18 | 13 478 | 13 480 | **5,71** | 108,9 | 0,00 | 93,59 | - | - | 0,00 | 0,00 | - |
| 19 | 13 538 | 13 540 | **5,69** | 108,9 | 0,00 | 93,63 | - | - | 0,00 | 0,00 | - |
| 2 | 10 494 | 10 497 | **8,79** | 108,9 | 0,00 | 91,42 | - | - | 0,00 | 0,00 | - |
| 20 | 15 102 | 15 104 | **4,30** | 108,9 | 0,00 | 94,58 | - | - | 0,00 | 0,00 | - |
| 21 | 14 115 | 14 117 | **5,14** | 108,9 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |
| 22 | 15 810 | 15 812 | **3,75** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 23 | 15 946 | 15 948 | **3,62** | 108,9 | 0,00 | 95,05 | - | - | 0,00 | 0,00 | - |
| 24 | 13 174 | 13 176 | **6,00** | 108,9 | 0,00 | 93,40 | - | - | 0,00 | 0,00 | - |
| 25 | 15 633 | 15 634 | **3,87** | 108,9 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 26 | 16 736 | 16 738 | **3,01** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 27 | 16 584 | 16 586 | **3,13** | 108,9 | 0,00 | 95,39 | - | - | 0,00 | 0,00 | - |
| 28 | 14 979 | 14 981 | **4,40** | 108,9 | 0,00 | 94,51 | - | - | 0,00 | 0,00 | - |
| 29 | 14 283 | 14 285 | **5,00** | 108,9 | 0,00 | 94,10 | - | - | 0,00 | 0,00 | - |
| 3 | 9 994 | 9 998 | **9,36** | 108,9 | 0,00 | 91,00 | - | - | 0,00 | 0,00 | - |
| 30 | 12 252 | 12 255 | **6,89** | 108,9 | 0,00 | 92,77 | - | - | 0,00 | 0,00 | - |
| 31 | 14 900 | 14 902 | **4,47** | 108,9 | 0,00 | 94,47 | - | - | 0,00 | 0,00 | - |
| 4 | 10 868 | 10 871 | **8,35** | 108,9 | 0,00 | 91,73 | - | - | 0,00 | 0,00 | - |
| 5 | 11 807 | 11 810 | **7,34** | 108,9 | 0,00 | 92,44 | - | - | 0,00 | 0,00 | - |
| 6 | 9 484 | 9 488 | **9,98** | 108,9 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 61 | 6 011 | 6 014 | **10,45** | 106,0 | 0,00 | 86,58 | - | - | 0,00 | 0,00 | - |
| 62 | 5 477 | 5 480 | **11,66** | 106,0 | 0,00 | 85,78 | - | - | 0,00 | 0,00 | - |
| 63 | 4 843 | 4 847 | **13,35** | 106,0 | 0,00 | 84,71 | - | - | 0,00 | 0,00 | - |
| 64 | 6 523 | 6 526 | **9,48** | 106,0 | 0,00 | 87,29 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 7 219 | 7 222 | **8,27** | 106,0 | 0,00 | 88,17 | - | - | 0,00 | 0,00 | - |
| 66 | 7 977 | 7 980 | **7,08** | 106,0 | 0,00 | 89,04 | - | - | 0,00 | 0,00 | - |
| 67 | 6 751 | 6 754 | **9,07** | 106,0 | 0,00 | 87,59 | - | - | 0,00 | 0,00 | - |
| 68 | 8 045 | 8 047 | **7,00** | 106,0 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |
| 69 | 8 666 | 8 668 | **6,10** | 106,0 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| 7 | 9 683 | 9 685 | **9,74** | 108,9 | 0,00 | 90,72 | - | - | 0,00 | 0,00 | - |
| 70 | 7 246 | 7 249 | **8,25** | 106,0 | 0,00 | 88,21 | - | - | 0,00 | 0,00 | - |
| 71 | 6 073 | 6 076 | **10,34** | 106,0 | 0,00 | 86,67 | - | - | 0,00 | 0,00 | - |
| 72 | 4 964 | 4 967 | **13,02** | 106,0 | 0,00 | 84,92 | - | - | 0,00 | 0,00 | - |
| 73 | 5 079 | 5 083 | **12,72** | 106,0 | 0,00 | 85,12 | - | - | 0,00 | 0,00 | - |
| 74 | 6 543 | 6 546 | **9,46** | 106,0 | 0,00 | 87,32 | - | - | 0,00 | 0,00 | - |
| 75 | 6 301 | 6 304 | **9,89** | 106,0 | 0,00 | 86,99 | - | - | 0,00 | 0,00 | - |
| 76 | 5 309 | 5 313 | **12,10** | 106,0 | 0,00 | 85,51 | - | - | 0,00 | 0,00 | - |
| 77 | 4 749 | 4 754 | **13,64** | 106,0 | 0,00 | 84,54 | - | - | 0,00 | 0,00 | - |
| 78 | 3 830 | 3 835 | **16,56** | 106,0 | 0,00 | 82,68 | - | - | 0,00 | 0,00 | - |
| 79 | 3 457 | 3 462 | **17,94** | 106,0 | 0,00 | 81,79 | - | - | 0,00 | 0,00 | - |
| 8 | 10 419 | 10 422 | **8,86** | 108,9 | 0,00 | 91,36 | - | - | 0,00 | 0,00 | - |
| 80 | 3 233 | 3 239 | **18,84** | 106,0 | 0,00 | 81,21 | - | - | 0,00 | 0,00 | - |
| 81 | 4 063 | 4 068 | **15,75** | 106,0 | 0,00 | 83,19 | - | - | 0,00 | 0,00 | - |
| 82 | 4 480 | 4 485 | **14,42** | 106,0 | 0,00 | 84,03 | - | - | 0,00 | 0,00 | - |
| 83 | 2 717 | 2 724 | **21,14** | 106,0 | 0,00 | 79,70 | - | - | 0,00 | 0,00 | - |
| 84 | 3 301 | 3 306 | **18,56** | 106,0 | 0,00 | 81,39 | - | - | 0,00 | 0,00 | - |
| 85 | 3 725 | 3 730 | **16,94** | 106,0 | 0,00 | 82,43 | - | - | 0,00 | 0,00 | - |
| 86 | 4 269 | 4 273 | **15,08** | 106,0 | 0,00 | 83,61 | - | - | 0,00 | 0,00 | - |
| 87 | 2 393 | 2 401 | **22,81** | 106,0 | 0,00 | 78,61 | - | - | 0,00 | 0,00 | - |
| 88 | 2 936 | 2 943 | **20,12** | 106,0 | 0,00 | 80,37 | - | - | 0,00 | 0,00 | - |
| 89 | 3 557 | 3 563 | **17,56** | 106,0 | 0,00 | 82,04 | - | - | 0,00 | 0,00 | - |
| 9 | 12 651 | 12 654 | **6,49** | 108,9 | 0,00 | 93,04 | - | - | 0,00 | 0,00 | - |
| 90 | 4 079 | 4 084 | **15,73** | 106,0 | 0,00 | 83,22 | - | - | 0,00 | 0,00 | - |
| 91 | 4 719 | 4 723 | **13,72** | 106,0 | 0,00 | 84,48 | - | - | 0,00 | 0,00 | - |
| 92 | 3 269 | 3 275 | **18,72** | 106,0 | 0,00 | 81,30 | - | - | 0,00 | 0,00 | - |
| 93 | 2 618 | 2 626 | **21,61** | 106,0 | 0,00 | 79,39 | - | - | 0,00 | 0,00 | - |
| 94 | 2 038 | 2 047 | **24,81** | 106,0 | 0,00 | 77,22 | - | - | 0,00 | 0,00 | - |
| 95 | 2 516 | 2 524 | **22,13** | 106,0 | 0,00 | 79,04 | - | - | 0,00 | 0,00 | - |
| 96 | 2 062 | 2 071 | **24,67** | 106,0 | 0,00 | 77,32 | - | - | 0,00 | 0,00 | - |
| 97 | 3 174 | 3 180 | **19,08** | 106,0 | 0,00 | 81,05 | - | - | 0,00 | 0,00 | - |
| 98 | 4 211 | 4 215 | **15,27** | 106,0 | 0,00 | 83,50 | - | - | 0,00 | 0,00 | - |
| 99 | 3 789 | 3 794 | **16,70** | 106,0 | 0,00 | 82,58 | - | - | 0,00 | 0,00 | - |
| T1 | 11 268 | 11 270 | **7,95** | 110,1 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| T10 | 8 473 | 8 476 | **11,57** | 110,1 | 0,00 | 89,56 | - | - | 0,00 | 0,00 | - |
| T11 | 8 946 | 8 949 | **10,89** | 110,1 | 0,00 | 90,04 | - | - | 0,00 | 0,00 | - |
| T12 | 7 729 | 7 732 | **12,70** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T13 | 7 234 | 7 238 | **13,51** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T14 | 7 715 | 7 719 | **12,73** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T15 | 8 196 | 8 199 | **11,98** | 110,1 | 0,00 | 89,28 | - | - | 0,00 | 0,00 | - |
| T16 | 6 619 | 6 623 | **14,59** | 110,1 | 0,00 | 87,42 | - | - | 0,00 | 0,00 | - |
| T17 | 6 726 | 6 730 | **14,39** | 110,1 | 0,00 | 87,56 | - | - | 0,00 | 0,00 | - |
| T18 | 7 142 | 7 147 | **13,67** | 110,1 | 0,00 | 88,08 | - | - | 0,00 | 0,00 | - |
| T19 | 5 706 | 5 711 | **16,62** | 110,1 | 0,00 | 86,13 | - | - | 0,00 | 0,00 | - |
| T2 | 10 776 | 10 779 | **8,52** | 110,1 | 0,00 | 91,65 | - | - | 0,00 | 0,00 | - |
| T20 | 5 729 | 5 734 | **16,56** | 110,1 | 0,00 | 86,17 | - | - | 0,00 | 0,00 | - |
| T21 | 6 108 | 6 112 | **15,68** | 110,1 | 0,00 | 86,72 | - | - | 0,00 | 0,00 | - |
| T22 | 4 762 | 4 768 | **19,08** | 110,1 | 0,00 | 84,57 | - | - | 0,00 | 0,00 | - |
| T23 | 5 033 | 5 038 | **18,33** | 110,1 | 0,00 | 85,05 | - | - | 0,00 | 0,00 | - |
| T24 | 5 785 | 5 789 | **16,43** | 110,1 | 0,00 | 86,25 | - | - | 0,00 | 0,00 | - |
| T25 | 3 801 | 3 808 | **22,09** | 110,1 | 0,00 | 82,61 | - | - | 0,00 | 0,00 | - |
| T26 | 4 364 | 4 370 | **20,26** | 110,1 | 0,00 | 83,81 | - | - | 0,00 | 0,00 | - |
| T27 | 4 946 | 4 951 | **18,57** | 110,1 | 0,00 | 84,89 | - | - | 0,00 | 0,00 | - |
| T28 | 2 753 | 2 761 | **26,25** | 110,1 | 0,00 | 79,82 | - | - | 0,00 | 0,00 | - |
| T29 | 3 555 | 3 562 | **22,97** | 110,1 | 0,00 | 82,03 | - | - | 0,00 | 0,00 | - |
| T3 | 9 937 | 9 939 | **9,56** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T4 | 9 838 | 9 841 | **9,69** | 110,1 | 0,00 | 90,86 | - | - | 0,00 | 0,00 | - |
| T5 | 9 120 | 9 123 | **10,64** | 110,1 | 0,00 | 90,20 | - | - | 0,00 | 0,00 | - |
| T6 | 8 970 | 8 972 | **10,85** | 110,1 | 0,00 | 90,06 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

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**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T7 | 9 521 | 9 524 | **10,10** | 110,1 | 0,00 | 90,58 | - | - | 0,00 | 0,00 | - |
| T8 | 9 743 | 9 746 | **9,81** | 110,1 | 0,00 | 90,78 | - | - | 0,00 | 0,00 | - |
| T9 | 8 396 | 8 399 | **11,68** | 110,1 | 0,00 | 89,48 | - | - | 0,00 | 0,00 | - |
| Sum | | | **36,36** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 500 | 16 502 | **3,21** | 108,9 | 0,00 | 95,35 | - | - | 0,00 | 0,00 | - |
| 10 | 17 677 | 17 678 | **2,32** | 108,9 | 0,00 | 95,95 | - | - | 0,00 | 0,00 | - |
| 100 | 11 513 | 11 514 | **3,25** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 101 | 9 132 | 9 134 | **6,25** | 106,0 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| 102 | 9 806 | 9 808 | **5,30** | 106,0 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| 11 | 16 528 | 16 530 | **3,17** | 108,9 | 0,00 | 95,37 | - | - | 0,00 | 0,00 | - |
| 12 | 15 748 | 15 749 | **3,79** | 108,9 | 0,00 | 94,95 | - | - | 0,00 | 0,00 | - |
| 13 | 17 412 | 17 414 | **2,55** | 108,9 | 0,00 | 95,82 | - | - | 0,00 | 0,00 | - |
| 14 | 20 455 | 20 457 | **0,49** | 108,9 | 0,00 | 97,22 | - | - | 0,00 | 0,00 | - |
| 15 | 16 689 | 16 690 | **3,06** | 108,9 | 0,00 | 95,45 | - | - | 0,00 | 0,00 | - |
| 16 | 17 765 | 17 767 | **2,27** | 108,9 | 0,00 | 95,99 | - | - | 0,00 | 0,00 | - |
| 17 | 18 305 | 18 306 | **1,91** | 108,9 | 0,00 | 96,25 | - | - | 0,00 | 0,00 | - |
| 18 | 19 197 | 19 198 | **1,30** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |
| 19 | 18 758 | 18 760 | **1,57** | 108,9 | 0,00 | 96,46 | - | - | 0,00 | 0,00 | - |
| 2 | 17 541 | 17 543 | **2,45** | 108,9 | 0,00 | 95,88 | - | - | 0,00 | 0,00 | - |
| 20 | 20 564 | 20 565 | **0,41** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 21 | 20 046 | 20 047 | **0,73** | 108,9 | 0,00 | 97,04 | - | - | 0,00 | 0,00 | - |
| 22 | 21 464 | 21 465 | **-0,12** | 108,9 | 0,00 | 97,63 | - | - | 0,00 | 0,00 | - |
| 23 | 21 938 | 21 939 | **-0,43** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 24 | 19 263 | 19 265 | **1,27** | 108,9 | 0,00 | 96,70 | - | - | 0,00 | 0,00 | - |
| 25 | 21 917 | 21 919 | **-0,41** | 108,9 | 0,00 | 97,82 | - | - | 0,00 | 0,00 | - |
| 26 | 22 518 | 22 519 | **-0,76** | 108,9 | 0,00 | 98,05 | - | - | 0,00 | 0,00 | - |
| 27 | 22 757 | 22 759 | **-0,89** | 108,9 | 0,00 | 98,14 | - | - | 0,00 | 0,00 | - |
| 28 | 20 931 | 20 932 | **0,18** | 108,9 | 0,00 | 97,42 | - | - | 0,00 | 0,00 | - |
| 29 | 19 914 | 19 915 | **0,84** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 3 | 16 648 | 16 650 | **3,08** | 108,9 | 0,00 | 95,43 | - | - | 0,00 | 0,00 | - |
| 30 | 18 388 | 18 390 | **1,87** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 31 | 21 305 | 21 307 | **-0,07** | 108,9 | 0,00 | 97,57 | - | - | 0,00 | 0,00 | - |
| 4 | 17 482 | 17 484 | **2,46** | 108,9 | 0,00 | 95,85 | - | - | 0,00 | 0,00 | - |
| 5 | 18 378 | 18 380 | **1,83** | 108,9 | 0,00 | 96,29 | - | - | 0,00 | 0,00 | - |
| 6 | 15 818 | 15 820 | **3,77** | 108,9 | 0,00 | 94,98 | - | - | 0,00 | 0,00 | - |
| 61 | 12 678 | 12 679 | **1,51** | 106,0 | 0,00 | 93,06 | - | - | 0,00 | 0,00 | - |
| 62 | 12 203 | 12 205 | **1,96** | 106,0 | 0,00 | 92,73 | - | - | 0,00 | 0,00 | - |
| 63 | 11 585 | 11 586 | **2,60** | 106,0 | 0,00 | 92,28 | - | - | 0,00 | 0,00 | - |
| 64 | 13 244 | 13 246 | **0,97** | 106,0 | 0,00 | 93,44 | - | - | 0,00 | 0,00 | - |
| 65 | 14 016 | 14 017 | **0,27** | 106,0 | 0,00 | 93,93 | - | - | 0,00 | 0,00 | - |
| 66 | 14 820 | 14 822 | **-0,41** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 67 | 13 693 | 13 694 | **0,56** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 68 | 15 048 | 15 049 | **-0,59** | 106,0 | 0,00 | 94,55 | - | - | 0,00 | 0,00 | - |
| 69 | 15 628 | 15 629 | **-1,06** | 106,0 | 0,00 | 94,88 | - | - | 0,00 | 0,00 | - |
| 7 | 15 555 | 15 557 | **4,00** | 108,9 | 0,00 | 94,84 | - | - | 0,00 | 0,00 | - |
| 70 | 14 291 | 14 292 | **0,05** | 106,0 | 0,00 | 94,10 | - | - | 0,00 | 0,00 | - |
| 71 | 13 134 | 13 135 | **1,08** | 106,0 | 0,00 | 93,37 | - | - | 0,00 | 0,00 | - |
| 72 | 11 944 | 11 945 | **2,24** | 106,0 | 0,00 | 92,54 | - | - | 0,00 | 0,00 | - |
| 73 | 12 198 | 12 200 | **1,99** | 106,0 | 0,00 | 92,73 | - | - | 0,00 | 0,00 | - |
| 74 | 13 706 | 13 707 | **0,57** | 106,0 | 0,00 | 93,74 | - | - | 0,00 | 0,00 | - |
| 75 | 13 526 | 13 527 | **0,75** | 106,0 | 0,00 | 93,62 | - | - | 0,00 | 0,00 | - |
| 76 | 12 510 | 12 512 | **2,25** | 106,0 | 0,00 | 92,95 | - | - | 0,00 | 0,00 | - |
| 77 | 11 915 | 11 916 | **2,87** | 106,0 | 0,00 | 92,52 | - | - | 0,00 | 0,00 | - |
| 78 | 10 845 | 10 847 | **4,09** | 106,0 | 0,00 | 91,71 | - | - | 0,00 | 0,00 | - |
| 79 | 10 265 | 10 266 | **4,81** | 106,0 | 0,00 | 91,23 | - | - | 0,00 | 0,00 | - |
| 8 | 16 730 | 16 731 | **3,03** | 108,9 | 0,00 | 95,47 | - | - | 0,00 | 0,00 | - |
| 80 | 9 832 | 9 834 | **5,37** | 106,0 | 0,00 | 90,85 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 81 | 10 793 | 10 795 | **4,21** | 106,0 | 0,00 | 91,66 | - | - | 0,00 | 0,00 | - |
| 82 | 11 509 | 11 510 | **3,35** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 83 | 9 588 | 9 589 | **4,92** | 106,0 | 0,00 | 90,64 | - | - | 0,00 | 0,00 | - |
| 84 | 10 070 | 10 072 | **4,31** | 106,0 | 0,00 | 91,06 | - | - | 0,00 | 0,00 | - |
| 85 | 10 542 | 10 544 | **3,75** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 86 | 11 168 | 11 169 | **3,06** | 106,0 | 0,00 | 91,96 | - | - | 0,00 | 0,00 | - |
| 87 | 9 541 | 9 542 | **5,03** | 106,0 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| 88 | 10 030 | 10 032 | **4,39** | 106,0 | 0,00 | 91,03 | - | - | 0,00 | 0,00 | - |
| 89 | 10 585 | 10 586 | **3,72** | 106,0 | 0,00 | 91,49 | - | - | 0,00 | 0,00 | - |
| 9 | 19 046 | 19 048 | **1,39** | 108,9 | 0,00 | 96,60 | - | - | 0,00 | 0,00 | - |
| 90 | 11 272 | 11 273 | **2,99** | 106,0 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| 91 | 11 917 | 11 919 | **2,31** | 106,0 | 0,00 | 92,52 | - | - | 0,00 | 0,00 | - |
| 92 | 10 487 | 10 489 | **3,89** | 106,0 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| 93 | 9 901 | 9 902 | **4,86** | 106,0 | 0,00 | 90,91 | - | - | 0,00 | 0,00 | - |
| 94 | 9 346 | 9 348 | **5,70** | 106,0 | 0,00 | 90,41 | - | - | 0,00 | 0,00 | - |
| 95 | 9 784 | 9 786 | **5,25** | 106,0 | 0,00 | 90,81 | - | - | 0,00 | 0,00 | - |
| 96 | 9 240 | 9 242 | **5,99** | 106,0 | 0,00 | 90,32 | - | - | 0,00 | 0,00 | - |
| 97 | 10 466 | 10 467 | **4,39** | 106,0 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| 98 | 11 512 | 11 514 | **3,18** | 106,0 | 0,00 | 92,22 | - | - | 0,00 | 0,00 | - |
| 99 | 11 020 | 11 022 | **3,82** | 106,0 | 0,00 | 91,85 | - | - | 0,00 | 0,00 | - |
| T1 | 12 636 | 12 638 | **7,85** | 110,1 | 0,00 | 93,03 | - | - | 0,00 | 0,00 | - |
| T10 | 11 638 | 11 640 | **8,74** | 110,1 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| T11 | 12 857 | 12 859 | **7,39** | 110,1 | 0,00 | 93,18 | - | - | 0,00 | 0,00 | - |
| T12 | 10 368 | 10 370 | **10,26** | 110,1 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| T13 | 10 507 | 10 509 | **10,04** | 110,1 | 0,00 | 91,43 | - | - | 0,00 | 0,00 | - |
| T14 | 11 547 | 11 549 | **8,81** | 110,1 | 0,00 | 92,25 | - | - | 0,00 | 0,00 | - |
| T15 | 12 471 | 12 473 | **7,78** | 110,1 | 0,00 | 92,92 | - | - | 0,00 | 0,00 | - |
| T16 | 9 350 | 9 352 | **11,55** | 110,1 | 0,00 | 90,42 | - | - | 0,00 | 0,00 | - |
| T17 | 10 591 | 10 594 | **9,92** | 110,1 | 0,00 | 91,50 | - | - | 0,00 | 0,00 | - |
| T18 | 11 555 | 11 557 | **8,75** | 110,1 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| T19 | 8 505 | 8 507 | **12,74** | 110,1 | 0,00 | 89,60 | - | - | 0,00 | 0,00 | - |
| T2 | 12 590 | 12 592 | **7,85** | 110,1 | 0,00 | 93,00 | - | - | 0,00 | 0,00 | - |
| T20 | 9 434 | 9 436 | **11,38** | 110,1 | 0,00 | 90,50 | - | - | 0,00 | 0,00 | - |
| T21 | 10 738 | 10 741 | **9,69** | 110,1 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| T22 | 8 288 | 8 291 | **13,00** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T23 | 9 295 | 9 298 | **11,54** | 110,1 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| T24 | 10 912 | 10 914 | **9,46** | 110,1 | 0,00 | 91,76 | - | - | 0,00 | 0,00 | - |
| T25 | 8 107 | 8 110 | **13,23** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T26 | 9 191 | 9 194 | **11,65** | 110,1 | 0,00 | 90,27 | - | - | 0,00 | 0,00 | - |
| T27 | 10 402 | 10 404 | **10,05** | 110,1 | 0,00 | 91,34 | - | - | 0,00 | 0,00 | - |
| T28 | 7 498 | 7 501 | **14,15** | 110,1 | 0,00 | 88,50 | - | - | 0,00 | 0,00 | - |
| T29 | 9 098 | 9 101 | **11,74** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T3 | 11 631 | 11 633 | **8,89** | 110,1 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| T4 | 12 167 | 12 169 | **8,25** | 110,1 | 0,00 | 92,71 | - | - | 0,00 | 0,00 | - |
| T5 | 10 799 | 10 801 | **9,84** | 110,1 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| T6 | 11 650 | 11 653 | **8,75** | 110,1 | 0,00 | 92,33 | - | - | 0,00 | 0,00 | - |
| T7 | 12 619 | 12 621 | **7,69** | 110,1 | 0,00 | 93,02 | - | - | 0,00 | 0,00 | - |
| T8 | 13 338 | 13 340 | **6,92** | 110,1 | 0,00 | 93,50 | - | - | 0,00 | 0,00 | - |
| T9 | 10 475 | 10 477 | **10,19** | 110,1 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| Sum | | | **26,58** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: M Lomarakennus M (Haukilahti)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 226 | 18 228 | **2,09** | 108,9 | 0,00 | 96,21 | - | - | 0,00 | 0,00 | - |
| 10 | 20 098 | 20 099 | **0,72** | 108,9 | 0,00 | 97,06 | - | - | 0,00 | 0,00 | - |
| 100 | 12 222 | 12 223 | **2,47** | 106,0 | 0,00 | 92,74 | - | - | 0,00 | 0,00 | - |
| 101 | 9 499 | 9 501 | **5,59** | 106,0 | 0,00 | 90,56 | - | - | 0,00 | 0,00 | - |
| 102 | 10 376 | 10 378 | **4,51** | 106,0 | 0,00 | 91,32 | - | - | 0,00 | 0,00 | - |
| 11 | 19 284 | 19 286 | **1,33** | 108,9 | 0,00 | 96,70 | - | - | 0,00 | 0,00 | - |
| 12 | 18 831 | 18 832 | **1,56** | 108,9 | 0,00 | 96,50 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 20 250 | 20 252 | **0,64** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 14 | 22 912 | 22 913 | **-0,98** | 108,9 | 0,00 | 98,20 | - | - | 0,00 | 0,00 | - |
| 15 | 19 759 | 19 760 | **0,94** | 108,9 | 0,00 | 96,92 | - | - | 0,00 | 0,00 | - |
| 16 | 20 810 | 20 811 | **0,27** | 108,9 | 0,00 | 97,37 | - | - | 0,00 | 0,00 | - |
| 17 | 21 133 | 21 134 | **0,10** | 108,9 | 0,00 | 97,50 | - | - | 0,00 | 0,00 | - |
| 18 | 22 016 | 22 018 | **-0,42** | 108,9 | 0,00 | 97,86 | - | - | 0,00 | 0,00 | - |
| 19 | 21 856 | 21 857 | **-0,37** | 108,9 | 0,00 | 97,79 | - | - | 0,00 | 0,00 | - |
| 2 | 19 141 | 19 142 | **1,51** | 108,9 | 0,00 | 96,64 | - | - | 0,00 | 0,00 | - |
| 20 | 23 550 | 23 551 | **-1,37** | 108,9 | 0,00 | 98,44 | - | - | 0,00 | 0,00 | - |
| 21 | 22 735 | 22 736 | **-0,88** | 108,9 | 0,00 | 98,13 | - | - | 0,00 | 0,00 | - |
| 22 | 24 344 | 24 345 | **-1,77** | 108,9 | 0,00 | 98,73 | - | - | 0,00 | 0,00 | - |
| 23 | 24 596 | 24 597 | **-1,92** | 108,9 | 0,00 | 98,82 | - | - | 0,00 | 0,00 | - |
| 24 | 21 835 | 21 836 | **-0,37** | 108,9 | 0,00 | 97,78 | - | - | 0,00 | 0,00 | - |
| 25 | 24 349 | 24 351 | **-1,78** | 108,9 | 0,00 | 98,73 | - | - | 0,00 | 0,00 | - |
| 26 | 25 323 | 25 324 | **-2,25** | 108,9 | 0,00 | 99,07 | - | - | 0,00 | 0,00 | - |
| 27 | 25 282 | 25 283 | **-2,28** | 108,9 | 0,00 | 99,06 | - | - | 0,00 | 0,00 | - |
| 28 | 23 611 | 23 613 | **-1,38** | 108,9 | 0,00 | 98,46 | - | - | 0,00 | 0,00 | - |
| 29 | 22 795 | 22 796 | **-0,91** | 108,9 | 0,00 | 98,16 | - | - | 0,00 | 0,00 | - |
| 3 | 18 737 | 18 739 | **1,65** | 108,9 | 0,00 | 96,45 | - | - | 0,00 | 0,00 | - |
| 30 | 20 920 | 20 921 | **0,18** | 108,9 | 0,00 | 97,41 | - | - | 0,00 | 0,00 | - |
| 31 | 23 633 | 23 634 | **-1,37** | 108,9 | 0,00 | 98,47 | - | - | 0,00 | 0,00 | - |
| 4 | 19 610 | 19 611 | **1,06** | 108,9 | 0,00 | 96,85 | - | - | 0,00 | 0,00 | - |
| 5 | 20 548 | 20 550 | **0,46** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 6 | 18 181 | 18 183 | **2,00** | 108,9 | 0,00 | 96,19 | - | - | 0,00 | 0,00 | - |
| 61 | 14 743 | 14 744 | **-0,31** | 106,0 | 0,00 | 94,37 | - | - | 0,00 | 0,00 | - |
| 62 | 14 213 | 14 214 | **0,14** | 106,0 | 0,00 | 94,05 | - | - | 0,00 | 0,00 | - |
| 63 | 13 577 | 13 578 | **0,70** | 106,0 | 0,00 | 93,66 | - | - | 0,00 | 0,00 | - |
| 64 | 15 263 | 15 264 | **-0,73** | 106,0 | 0,00 | 94,67 | - | - | 0,00 | 0,00 | - |
| 65 | 15 961 | 15 962 | **-1,27** | 106,0 | 0,00 | 95,06 | - | - | 0,00 | 0,00 | - |
| 66 | 16 714 | 16 715 | **-1,82** | 106,0 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 67 | 15 478 | 15 479 | **-0,85** | 106,0 | 0,00 | 94,80 | - | - | 0,00 | 0,00 | - |
| 68 | 16 741 | 16 742 | **-1,79** | 106,0 | 0,00 | 95,48 | - | - | 0,00 | 0,00 | - |
| 69 | 17 372 | 17 373 | **-2,25** | 106,0 | 0,00 | 95,80 | - | - | 0,00 | 0,00 | - |
| 7 | 18 235 | 18 237 | **2,04** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 70 | 15 933 | 15 934 | **-1,17** | 106,0 | 0,00 | 95,05 | - | - | 0,00 | 0,00 | - |
| 71 | 14 769 | 14 770 | **-0,24** | 106,0 | 0,00 | 94,39 | - | - | 0,00 | 0,00 | - |
| 72 | 13 697 | 13 698 | **0,64** | 106,0 | 0,00 | 93,73 | - | - | 0,00 | 0,00 | - |
| 73 | 13 763 | 13 764 | **0,63** | 106,0 | 0,00 | 93,77 | - | - | 0,00 | 0,00 | - |
| 74 | 15 162 | 15 163 | **-0,50** | 106,0 | 0,00 | 94,62 | - | - | 0,00 | 0,00 | - |
| 75 | 14 850 | 14 851 | **-0,21** | 106,0 | 0,00 | 94,44 | - | - | 0,00 | 0,00 | - |
| 76 | 12 977 | 12 979 | **1,75** | 106,0 | 0,00 | 93,26 | - | - | 0,00 | 0,00 | - |
| 77 | 12 365 | 12 366 | **2,35** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 78 | 11 197 | 11 199 | **3,59** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 79 | 10 486 | 10 487 | **4,42** | 106,0 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| 8 | 19 118 | 19 119 | **1,36** | 108,9 | 0,00 | 96,63 | - | - | 0,00 | 0,00 | - |
| 80 | 9 956 | 9 958 | **5,06** | 106,0 | 0,00 | 90,96 | - | - | 0,00 | 0,00 | - |
| 81 | 10 838 | 10 840 | **4,04** | 106,0 | 0,00 | 91,70 | - | - | 0,00 | 0,00 | - |
| 82 | 11 786 | 11 788 | **2,97** | 106,0 | 0,00 | 92,43 | - | - | 0,00 | 0,00 | - |
| 83 | 11 445 | 11 446 | **2,78** | 106,0 | 0,00 | 92,17 | - | - | 0,00 | 0,00 | - |
| 84 | 12 019 | 12 020 | **2,18** | 106,0 | 0,00 | 92,60 | - | - | 0,00 | 0,00 | - |
| 85 | 12 458 | 12 460 | **1,75** | 106,0 | 0,00 | 92,91 | - | - | 0,00 | 0,00 | - |
| 86 | 13 012 | 13 013 | **1,23** | 106,0 | 0,00 | 93,29 | - | - | 0,00 | 0,00 | - |
| 87 | 11 121 | 11 122 | **3,18** | 106,0 | 0,00 | 91,92 | - | - | 0,00 | 0,00 | - |
| 88 | 11 669 | 11 670 | **2,59** | 106,0 | 0,00 | 92,34 | - | - | 0,00 | 0,00 | - |
| 89 | 12 295 | 12 297 | **1,94** | 106,0 | 0,00 | 92,80 | - | - | 0,00 | 0,00 | - |
| 9 | 21 376 | 21 378 | **-0,07** | 108,9 | 0,00 | 97,60 | - | - | 0,00 | 0,00 | - |
| 90 | 12 734 | 12 736 | **1,60** | 106,0 | 0,00 | 93,10 | - | - | 0,00 | 0,00 | - |
| 91 | 13 350 | 13 351 | **1,04** | 106,0 | 0,00 | 93,51 | - | - | 0,00 | 0,00 | - |
| 92 | 11 928 | 11 929 | **2,39** | 106,0 | 0,00 | 92,53 | - | - | 0,00 | 0,00 | - |
| 93 | 11 214 | 11 215 | **3,17** | 106,0 | 0,00 | 92,00 | - | - | 0,00 | 0,00 | - |
| 94 | 10 539 | 10 541 | **3,98** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 95 | 10 713 | 10 714 | **3,87** | 106,0 | 0,00 | 91,60 | - | - | 0,00 | 0,00 | - |
| 96 | 10 079 | 10 081 | **4,63** | 106,0 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| 97 | 11 398 | 11 400 | **3,14** | 106,0 | 0,00 | 92,14 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | 12 413 | 12 415 | **2,23** | 106,0 | 0,00 | 92,88 | - | - | 0,00 | 0,00 | - |
| 99 | 11 707 | 11 709 | **3,01** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| T1 | 8 960 | 8 963 | **12,33** | 110,1 | 0,00 | 90,05 | - | - | 0,00 | 0,00 | - |
| T10 | 9 035 | 9 038 | **12,29** | 110,1 | 0,00 | 90,12 | - | - | 0,00 | 0,00 | - |
| T11 | 10 479 | 10 481 | **10,37** | 110,1 | 0,00 | 91,41 | - | - | 0,00 | 0,00 | - |
| T12 | 7 744 | 7 747 | **14,21** | 110,1 | 0,00 | 88,78 | - | - | 0,00 | 0,00 | - |
| T13 | 8 221 | 8 224 | **13,43** | 110,1 | 0,00 | 89,30 | - | - | 0,00 | 0,00 | - |
| T14 | 9 357 | 9 360 | **11,80** | 110,1 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| T15 | 10 380 | 10 383 | **10,44** | 110,1 | 0,00 | 91,33 | - | - | 0,00 | 0,00 | - |
| T16 | 7 082 | 7 086 | **15,11** | 110,1 | 0,00 | 88,01 | - | - | 0,00 | 0,00 | - |
| T17 | 8 642 | 8 645 | **12,63** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T18 | 9 724 | 9 726 | **11,12** | 110,1 | 0,00 | 90,76 | - | - | 0,00 | 0,00 | - |
| T19 | 6 612 | 6 615 | **15,77** | 110,1 | 0,00 | 87,41 | - | - | 0,00 | 0,00 | - |
| T2 | 9 123 | 9 126 | **12,11** | 110,1 | 0,00 | 90,21 | - | - | 0,00 | 0,00 | - |
| T20 | 7 735 | 7 738 | **13,91** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T21 | 9 235 | 9 237 | **11,67** | 110,1 | 0,00 | 90,31 | - | - | 0,00 | 0,00 | - |
| T22 | 6 954 | 6 958 | **15,01** | 110,1 | 0,00 | 87,85 | - | - | 0,00 | 0,00 | - |
| T23 | 7 994 | 7 997 | **13,36** | 110,1 | 0,00 | 89,06 | - | - | 0,00 | 0,00 | - |
| T24 | 9 693 | 9 696 | **10,94** | 110,1 | 0,00 | 90,73 | - | - | 0,00 | 0,00 | - |
| T25 | 7 352 | 7 355 | **14,28** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T26 | 8 286 | 8 288 | **12,85** | 110,1 | 0,00 | 89,37 | - | - | 0,00 | 0,00 | - |
| T27 | 9 533 | 9 536 | **11,07** | 110,1 | 0,00 | 90,59 | - | - | 0,00 | 0,00 | - |
| T28 | 7 363 | 7 366 | **14,12** | 110,1 | 0,00 | 88,34 | - | - | 0,00 | 0,00 | - |
| T29 | 8 685 | 8 688 | **12,17** | 110,1 | 0,00 | 89,78 | - | - | 0,00 | 0,00 | - |
| T3 | 8 241 | 8 244 | **13,43** | 110,1 | 0,00 | 89,32 | - | - | 0,00 | 0,00 | - |
| T4 | 9 015 | 9 018 | **12,33** | 110,1 | 0,00 | 90,10 | - | - | 0,00 | 0,00 | - |
| T5 | 7 547 | 7 550 | **14,53** | 110,1 | 0,00 | 88,56 | - | - | 0,00 | 0,00 | - |
| T6 | 8 773 | 8 776 | **12,68** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T7 | 9 809 | 9 812 | **11,25** | 110,1 | 0,00 | 90,83 | - | - | 0,00 | 0,00 | - |
| T8 | 10 705 | 10 707 | **10,09** | 110,1 | 0,00 | 91,59 | - | - | 0,00 | 0,00 | - |
| T9 | 7 508 | 7 510 | **14,60** | 110,1 | 0,00 | 88,51 | - | - | 0,00 | 0,00 | - |
| Sum | | | **28,35** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: N Lomarakennus N (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 629 | 17 630 | **2,38** | 108,9 | 0,00 | 95,93 | - | - | 0,00 | 0,00 | - |
| 10 | 19 514 | 19 515 | **1,06** | 108,9 | 0,00 | 96,81 | - | - | 0,00 | 0,00 | - |
| 100 | 11 625 | 11 626 | **2,57** | 106,0 | 0,00 | 92,31 | - | - | 0,00 | 0,00 | - |
| 101 | 8 904 | 8 906 | **5,79** | 106,0 | 0,00 | 89,99 | - | - | 0,00 | 0,00 | - |
| 102 | 9 779 | 9 781 | **4,68** | 106,0 | 0,00 | 90,81 | - | - | 0,00 | 0,00 | - |
| 11 | 18 715 | 18 716 | **1,70** | 108,9 | 0,00 | 96,44 | - | - | 0,00 | 0,00 | - |
| 12 | 18 280 | 18 282 | **1,94** | 108,9 | 0,00 | 96,24 | - | - | 0,00 | 0,00 | - |
| 13 | 19 684 | 19 685 | **1,03** | 108,9 | 0,00 | 96,88 | - | - | 0,00 | 0,00 | - |
| 14 | 22 327 | 22 329 | **-0,67** | 108,9 | 0,00 | 97,98 | - | - | 0,00 | 0,00 | - |
| 15 | 19 206 | 19 208 | **1,30** | 108,9 | 0,00 | 96,67 | - | - | 0,00 | 0,00 | - |
| 16 | 20 255 | 20 256 | **0,62** | 108,9 | 0,00 | 97,13 | - | - | 0,00 | 0,00 | - |
| 17 | 20 565 | 20 566 | **0,48** | 108,9 | 0,00 | 97,26 | - | - | 0,00 | 0,00 | - |
| 18 | 21 447 | 21 449 | **-0,08** | 108,9 | 0,00 | 97,63 | - | - | 0,00 | 0,00 | - |
| 19 | 21 303 | 21 304 | **-0,04** | 108,9 | 0,00 | 97,57 | - | - | 0,00 | 0,00 | - |
| 2 | 18 542 | 18 543 | **1,76** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 20 | 22 989 | 22 990 | **-1,05** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 21 | 22 159 | 22 160 | **-0,55** | 108,9 | 0,00 | 97,91 | - | - | 0,00 | 0,00 | - |
| 22 | 23 776 | 23 777 | **-1,44** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 23 | 24 018 | 24 019 | **-1,62** | 108,9 | 0,00 | 98,61 | - | - | 0,00 | 0,00 | - |
| 24 | 21 255 | 21 257 | **-0,03** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 25 | 23 763 | 23 765 | **-1,49** | 108,9 | 0,00 | 98,52 | - | - | 0,00 | 0,00 | - |
| 26 | 24 751 | 24 752 | **-1,96** | 108,9 | 0,00 | 98,87 | - | - | 0,00 | 0,00 | - |
| 27 | 24 699 | 24 700 | **-2,00** | 108,9 | 0,00 | 98,85 | - | - | 0,00 | 0,00 | - |
| 28 | 23 035 | 23 036 | **-1,07** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 29 | 22 228 | 22 229 | **-0,56** | 108,9 | 0,00 | 97,94 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 18 145 | 18 146 | **1,99** | 108,9 | 0,00 | 96,18 | - | - | 0,00 | 0,00 | - |
| 30 | 20 339 | 20 341 | **0,53** | 108,9 | 0,00 | 97,17 | - | - | 0,00 | 0,00 | - |
| 31 | 23 044 | 23 045 | **-1,09** | 108,9 | 0,00 | 98,25 | - | - | 0,00 | 0,00 | - |
| 4 | 19 018 | 19 019 | **1,39** | 108,9 | 0,00 | 96,58 | - | - | 0,00 | 0,00 | - |
| 5 | 19 957 | 19 958 | **0,78** | 108,9 | 0,00 | 97,00 | - | - | 0,00 | 0,00 | - |
| 6 | 17 597 | 17 599 | **2,38** | 108,9 | 0,00 | 95,91 | - | - | 0,00 | 0,00 | - |
| 61 | 14 154 | 14 155 | **0,13** | 106,0 | 0,00 | 94,02 | - | - | 0,00 | 0,00 | - |
| 62 | 13 623 | 13 624 | **0,60** | 106,0 | 0,00 | 93,69 | - | - | 0,00 | 0,00 | - |
| 63 | 12 987 | 12 988 | **1,18** | 106,0 | 0,00 | 93,27 | - | - | 0,00 | 0,00 | - |
| 64 | 14 672 | 14 673 | **-0,31** | 106,0 | 0,00 | 94,33 | - | - | 0,00 | 0,00 | - |
| 65 | 15 368 | 15 369 | **-0,87** | 106,0 | 0,00 | 94,73 | - | - | 0,00 | 0,00 | - |
| 66 | 16 119 | 16 121 | **-1,44** | 106,0 | 0,00 | 95,15 | - | - | 0,00 | 0,00 | - |
| 67 | 14 882 | 14 883 | **-0,45** | 106,0 | 0,00 | 94,45 | - | - | 0,00 | 0,00 | - |
| 68 | 16 143 | 16 145 | **-1,45** | 106,0 | 0,00 | 95,16 | - | - | 0,00 | 0,00 | - |
| 69 | 16 775 | 16 776 | **-1,93** | 106,0 | 0,00 | 95,49 | - | - | 0,00 | 0,00 | - |
| 7 | 17 663 | 17 665 | **2,43** | 108,9 | 0,00 | 95,94 | - | - | 0,00 | 0,00 | - |
| 70 | 15 335 | 15 337 | **-0,82** | 106,0 | 0,00 | 94,71 | - | - | 0,00 | 0,00 | - |
| 71 | 14 171 | 14 173 | **0,14** | 106,0 | 0,00 | 94,03 | - | - | 0,00 | 0,00 | - |
| 72 | 13 102 | 13 103 | **1,10** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 73 | 13 165 | 13 166 | **1,05** | 106,0 | 0,00 | 93,39 | - | - | 0,00 | 0,00 | - |
| 74 | 14 563 | 14 564 | **-0,16** | 106,0 | 0,00 | 94,27 | - | - | 0,00 | 0,00 | - |
| 75 | 14 251 | 14 252 | **0,11** | 106,0 | 0,00 | 94,08 | - | - | 0,00 | 0,00 | - |
| 76 | 12 386 | 12 387 | **1,77** | 106,0 | 0,00 | 92,86 | - | - | 0,00 | 0,00 | - |
| 77 | 11 772 | 11 774 | **2,38** | 106,0 | 0,00 | 92,42 | - | - | 0,00 | 0,00 | - |
| 78 | 10 605 | 10 606 | **3,65** | 106,0 | 0,00 | 91,51 | - | - | 0,00 | 0,00 | - |
| 79 | 9 895 | 9 897 | **4,50** | 106,0 | 0,00 | 90,91 | - | - | 0,00 | 0,00 | - |
| 8 | 18 533 | 18 535 | **1,72** | 108,9 | 0,00 | 96,36 | - | - | 0,00 | 0,00 | - |
| 80 | 9 367 | 9 369 | **5,16** | 106,0 | 0,00 | 90,43 | - | - | 0,00 | 0,00 | - |
| 81 | 10 253 | 10 255 | **4,07** | 106,0 | 0,00 | 91,22 | - | - | 0,00 | 0,00 | - |
| 82 | 11 197 | 11 198 | **3,00** | 106,0 | 0,00 | 91,98 | - | - | 0,00 | 0,00 | - |
| 83 | 10 855 | 10 857 | **3,35** | 106,0 | 0,00 | 91,71 | - | - | 0,00 | 0,00 | - |
| 84 | 11 430 | 11 431 | **2,73** | 106,0 | 0,00 | 92,16 | - | - | 0,00 | 0,00 | - |
| 85 | 11 868 | 11 870 | **2,27** | 106,0 | 0,00 | 92,49 | - | - | 0,00 | 0,00 | - |
| 86 | 12 419 | 12 420 | **1,72** | 106,0 | 0,00 | 92,88 | - | - | 0,00 | 0,00 | - |
| 87 | 10 526 | 10 528 | **3,77** | 106,0 | 0,00 | 91,45 | - | - | 0,00 | 0,00 | - |
| 88 | 11 074 | 11 076 | **3,15** | 106,0 | 0,00 | 91,89 | - | - | 0,00 | 0,00 | - |
| 89 | 11 701 | 11 703 | **2,45** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 9 | 20 789 | 20 790 | **0,25** | 108,9 | 0,00 | 97,36 | - | - | 0,00 | 0,00 | - |
| 90 | 12 136 | 12 138 | **2,04** | 106,0 | 0,00 | 92,68 | - | - | 0,00 | 0,00 | - |
| 91 | 12 751 | 12 752 | **1,46** | 106,0 | 0,00 | 93,11 | - | - | 0,00 | 0,00 | - |
| 92 | 11 330 | 11 332 | **2,88** | 106,0 | 0,00 | 92,09 | - | - | 0,00 | 0,00 | - |
| 93 | 10 615 | 10 617 | **3,70** | 106,0 | 0,00 | 91,52 | - | - | 0,00 | 0,00 | - |
| 94 | 9 940 | 9 942 | **4,52** | 106,0 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| 95 | 10 113 | 10 115 | **4,32** | 106,0 | 0,00 | 91,10 | - | - | 0,00 | 0,00 | - |
| 96 | 9 480 | 9 481 | **5,11** | 106,0 | 0,00 | 90,54 | - | - | 0,00 | 0,00 | - |
| 97 | 10 799 | 10 800 | **3,51** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 98 | 11 815 | 11 816 | **2,39** | 106,0 | 0,00 | 92,45 | - | - | 0,00 | 0,00 | - |
| 99 | 11 110 | 11 112 | **3,12** | 106,0 | 0,00 | 91,92 | - | - | 0,00 | 0,00 | - |
| T1 | 8 779 | 8 782 | **12,71** | 110,1 | 0,00 | 89,87 | - | - | 0,00 | 0,00 | - |
| T10 | 8 649 | 8 652 | **11,97** | 110,1 | 0,00 | 89,74 | - | - | 0,00 | 0,00 | - |
| T11 | 10 073 | 10 075 | **9,90** | 110,1 | 0,00 | 91,07 | - | - | 0,00 | 0,00 | - |
| T12 | 7 349 | 7 352 | **13,93** | 110,1 | 0,00 | 88,33 | - | - | 0,00 | 0,00 | - |
| T13 | 7 785 | 7 788 | **12,96** | 110,1 | 0,00 | 88,83 | - | - | 0,00 | 0,00 | - |
| T14 | 8 920 | 8 923 | **11,25** | 110,1 | 0,00 | 90,01 | - | - | 0,00 | 0,00 | - |
| T15 | 9 939 | 9 941 | **9,82** | 110,1 | 0,00 | 90,95 | - | - | 0,00 | 0,00 | - |
| T16 | 6 632 | 6 635 | **14,80** | 110,1 | 0,00 | 87,44 | - | - | 0,00 | 0,00 | - |
| T17 | 8 172 | 8 175 | **12,18** | 110,1 | 0,00 | 89,25 | - | - | 0,00 | 0,00 | - |
| T18 | 9 250 | 9 253 | **10,62** | 110,1 | 0,00 | 90,33 | - | - | 0,00 | 0,00 | - |
| T19 | 6 113 | 6 117 | **15,75** | 110,1 | 0,00 | 86,73 | - | - | 0,00 | 0,00 | - |
| T2 | 8 894 | 8 896 | **12,43** | 110,1 | 0,00 | 89,98 | - | - | 0,00 | 0,00 | - |
| T20 | 7 232 | 7 235 | **13,60** | 110,1 | 0,00 | 88,19 | - | - | 0,00 | 0,00 | - |
| T21 | 8 727 | 8 730 | **11,25** | 110,1 | 0,00 | 89,82 | - | - | 0,00 | 0,00 | - |
| T22 | 6 413 | 6 417 | **15,04** | 110,1 | 0,00 | 87,15 | - | - | 0,00 | 0,00 | - |
| T23 | 7 461 | 7 464 | **13,20** | 110,1 | 0,00 | 88,46 | - | - | 0,00 | 0,00 | - |

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9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T24 | 9 167 | 9 169 | **10,63** | 110,1 | 0,00 | 90,25 | - | - | 0,00 | 0,00 | - |
| T25 | 6 781 | 6 784 | **14,33** | 110,1 | 0,00 | 87,63 | - | - | 0,00 | 0,00 | - |
| T26 | 7 729 | 7 732 | **12,75** | 110,1 | 0,00 | 88,77 | - | - | 0,00 | 0,00 | - |
| T27 | 8 983 | 8 986 | **10,87** | 110,1 | 0,00 | 90,07 | - | - | 0,00 | 0,00 | - |
| T28 | 6 771 | 6 774 | **14,34** | 110,1 | 0,00 | 87,62 | - | - | 0,00 | 0,00 | - |
| T29 | 8 108 | 8 111 | **12,15** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T3 | 7 988 | 7 991 | **13,69** | 110,1 | 0,00 | 89,05 | - | - | 0,00 | 0,00 | - |
| T4 | 8 720 | 8 723 | **12,40** | 110,1 | 0,00 | 89,81 | - | - | 0,00 | 0,00 | - |
| T5 | 7 259 | 7 262 | **14,70** | 110,1 | 0,00 | 88,22 | - | - | 0,00 | 0,00 | - |
| T6 | 8 428 | 8 431 | **12,52** | 110,1 | 0,00 | 89,52 | - | - | 0,00 | 0,00 | - |
| T7 | 9 461 | 9 463 | **11,02** | 110,1 | 0,00 | 90,52 | - | - | 0,00 | 0,00 | - |
| T8 | 10 335 | 10 338 | **9,77** | 110,1 | 0,00 | 91,29 | - | - | 0,00 | 0,00 | - |
| T9 | 7 165 | 7 168 | **14,53** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| Sum | | | **28,30** | | | | | | | | |

- Data undefined due to calculation with octave data

## Noise sensitive area: O Lomarakennus O (Kuusela)

Wind speed: 8,0 m/s

**WTG**

| No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 567 | 17 569 | **2,43** | 108,9 | 0,00 | 95,89 | - | - | 0,00 | 0,00 | - |
| 10 | 19 459 | 19 460 | **1,10** | 108,9 | 0,00 | 96,78 | - | - | 0,00 | 0,00 | - |
| 100 | 11 559 | 11 560 | **2,64** | 106,0 | 0,00 | 92,26 | - | - | 0,00 | 0,00 | - |
| 101 | 8 837 | 8 839 | **5,87** | 106,0 | 0,00 | 89,93 | - | - | 0,00 | 0,00 | - |
| 102 | 9 713 | 9 715 | **4,77** | 106,0 | 0,00 | 90,75 | - | - | 0,00 | 0,00 | - |
| 11 | 18 664 | 18 665 | **1,74** | 108,9 | 0,00 | 96,42 | - | - | 0,00 | 0,00 | - |
| 12 | 18 234 | 18 235 | **1,98** | 108,9 | 0,00 | 96,22 | - | - | 0,00 | 0,00 | - |
| 13 | 19 634 | 19 635 | **1,07** | 108,9 | 0,00 | 96,86 | - | - | 0,00 | 0,00 | - |
| 14 | 22 272 | 22 273 | **-0,64** | 108,9 | 0,00 | 97,96 | - | - | 0,00 | 0,00 | - |
| 15 | 19 159 | 19 161 | **1,34** | 108,9 | 0,00 | 96,65 | - | - | 0,00 | 0,00 | - |
| 16 | 20 207 | 20 209 | **0,65** | 108,9 | 0,00 | 97,11 | - | - | 0,00 | 0,00 | - |
| 17 | 20 514 | 20 516 | **0,51** | 108,9 | 0,00 | 97,24 | - | - | 0,00 | 0,00 | - |
| 18 | 21 397 | 21 398 | **-0,05** | 108,9 | 0,00 | 97,61 | - | - | 0,00 | 0,00 | - |
| 19 | 21 256 | 21 257 | **-0,01** | 108,9 | 0,00 | 97,55 | - | - | 0,00 | 0,00 | - |
| 2 | 18 479 | 18 481 | **1,80** | 108,9 | 0,00 | 96,33 | - | - | 0,00 | 0,00 | - |
| 20 | 22 940 | 22 941 | **-1,02** | 108,9 | 0,00 | 98,21 | - | - | 0,00 | 0,00 | - |
| 21 | 22 107 | 22 108 | **-0,53** | 108,9 | 0,00 | 97,89 | - | - | 0,00 | 0,00 | - |
| 22 | 23 726 | 23 727 | **-1,40** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |
| 23 | 23 964 | 23 966 | **-1,59** | 108,9 | 0,00 | 98,59 | - | - | 0,00 | 0,00 | - |
| 24 | 21 202 | 21 203 | **0,00** | 108,9 | 0,00 | 97,53 | - | - | 0,00 | 0,00 | - |
| 25 | 23 708 | 23 709 | **-1,46** | 108,9 | 0,00 | 98,50 | - | - | 0,00 | 0,00 | - |
| 26 | 24 700 | 24 701 | **-1,93** | 108,9 | 0,00 | 98,85 | - | - | 0,00 | 0,00 | - |
| 27 | 24 644 | 24 645 | **-1,97** | 108,9 | 0,00 | 98,83 | - | - | 0,00 | 0,00 | - |
| 28 | 22 982 | 22 983 | **-1,04** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 29 | 22 178 | 22 179 | **-0,52** | 108,9 | 0,00 | 97,92 | - | - | 0,00 | 0,00 | - |
| 3 | 18 086 | 18 088 | **2,03** | 108,9 | 0,00 | 96,15 | - | - | 0,00 | 0,00 | - |
| 30 | 20 285 | 20 287 | **0,57** | 108,9 | 0,00 | 97,14 | - | - | 0,00 | 0,00 | - |
| 31 | 22 987 | 22 988 | **-1,05** | 108,9 | 0,00 | 98,23 | - | - | 0,00 | 0,00 | - |
| 4 | 18 960 | 18 961 | **1,43** | 108,9 | 0,00 | 96,56 | - | - | 0,00 | 0,00 | - |
| 5 | 19 899 | 19 901 | **0,81** | 108,9 | 0,00 | 96,98 | - | - | 0,00 | 0,00 | - |
| 6 | 17 542 | 17 544 | **2,42** | 108,9 | 0,00 | 95,88 | - | - | 0,00 | 0,00 | - |
| 61 | 14 097 | 14 098 | **0,18** | 106,0 | 0,00 | 93,98 | - | - | 0,00 | 0,00 | - |
| 62 | 13 565 | 13 567 | **0,65** | 106,0 | 0,00 | 93,65 | - | - | 0,00 | 0,00 | - |
| 63 | 12 930 | 12 931 | **1,23** | 106,0 | 0,00 | 93,23 | - | - | 0,00 | 0,00 | - |
| 64 | 14 614 | 14 616 | **-0,26** | 106,0 | 0,00 | 94,30 | - | - | 0,00 | 0,00 | - |
| 65 | 15 309 | 15 310 | **-0,82** | 106,0 | 0,00 | 94,70 | - | - | 0,00 | 0,00 | - |
| 66 | 16 060 | 16 061 | **-1,39** | 106,0 | 0,00 | 95,12 | - | - | 0,00 | 0,00 | - |
| 67 | 14 822 | 14 824 | **-0,40** | 106,0 | 0,00 | 94,42 | - | - | 0,00 | 0,00 | - |
| 68 | 16 082 | 16 084 | **-1,41** | 106,0 | 0,00 | 95,13 | - | - | 0,00 | 0,00 | - |
| 69 | 16 714 | 16 715 | **-1,88** | 106,0 | 0,00 | 95,46 | - | - | 0,00 | 0,00 | - |
| 7 | 17 612 | 17 613 | **2,46** | 108,9 | 0,00 | 95,92 | - | - | 0,00 | 0,00 | - |
| 70 | 15 274 | 15 275 | **-0,77** | 106,0 | 0,00 | 94,68 | - | - | 0,00 | 0,00 | - |
| 71 | 14 111 | 14 112 | **0,20** | 106,0 | 0,00 | 93,99 | - | - | 0,00 | 0,00 | - |

To be continued on next page...

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Detailed results

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas **Noise calculation model:** ISO 9613-2 General 8,0 m/s

...continued from previous page

| WTG No. | Distance [m] | Sound distance [m] | **Calculated [dB(A)]** | LwA,ref [dB(A)] | Dc [dB] | Adiv [dB] | Aatm [dB] | Agr [dB] | Abar [dB] | Amisc [dB] | A [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | 13 043 | 13 044 | **1,16** | 106,0 | 0,00 | 93,31 | - | - | 0,00 | 0,00 | - |
| 73 | 13 104 | 13 105 | **1,10** | 106,0 | 0,00 | 93,35 | - | - | 0,00 | 0,00 | - |
| 74 | 14 501 | 14 502 | **-0,11** | 106,0 | 0,00 | 94,23 | - | - | 0,00 | 0,00 | - |
| 75 | 14 187 | 14 189 | **0,16** | 106,0 | 0,00 | 94,04 | - | - | 0,00 | 0,00 | - |
| 76 | 12 318 | 12 319 | **1,84** | 106,0 | 0,00 | 92,81 | - | - | 0,00 | 0,00 | - |
| 77 | 11 705 | 11 706 | **2,46** | 106,0 | 0,00 | 92,37 | - | - | 0,00 | 0,00 | - |
| 78 | 10 537 | 10 539 | **3,73** | 106,0 | 0,00 | 91,46 | - | - | 0,00 | 0,00 | - |
| 79 | 9 827 | 9 829 | **4,58** | 106,0 | 0,00 | 90,85 | - | - | 0,00 | 0,00 | - |
| 8 | 18 478 | 18 480 | **1,76** | 108,9 | 0,00 | 96,33 | - | - | 0,00 | 0,00 | - |
| 80 | 9 299 | 9 301 | **5,25** | 106,0 | 0,00 | 90,37 | - | - | 0,00 | 0,00 | - |
| 81 | 10 184 | 10 186 | **4,15** | 106,0 | 0,00 | 91,16 | - | - | 0,00 | 0,00 | - |
| 82 | 11 129 | 11 130 | **3,07** | 106,0 | 0,00 | 91,93 | - | - | 0,00 | 0,00 | - |
| 83 | 10 798 | 10 800 | **3,42** | 106,0 | 0,00 | 91,67 | - | - | 0,00 | 0,00 | - |
| 84 | 11 374 | 11 375 | **2,79** | 106,0 | 0,00 | 92,12 | - | - | 0,00 | 0,00 | - |
| 85 | 11 811 | 11 812 | **2,33** | 106,0 | 0,00 | 92,45 | - | - | 0,00 | 0,00 | - |
| 86 | 12 361 | 12 362 | **1,78** | 106,0 | 0,00 | 92,84 | - | - | 0,00 | 0,00 | - |
| 87 | 10 467 | 10 468 | **3,85** | 106,0 | 0,00 | 91,40 | - | - | 0,00 | 0,00 | - |
| 88 | 11 015 | 11 017 | **3,22** | 106,0 | 0,00 | 91,84 | - | - | 0,00 | 0,00 | - |
| 89 | 11 642 | 11 644 | **2,54** | 106,0 | 0,00 | 92,32 | - | - | 0,00 | 0,00 | - |
| 9 | 20 732 | 20 734 | **0,29** | 108,9 | 0,00 | 97,33 | - | - | 0,00 | 0,00 | - |
| 90 | 12 075 | 12 077 | **2,12** | 106,0 | 0,00 | 92,64 | - | - | 0,00 | 0,00 | - |
| 91 | 12 689 | 12 690 | **1,53** | 106,0 | 0,00 | 93,07 | - | - | 0,00 | 0,00 | - |
| 92 | 11 269 | 11 271 | **2,95** | 106,0 | 0,00 | 92,04 | - | - | 0,00 | 0,00 | - |
| 93 | 10 554 | 10 556 | **3,78** | 106,0 | 0,00 | 91,47 | - | - | 0,00 | 0,00 | - |
| 94 | 9 878 | 9 880 | **4,60** | 106,0 | 0,00 | 90,90 | - | - | 0,00 | 0,00 | - |
| 95 | 10 049 | 10 051 | **4,40** | 106,0 | 0,00 | 91,04 | - | - | 0,00 | 0,00 | - |
| 96 | 9 416 | 9 417 | **5,20** | 106,0 | 0,00 | 90,48 | - | - | 0,00 | 0,00 | - |
| 97 | 10 735 | 10 736 | **3,59** | 106,0 | 0,00 | 91,62 | - | - | 0,00 | 0,00 | - |
| 98 | 11 750 | 11 751 | **2,46** | 106,0 | 0,00 | 92,40 | - | - | 0,00 | 0,00 | - |
| 99 | 11 044 | 11 046 | **3,20** | 106,0 | 0,00 | 91,86 | - | - | 0,00 | 0,00 | - |
| T1 | 8 734 | 8 737 | **12,50** | 110,1 | 0,00 | 89,83 | - | - | 0,00 | 0,00 | - |
| T10 | 8 587 | 8 589 | **12,36** | 110,1 | 0,00 | 89,68 | - | - | 0,00 | 0,00 | - |
| T11 | 10 009 | 10 011 | **10,24** | 110,1 | 0,00 | 91,01 | - | - | 0,00 | 0,00 | - |
| T12 | 7 286 | 7 289 | **14,33** | 110,1 | 0,00 | 88,25 | - | - | 0,00 | 0,00 | - |
| T13 | 7 719 | 7 722 | **13,24** | 110,1 | 0,00 | 88,75 | - | - | 0,00 | 0,00 | - |
| T14 | 8 854 | 8 857 | **11,51** | 110,1 | 0,00 | 89,95 | - | - | 0,00 | 0,00 | - |
| T15 | 9 872 | 9 875 | **10,08** | 110,1 | 0,00 | 90,89 | - | - | 0,00 | 0,00 | - |
| T16 | 6 565 | 6 569 | **15,10** | 110,1 | 0,00 | 87,35 | - | - | 0,00 | 0,00 | - |
| T17 | 8 105 | 8 108 | **12,47** | 110,1 | 0,00 | 89,18 | - | - | 0,00 | 0,00 | - |
| T18 | 9 182 | 9 185 | **10,87** | 110,1 | 0,00 | 90,26 | - | - | 0,00 | 0,00 | - |
| T19 | 6 045 | 6 048 | **15,94** | 110,1 | 0,00 | 86,63 | - | - | 0,00 | 0,00 | - |
| T2 | 8 844 | 8 846 | **12,35** | 110,1 | 0,00 | 89,94 | - | - | 0,00 | 0,00 | - |
| T20 | 7 163 | 7 166 | **13,71** | 110,1 | 0,00 | 88,11 | - | - | 0,00 | 0,00 | - |
| T21 | 8 658 | 8 661 | **11,35** | 110,1 | 0,00 | 89,75 | - | - | 0,00 | 0,00 | - |
| T22 | 6 343 | 6 347 | **15,19** | 110,1 | 0,00 | 87,05 | - | - | 0,00 | 0,00 | - |
| T23 | 7 391 | 7 394 | **13,31** | 110,1 | 0,00 | 88,38 | - | - | 0,00 | 0,00 | - |
| T24 | 9 097 | 9 099 | **10,72** | 110,1 | 0,00 | 90,18 | - | - | 0,00 | 0,00 | - |
| T25 | 6 711 | 6 714 | **14,45** | 110,1 | 0,00 | 87,54 | - | - | 0,00 | 0,00 | - |
| T26 | 7 659 | 7 662 | **12,86** | 110,1 | 0,00 | 88,69 | - | - | 0,00 | 0,00 | - |
| T27 | 8 913 | 8 916 | **10,97** | 110,1 | 0,00 | 90,00 | - | - | 0,00 | 0,00 | - |
| T28 | 6 703 | 6 707 | **14,46** | 110,1 | 0,00 | 87,53 | - | - | 0,00 | 0,00 | - |
| T29 | 8 039 | 8 042 | **12,26** | 110,1 | 0,00 | 89,11 | - | - | 0,00 | 0,00 | - |
| T3 | 7 936 | 7 939 | **13,68** | 110,1 | 0,00 | 89,00 | - | - | 0,00 | 0,00 | - |
| T4 | 8 664 | 8 667 | **12,54** | 110,1 | 0,00 | 89,76 | - | - | 0,00 | 0,00 | - |
| T5 | 7 204 | 7 207 | **14,81** | 110,1 | 0,00 | 88,16 | - | - | 0,00 | 0,00 | - |
| T6 | 8 368 | 8 371 | **12,80** | 110,1 | 0,00 | 89,46 | - | - | 0,00 | 0,00 | - |
| T7 | 9 401 | 9 403 | **11,32** | 110,1 | 0,00 | 90,47 | - | - | 0,00 | 0,00 | - |
| T8 | 10 274 | 10 276 | **10,11** | 110,1 | 0,00 | 91,24 | - | - | 0,00 | 0,00 | - |
| T9 | 7 106 | 7 109 | **14,84** | 110,1 | 0,00 | 88,04 | - | - | 0,00 | 0,00 | - |
| Sum | | | **28,46** | | | | | | | | |

- Data undefined due to calculation with octave data

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Calculated:
9.5.2023 19.07/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise calculation model:**
ISO 9613-2 General
**Wind speed (in 10 m height):**
8,0 m/s
**Ground attenuation:**
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Haarasuonkangas_melu ja varjot_1.w2r (11)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
**Meteorological coefficient, C0:**
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:**
Ignore pure tones setting on WTG
**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)
**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:** VESTAS V172-7.2 7200 250.0 !O!
**Noise:** V172 - 7,2 MW PO7200 STE + 2dB

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Vestas | 15.11.2022 | USER | 29.11.2022 14.53 |

DMS no.: 0128-4336_00

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 225,0 | 8,0 | 108,9 | No | 92,4 | 100,0 | 103,3 | 103,5 | 101,9 | 97,4 | 89,9 | 79,2 |

**WTG:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 214,0 | 8,0 | 110,1 | No | 91,5 | 100,2 | 104,1 | 105,0 | 103,7 | 99,3 | 91,6 | 80,8 |

**WTG:** NORDEX N149/4.0-4.5 4500 180.0 !O!
**Noise:** Serrations Mode 00 - 106.0 dB(A) octave data only

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| F008_271_A13_R01 | 30.6.2017 | USER | 10.11.2022 10.32 |

Mode available on request

| | | | | | Octave data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | Pure tones | 63 [dB] | 125 [dB] | 250 [dB] | 500 [dB] | 1000 [dB] | 2000 [dB] | 4000 [dB] | 8000 [dB] |
| From Windcat | 190,0 | 8,0 | 106,0 | No | 88,0 | 94,0 | 98,0 | 100,0 | 101,0 | 98,0 | 91,0 | 83,0 |

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9.5.2023 19.07/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

## Noise sensitive area: A Lomarakennus A (Syvälahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: B Asuinrakennus B (Syväänlahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: C Lomarakennus C (Mutalahti)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: D Lomarakennus D (Mutaniemi)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: E Asuinrakennus E (Alanko)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: F Asuinrakennus F (Joensuu)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: G Asuinrakennus G (Heiniaho)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: H Asuinrakennus H (Mäkelä)
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: I Lomarakennus I
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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9.5.2023 19.07/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: K Asuinrakennus K (Takalo)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: N Lomarakennus N (Kuusela)

**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

## Noise sensitive area: O Lomarakennus O (Kuusela)

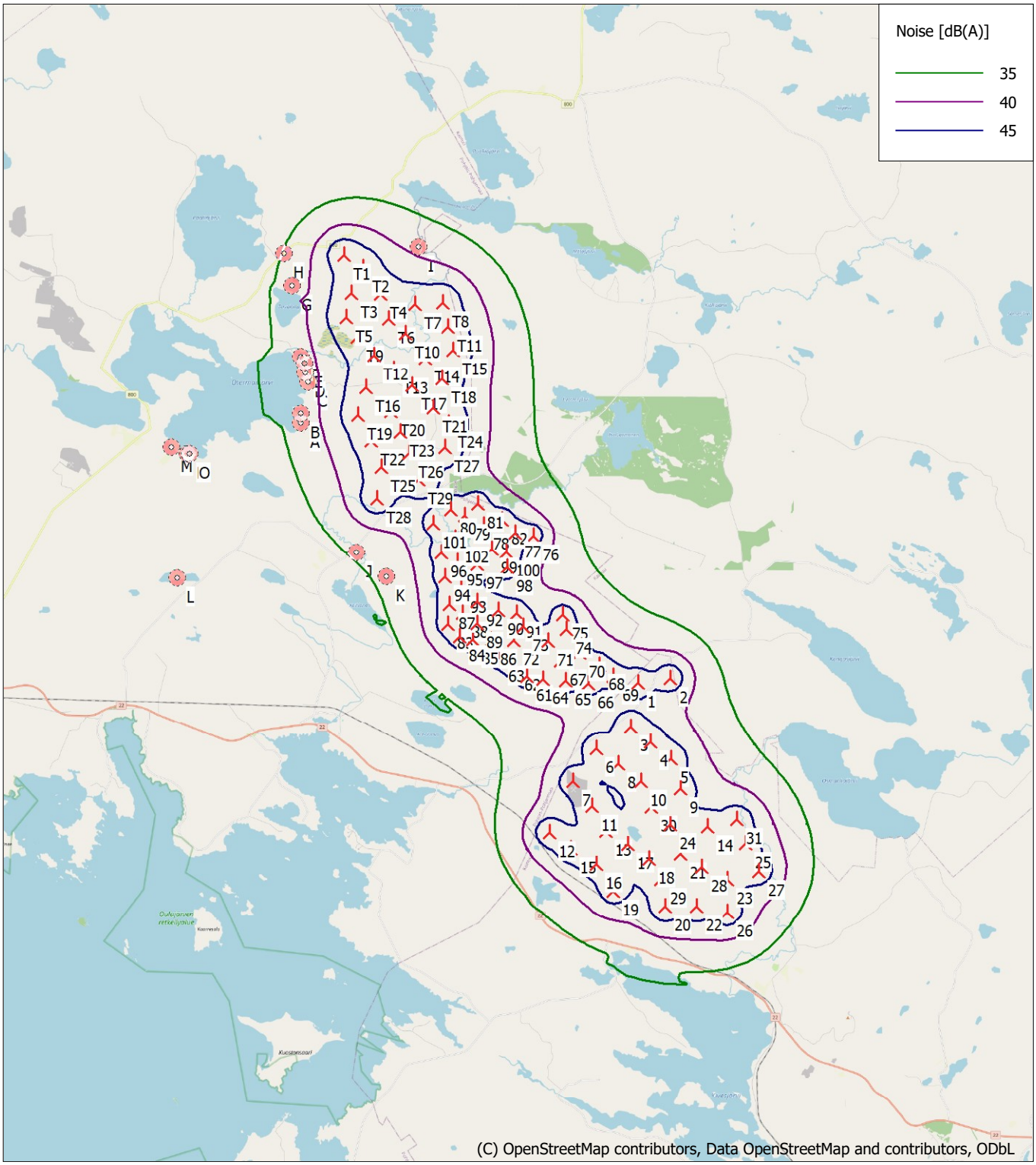
**Predefined calculation standard:**
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:** 40,0 dB(A)
**No distance demand**

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Calculated:
9.5.2023 19.07/3.5.584

## DECIBEL - Map 8,0 m/s

**Calculation:** Haarasuonkangas_VE2_V172x39xHH214_2023058 + Turkkiselkä + Takiankangas




Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 514 339 North: 7 163 440

New WTG  Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

## Liite 9. Matalataajuisen melun yhteisvaikutuksen rakennuskohtaiset arvot – VE1

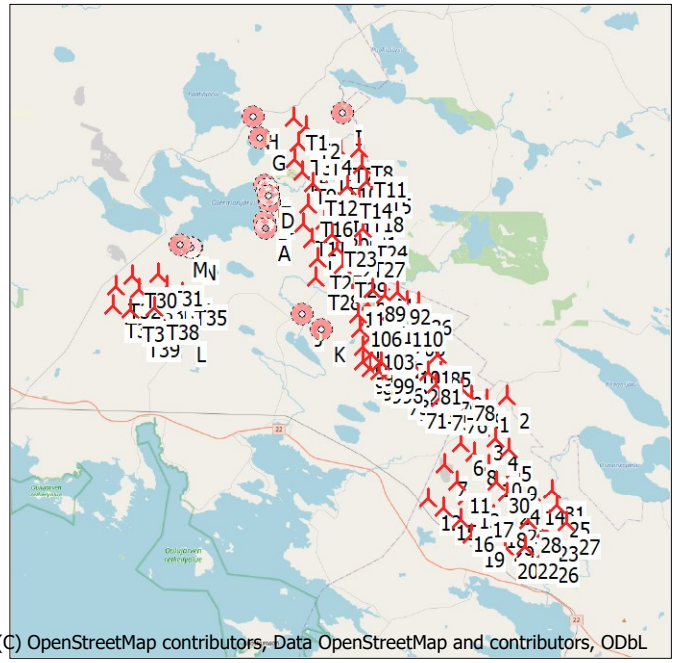
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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model has priority
**Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:**
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 100 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 101 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 102 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 103 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 104 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 105 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 106 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 107 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 108 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 109 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 110 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 111 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 112 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 71 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 72 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 73 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 74 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 75 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 76 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 77 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 78 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 79 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 80 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 81 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |

To be continued on next page...

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Main Result

## Calculation: Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| 82 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 83 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 84 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 85 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 86 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 87 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 88 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 89 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 90 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 91 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 92 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 93 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 94 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 95 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 96 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 97 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 98 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 99 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T30 | 499 777 | 7 166 541 | 137,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T31 | 501 112 | 7 166 571 | 140,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T32 | 498 884 | 7 165 924 | 140,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T33 | 500 060 | 7 165 826 | 146,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T34 | 501 577 | 7 165 939 | 141,7 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T35 | 502 368 | 7 165 645 | 147,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T36 | 498 706 | 7 164 985 | 147,2 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T37 | 499 643 | 7 164 765 | 154,4 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T38 | 500 913 | 7 164 850 | 150,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T39 | 499 856 | 7 163 927 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |

# Calculation Results

## Sound level

| No. | Name | East | North | Z | Immission height | Most critical demand Frequency | Noise | Predicted sound level WTG noise |
|---|---|---|---|---|---|---|---|---|
| | **Noise sensitive area** | | | | | | | |
| | | | | [m] | [m] | [Hz] | [dB] | [dB] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 50,0 | 44,0 | 37,8 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 50,0 | 44,0 | 37,9 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 50,0 | 44,0 | 38,4 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 50,0 | 44,0 | 38,3 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 50,0 | 44,0 | 38,3 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 50,0 | 44,0 | 38,0 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 63,0 | 42,0 | 35,1 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 50,0 | 44,0 | 35,7 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 63,0 | 42,0 | 36,0 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 50,0 | 44,0 | 38,4 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 50,0 | 44,0 | 39,5 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 50,0 | 44,0 | 36,4 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 50,0 | 44,0 | 36,0 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 50,0 | 44,0 | 36,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 50,0 | 44,0 | 35,9 |

***)Spectral distribution, please see details in report "Detailed results"**

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9.5.2023 20.42/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14841 | 15043 | 15555 | 15832 | 16100 | 16350 | 18351 | 19383 | 16989 | 10816 | 9530 | 16500 | 18226 | 17629 | 17567 |
| 10 | 17232 | 17467 | 18116 | 18417 | 18710 | 18968 | 21130 | 22204 | 20165 | 12731 | 11401 | 17677 | 20098 | 19514 | 19459 |
| 100 | 9485 | 9710 | 10340 | 10640 | 10935 | 11193 | 13393 | 14485 | 12936 | 5336 | 4079 | 11272 | 12734 | 12136 | 12075 |
| 101 | 10019 | 10237 | 10830 | 11124 | 11412 | 11669 | 13822 | 14903 | 13178 | 5965 | 4719 | 11917 | 13350 | 12751 | 12689 |
| 102 | 8745 | 8978 | 9643 | 9950 | 10252 | 10511 | 12757 | 13860 | 12517 | 4524 | 3269 | 10487 | 11928 | 11330 | 11269 |
| 103 | 8012 | 8247 | 8925 | 9234 | 9538 | 9798 | 12065 | 13173 | 11964 | 3832 | 2618 | 9901 | 11214 | 10615 | 10554 |
| 104 | 7332 | 7570 | 8265 | 8577 | 8885 | 9145 | 11438 | 12551 | 11493 | 3186 | 2038 | 9346 | 10539 | 9940 | 9878 |
| 105 | 7264 | 7483 | 8101 | 8402 | 8698 | 8957 | 11180 | 12280 | 11007 | 3510 | 2516 | 9784 | 10713 | 10113 | 10049 |
| 106 | 6650 | 6875 | 7521 | 7827 | 8128 | 8388 | 10648 | 11756 | 10666 | 2929 | 2062 | 9240 | 10079 | 9480 | 9416 |
| 107 | 7868 | 8076 | 8648 | 8941 | 9228 | 9484 | 11649 | 12736 | 11231 | 4206 | 3174 | 10466 | 11398 | 10799 | 10735 |
| 108 | 8760 | 8953 | 9454 | 9734 | 10006 | 10258 | 12329 | 13392 | 11552 | 5261 | 4211 | 11512 | 12413 | 11815 | 11750 |
| 109 | 7965 | 8152 | 8636 | 8913 | 9184 | 9436 | 11505 | 12570 | 10808 | 4706 | 3789 | 11020 | 11707 | 11110 | 11044 |
| 11 | 16785 | 17040 | 17781 | 18096 | 18406 | 18666 | 20940 | 22042 | 20393 | 12069 | 10755 | 16528 | 19284 | 18715 | 18664 |
| 110 | 8450 | 8631 | 9089 | 9361 | 9626 | 9875 | 11904 | 12958 | 11047 | 5208 | 4254 | 11513 | 12222 | 11625 | 11559 |
| 111 | 5792 | 5996 | 6570 | 6868 | 7160 | 7417 | 9634 | 10736 | 9635 | 2849 | 2455 | 9132 | 9499 | 8904 | 8837 |
| 112 | 6696 | 6896 | 7446 | 7737 | 8023 | 8279 | 10449 | 11539 | 10184 | 3475 | 2754 | 9806 | 10376 | 9779 | 9713 |
| 12 | 16716 | 16987 | 17809 | 18134 | 18455 | 18716 | 21074 | 22195 | 20906 | 11863 | 10596 | 15748 | 18831 | 18280 | 18234 |
| 13 | 17797 | 18053 | 18799 | 19114 | 19424 | 19684 | 21958 | 23061 | 21386 | 13066 | 11756 | 17412 | 20250 | 19684 | 19634 |
| 14 | 19986 | 20215 | 20832 | 21126 | 21413 | 21669 | 23776 | 24834 | 22562 | 15537 | 14207 | 20455 | 22912 | 22327 | 22272 |
| 15 | 17585 | 17853 | 18659 | 18982 | 19301 | 19562 | 21901 | 23018 | 21618 | 12753 | 11475 | 16689 | 19759 | 19206 | 19159 |
| 16 | 18564 | 18829 | 19614 | 19935 | 20250 | 20512 | 22827 | 23939 | 22411 | 13759 | 12470 | 17765 | 20810 | 20255 | 20207 |
| 17 | 18634 | 18887 | 19618 | 19931 | 20239 | 20499 | 22753 | 23851 | 22080 | 13928 | 12614 | 18305 | 21133 | 20565 | 20514 |
| 18 | 19479 | 19729 | 20447 | 20757 | 21062 | 21322 | 23558 | 24650 | 22793 | 14795 | 13478 | 19197 | 22016 | 21447 | 21397 |
| 19 | 19633 | 19898 | 20682 | 21002 | 21318 | 21579 | 23891 | 25002 | 23435 | 14825 | 13538 | 18758 | 21856 | 21303 | 21256 |
| 2 | 15625 | 15815 | 16273 | 16539 | 16796 | 17041 | 18961 | 19969 | 17355 | 11759 | 10494 | 17541 | 19141 | 18542 | 18479 |
| 20 | 21146 | 21401 | 22141 | 22455 | 22763 | 23023 | 25280 | 26378 | 24561 | 16409 | 15102 | 20564 | 23550 | 22989 | 22940 |
| 21 | 20039 | 20281 | 20958 | 21262 | 21560 | 21818 | 24002 | 25081 | 23038 | 15441 | 14115 | 20046 | 22735 | 22159 | 22107 |
| 22 | 21801 | 22049 | 22754 | 23063 | 23365 | 23625 | 25839 | 26925 | 24943 | 17129 | 15810 | 21464 | 24344 | 23776 | 23726 |
| 23 | 21818 | 22054 | 22702 | 23001 | 23293 | 23550 | 25691 | 26757 | 24542 | 17275 | 15946 | 21938 | 24596 | 24018 | 23964 |
| 24 | 19052 | 19290 | 19950 | 20251 | 20546 | 20804 | 22971 | 24046 | 21972 | 14503 | 13174 | 19263 | 21835 | 21255 | 21202 |
| 25 | 21363 | 21587 | 22180 | 22470 | 22751 | 23006 | 25075 | 26122 | 23715 | 16962 | 15633 | 21917 | 24349 | 23763 | 23708 |
| 26 | 22677 | 22919 | 23596 | 23900 | 24197 | 24455 | 26631 | 27707 | 25584 | 18060 | 16736 | 22518 | 25323 | 24751 | 24700 |
| 27 | 22360 | 22587 | 23193 | 23486 | 23770 | 24025 | 26109 | 27159 | 24772 | 17914 | 16584 | 22757 | 25282 | 24699 | 24644 |
| 28 | 20882 | 21122 | 21786 | 22088 | 22383 | 22641 | 24806 | 25880 | 23759 | 16307 | 14979 | 20931 | 23611 | 23035 | 22982 |
| 29 | 20297 | 20549 | 21271 | 21582 | 21888 | 22148 | 24387 | 25480 | 23617 | 15598 | 14283 | 19914 | 22795 | 22228 | 22178 |
| 3 | 15627 | 15848 | 16441 | 16733 | 17016 | 17271 | 19371 | 20431 | 18265 | 11315 | 9994 | 16648 | 18737 | 18145 | 18086 |
| 30 | 18129 | 18367 | 19031 | 19333 | 19629 | 19887 | 22062 | 23140 | 21115 | 13581 | 12252 | 18388 | 20920 | 20339 | 20285 |
| 31 | 20570 | 20789 | 21364 | 21651 | 21930 | 22183 | 24231 | 25272 | 22826 | 16227 | 14900 | 21305 | 23633 | 23044 | 22987 |
| 4 | 16498 | 16718 | 17304 | 17594 | 17876 | 18130 | 20215 | 21270 | 19032 | 12190 | 10868 | 17482 | 19610 | 19018 | 18960 |
| 5 | 17439 | 17658 | 18238 | 18527 | 18807 | 19061 | 21132 | 22182 | 19878 | 13130 | 11807 | 18378 | 20548 | 19957 | 19899 |
| 6 | 15344 | 15583 | 16254 | 16559 | 16857 | 17115 | 19313 | 20399 | 18535 | 10815 | 9484 | 15818 | 18181 | 17597 | 17542 |
| 7 | 15707 | 15962 | 16705 | 17020 | 17330 | 17591 | 19869 | 20974 | 19379 | 10999 | 9683 | 15555 | 18235 | 17663 | 17612 |
| 71 | 11839 | 12081 | 12772 | 13080 | 13384 | 13643 | 15885 | 16984 | 15421 | 7339 | 6011 | 12678 | 14743 | 14154 | 14097 |
| 72 | 11301 | 11543 | 12239 | 12549 | 12853 | 13113 | 15365 | 16466 | 14966 | 6804 | 5477 | 12203 | 14213 | 13623 | 13565 |
| 73 | 10704 | 10950 | 11665 | 11978 | 12286 | 12546 | 14822 | 15929 | 14551 | 6172 | 4843 | 11585 | 13577 | 12987 | 12930 |
| 74 | 12280 | 12516 | 13179 | 13484 | 13782 | 14041 | 16250 | 17340 | 15644 | 7848 | 6523 | 13244 | 15263 | 14672 | 14614 |
| 75 | 12868 | 13096 | 13721 | 14019 | 14310 | 14567 | 16728 | 17806 | 15930 | 8536 | 7219 | 14016 | 15961 | 15368 | 15309 |
| 76 | 13535 | 13755 | 14347 | 14639 | 14923 | 15179 | 17293 | 18359 | 16319 | 9288 | 7977 | 14820 | 16714 | 16119 | 16060 |
| 77 | 12280 | 12501 | 13102 | 13396 | 13684 | 13940 | 16076 | 17149 | 15235 | 8053 | 6751 | 13693 | 15478 | 14882 | 14822 |
| 78 | 13397 | 13605 | 14145 | 14428 | 14703 | 14955 | 17007 | 18056 | 15854 | 9330 | 8045 | 15048 | 16741 | 16143 | 16082 |
| 79 | 14038 | 14245 | 14782 | 15065 | 15338 | 15590 | 17631 | 18677 | 16417 | 9956 | 8666 | 15628 | 17372 | 16775 | 16714 |
| 8 | 16261 | 16497 | 17156 | 17458 | 17754 | 18012 | 20190 | 21270 | 19312 | 11749 | 10419 | 16730 | 19118 | 18533 | 18478 |
| 80 | 12592 | 12802 | 13353 | 13638 | 13916 | 14169 | 16242 | 17298 | 15192 | 8526 | 7246 | 14291 | 15933 | 15335 | 15274 |
| 81 | 11494 | 11712 | 12299 | 12591 | 12877 | 13132 | 15261 | 16334 | 14441 | 7356 | 6073 | 13134 | 14769 | 14171 | 14111 |
| 82 | 10603 | 10836 | 11492 | 11796 | 12095 | 12353 | 14569 | 15663 | 14086 | 6271 | 4964 | 11944 | 13697 | 13102 | 13043 |
| 83 | 10505 | 10726 | 11335 | 11631 | 11921 | 12178 | 14343 | 15425 | 13696 | 6354 | 5079 | 12198 | 13763 | 13165 | 13104 |
| 84 | 11721 | 11925 | 12453 | 12735 | 13009 | 13261 | 15316 | 16368 | 14264 | 7790 | 6543 | 13706 | 15162 | 14563 | 14501 |
| 85 | 11329 | 11526 | 12030 | 12308 | 12578 | 12828 | 14860 | 15907 | 13767 | 7517 | 6301 | 13526 | 14850 | 14251 | 14187 |
| 86 | 8996 | 9149 | 9491 | 9740 | 9980 | 10220 | 12094 | 13107 | 10806 | 6182 | 5309 | 12510 | 12977 | 12386 | 12318 |
| 87 | 8413 | 8572 | 8943 | 9199 | 9447 | 9690 | 11617 | 12646 | 10516 | 5584 | 4749 | 11915 | 12365 | 11772 | 11705 |
| 88 | 7276 | 7444 | 7863 | 8130 | 8391 | 8638 | 10656 | 11711 | 9914 | 4522 | 3830 | 10845 | 11197 | 10605 | 10537 |
| 89 | 6548 | 6718 | 7154 | 7426 | 7691 | 7941 | 10001 | 11069 | 9468 | 3979 | 3457 | 10265 | 10486 | 9895 | 9827 |
| 9 | 18381 | 18607 | 19214 | 19507 | 19792 | 20047 | 22149 | 23206 | 20958 | 13980 | 12651 | 19046 | 21376 | 20789 | 20732 |
| 90 | 6013 | 6186 | 6641 | 6917 | 7188 | 7440 | 9539 | 10616 | 9186 | 3599 | 3233 | 9832 | 9956 | 9367 | 9299 |
| 91 | 6757 | 6905 | 7253 | 7507 | 7755 | 7999 | 9956 | 10999 | 9150 | 4542 | 4063 | 10793 | 10838 | 10253 | 10184 |
| 92 | 7770 | 7923 | 8276 | 8530 | 8776 | 9018 | 10944 | 11975 | 9920 | 5187 | 4480 | 11509 | 11786 | 11197 | 11129 |

To be continued on next page...

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# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

...continued from previous page

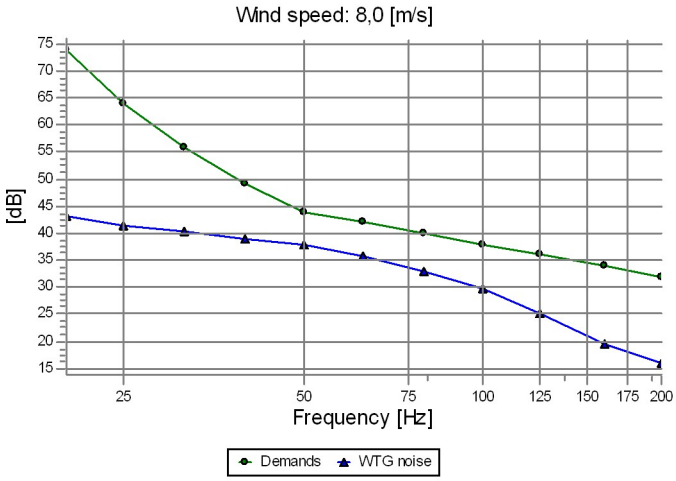
| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 8694 | 8953 | 9734 | 10056 | 10375 | 10636 | 12990 | 14113 | 13174 | 4047 | 2717 | 9588 | 11445 | 10855 | 10798 |
| 94 | 9275 | 9533 | 10304 | 10625 | 10942 | 11203 | 13544 | 14665 | 13629 | 4631 | 3301 | 10070 | 12019 | 11430 | 11374 |
| 95 | 9632 | 9884 | 10629 | 10946 | 11259 | 11520 | 13834 | 14949 | 13779 | 5054 | 3725 | 10542 | 12458 | 11868 | 11811 |
| 96 | 10061 | 10304 | 11009 | 11321 | 11627 | 11888 | 14159 | 15266 | 13911 | 5590 | 4269 | 11168 | 13012 | 12419 | 12361 |
| 97 | 8164 | 8414 | 9156 | 9474 | 9788 | 10049 | 12373 | 13492 | 12475 | 3695 | 2393 | 9541 | 11121 | 10526 | 10467 |
| 98 | 8690 | 8936 | 9660 | 9975 | 10286 | 10547 | 12850 | 13964 | 12822 | 4242 | 2936 | 10030 | 11669 | 11074 | 11015 |
| 99 | 9303 | 9547 | 10254 | 10567 | 10875 | 11135 | 13417 | 14526 | 13260 | 4869 | 3557 | 10585 | 12295 | 11701 | 11642 |
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T30 | 7471 | 7562 | 8247 | 8343 | 8473 | 8491 | 9912 | 10547 | 14064 | 9214 | 10427 | 3990 | 3016 | 3392 | 3457 |
| T31 | 6218 | 6329 | 7083 | 7206 | 7365 | 7407 | 9035 | 9767 | 13015 | 7925 | 9160 | 3257 | 2008 | 2230 | 2287 |
| T32 | 8524 | 8625 | 9327 | 9426 | 9559 | 9577 | 10974 | 11585 | 15148 | 9983 | 11150 | 4286 | 4102 | 4465 | 4529 |
| T33 | 7483 | 7604 | 8370 | 8495 | 8652 | 8692 | 10268 | 10962 | 14297 | 8804 | 9978 | 3287 | 3257 | 3517 | 3575 |
| T34 | 6090 | 6237 | 7081 | 7239 | 7429 | 7498 | 9295 | 10091 | 13106 | 7329 | 8532 | 2492 | 2361 | 2390 | 2431 |
| T35 | 5598 | 5775 | 6697 | 6886 | 7105 | 7201 | 9163 | 10026 | 12774 | 6497 | 7692 | 2024 | 2541 | 2363 | 2381 |
| T36 | 9070 | 9195 | 9964 | 10087 | 10240 | 10276 | 11785 | 12434 | 15875 | 10073 | 11178 | 4031 | 4817 | 5107 | 5166 |
| T37 | 8353 | 8499 | 9327 | 9472 | 9649 | 9704 | 11362 | 12078 | 15316 | 9129 | 10222 | 3077 | 4335 | 4532 | 4584 |
| T38 | 7241 | 7409 | 8296 | 8468 | 8669 | 8747 | 10571 | 11364 | 14348 | 7862 | 8970 | 2006 | 3614 | 3666 | 3706 |
| T39 | 8639 | 8809 | 9699 | 9869 | 10067 | 10142 | 11920 | 12682 | 15746 | 8932 | 9956 | 2662 | 4913 | 5026 | 5070 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

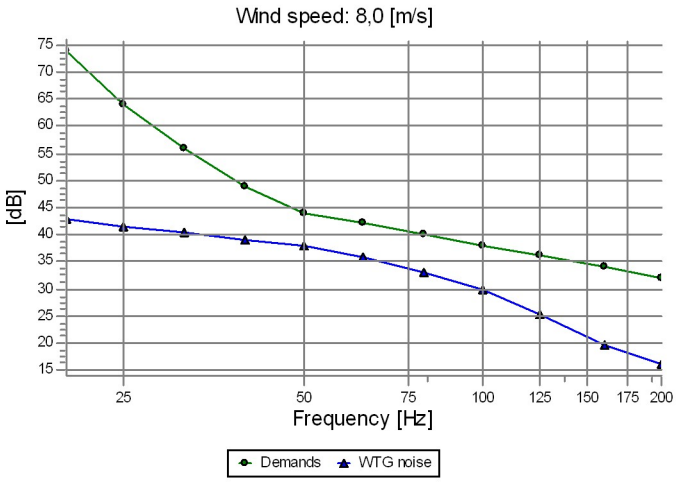
## A Lomarakennus A (Syvälahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,0 | Yes |
| 25,0 | 64,0 | 41,4 | Yes |
| 31,5 | 56,0 | 40,4 | Yes |
| 40,0 | 49,0 | 39,0 | Yes |
| 50,0 | 44,0 | 37,8 | Yes |
| 63,0 | 42,0 | 35,7 | Yes |
| 80,0 | 40,0 | 32,9 | Yes |
| 100,0 | 38,0 | 29,6 | Yes |
| 125,0 | 36,0 | 25,2 | Yes |
| 160,0 | 34,0 | 19,6 | Yes |
| 200,0 | 32,0 | 15,9 | Yes |

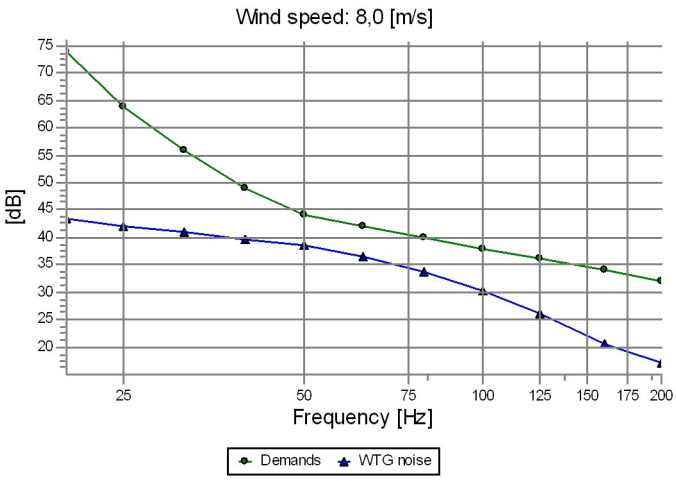
## B Asuinrakennus B (Syväänlahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,0 | Yes |
| 25,0 | 64,0 | 41,4 | Yes |
| 31,5 | 56,0 | 40,4 | Yes |
| 40,0 | 49,0 | 39,0 | Yes |
| 50,0 | 44,0 | 37,9 | Yes |
| 63,0 | 42,0 | 35,7 | Yes |
| 80,0 | 40,0 | 33,0 | Yes |
| 100,0 | 38,0 | 29,7 | Yes |
| 125,0 | 36,0 | 25,3 | Yes |
| 160,0 | 34,0 | 19,7 | Yes |
| 200,0 | 32,0 | 16,0 | Yes |

## C Lomarakennus C (Mutalahti)




**Sound level**

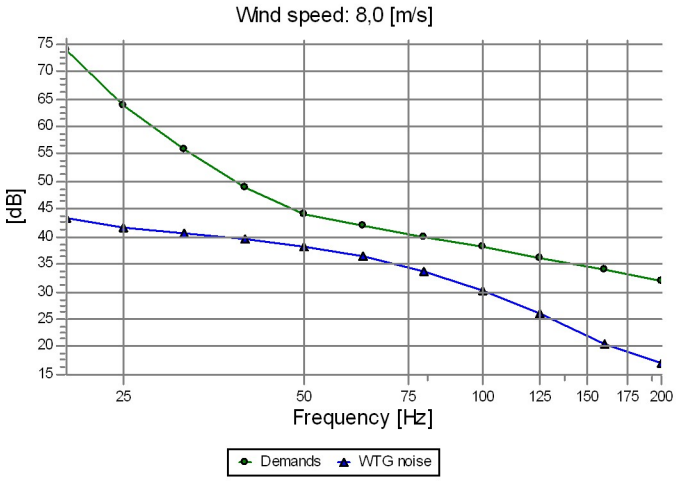
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,4 | Yes |
| 25,0 | 64,0 | 41,9 | Yes |
| 31,5 | 56,0 | 40,8 | Yes |
| 40,0 | 49,0 | 39,6 | Yes |
| 50,0 | 44,0 | 38,4 | Yes |
| 63,0 | 42,0 | 36,4 | Yes |
| 80,0 | 40,0 | 33,7 | Yes |
| 100,0 | 38,0 | 30,4 | Yes |
| 125,0 | 36,0 | 26,2 | Yes |
| 160,0 | 34,0 | 20,7 | Yes |
| 200,0 | 32,0 | 17,0 | Yes |

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

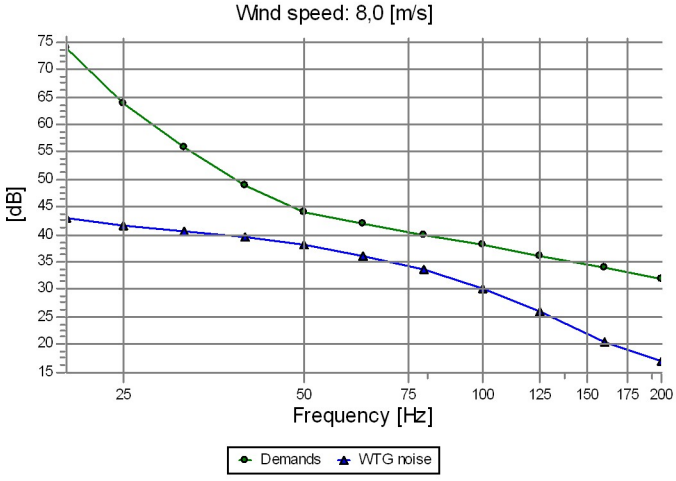
**D Lomarakennus D (Mutaniemi)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,2 | Yes |
| 25,0 | 64,0 | 41,8 | Yes |
| 31,5 | 56,0 | 40,7 | Yes |
| 40,0 | 49,0 | 39,5 | Yes |
| 50,0 | 44,0 | 38,3 | Yes |
| 63,0 | 42,0 | 36,3 | Yes |
| 80,0 | 40,0 | 33,6 | Yes |
| 100,0 | 38,0 | 30,3 | Yes |
| 125,0 | 36,0 | 26,1 | Yes |
| 160,0 | 34,0 | 20,6 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

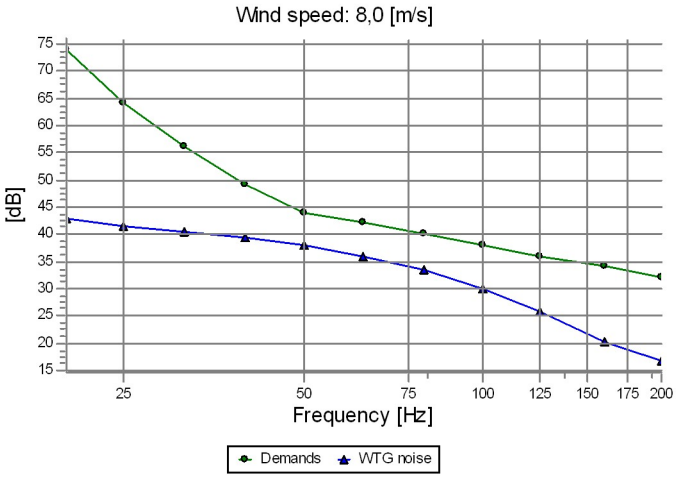
**E Asuinrakennus E (Alanko)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,2 | Yes |
| 25,0 | 64,0 | 41,7 | Yes |
| 31,5 | 56,0 | 40,7 | Yes |
| 40,0 | 49,0 | 39,4 | Yes |
| 50,0 | 44,0 | 38,3 | Yes |
| 63,0 | 42,0 | 36,2 | Yes |
| 80,0 | 40,0 | 33,6 | Yes |
| 100,0 | 38,0 | 30,3 | Yes |
| 125,0 | 36,0 | 26,0 | Yes |
| 160,0 | 34,0 | 20,5 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

**F Asuinrakennus F (Joensuu)**




**Sound level**

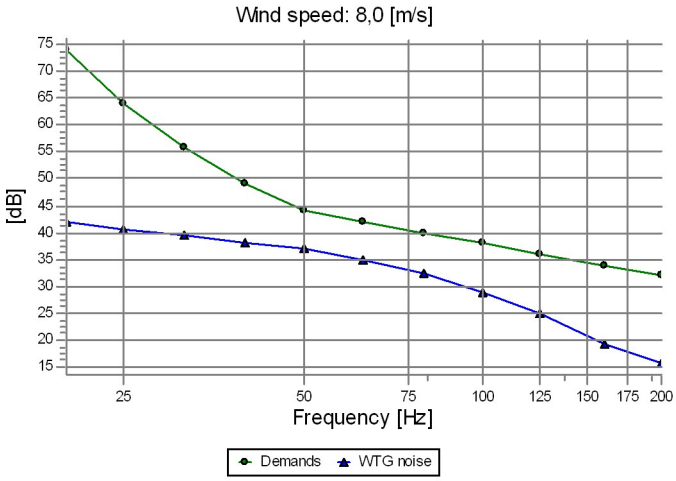
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,0 | Yes |
| 25,0 | 64,0 | 41,5 | Yes |
| 31,5 | 56,0 | 40,4 | Yes |
| 40,0 | 49,0 | 39,2 | Yes |
| 50,0 | 44,0 | 38,0 | Yes |
| 63,0 | 42,0 | 36,0 | Yes |
| 80,0 | 40,0 | 33,3 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,3 | Yes |
| 200,0 | 32,0 | 16,6 | Yes |

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

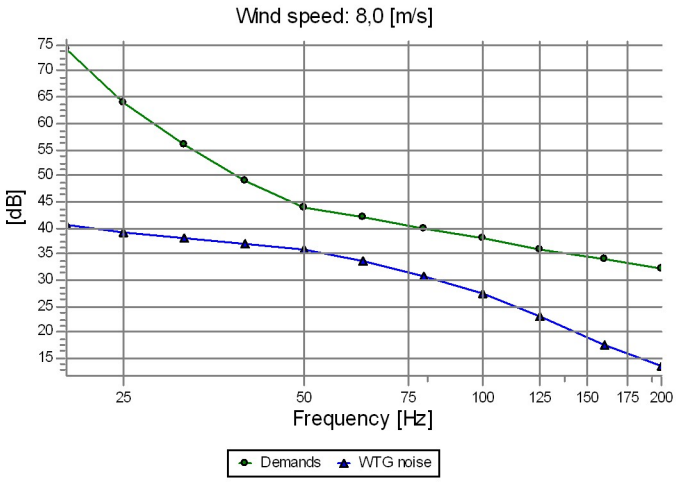
**G Asuinrakennus G (Heiniaho)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,0 | Yes |
| 25,0 | 64,0 | 40,5 | Yes |
| 31,5 | 56,0 | 39,5 | Yes |
| 40,0 | 49,0 | 38,3 | Yes |
| 50,0 | 44,0 | 37,1 | Yes |
| 63,0 | 42,0 | 35,1 | Yes |
| 80,0 | 40,0 | 32,4 | Yes |
| 100,0 | 38,0 | 29,1 | Yes |
| 125,0 | 36,0 | 24,9 | Yes |
| 160,0 | 34,0 | 19,4 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

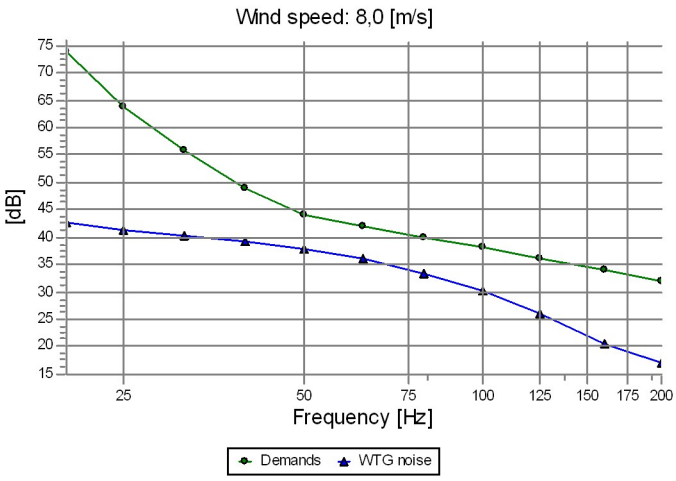
**H Asuinrakennus H (Mäkelä)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,7 | Yes |
| 25,0 | 64,0 | 39,2 | Yes |
| 31,5 | 56,0 | 38,1 | Yes |
| 40,0 | 49,0 | 36,9 | Yes |
| 50,0 | 44,0 | 35,7 | Yes |
| 63,0 | 42,0 | 33,6 | Yes |
| 80,0 | 40,0 | 30,9 | Yes |
| 100,0 | 38,0 | 27,5 | Yes |
| 125,0 | 36,0 | 23,2 | Yes |
| 160,0 | 34,0 | 17,5 | Yes |
| 200,0 | 32,0 | 13,7 | Yes |

**I Lomarakennus I**




**Sound level**

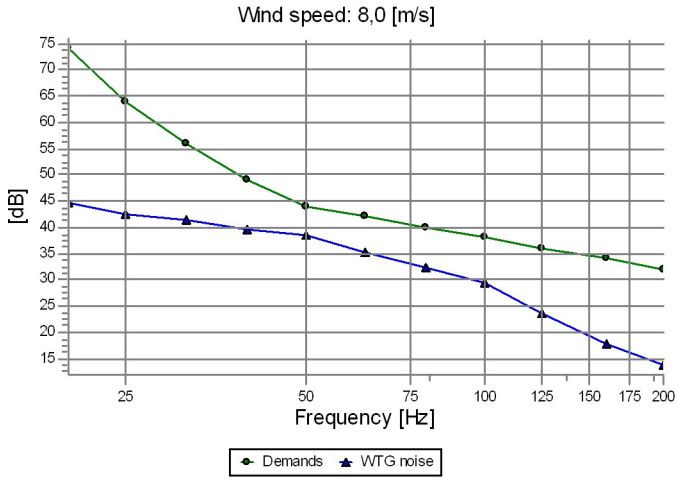
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,7 | Yes |
| 25,0 | 64,0 | 41,3 | Yes |
| 31,5 | 56,0 | 40,2 | Yes |
| 40,0 | 49,0 | 39,1 | Yes |
| 50,0 | 44,0 | 37,9 | Yes |
| 63,0 | 42,0 | 36,0 | Yes |
| 80,0 | 40,0 | 33,3 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,5 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

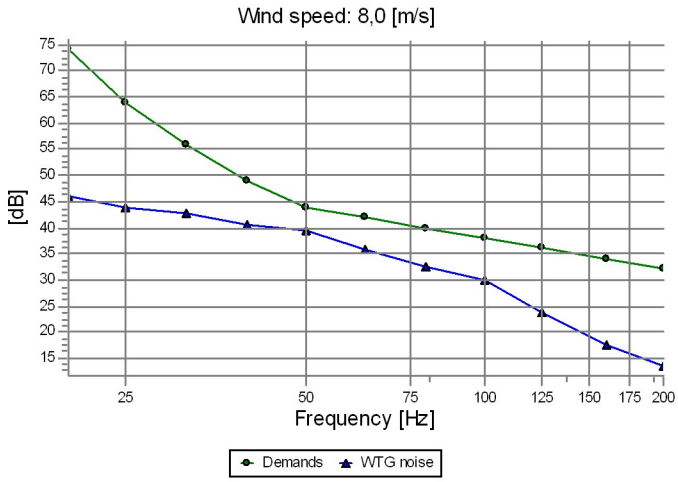
**J Lomarakennus J (Hautakaarto)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 44,7 | Yes |
| 25,0 | 64,0 | 42,4 | Yes |
| 31,5 | 56,0 | 41,4 | Yes |
| 40,0 | 49,0 | 39,5 | Yes |
| 50,0 | 44,0 | 38,4 | Yes |
| 63,0 | 42,0 | 35,2 | Yes |
| 80,0 | 40,0 | 32,2 | Yes |
| 100,0 | 38,0 | 29,3 | Yes |
| 125,0 | 36,0 | 23,8 | Yes |
| 160,0 | 34,0 | 17,9 | Yes |
| 200,0 | 32,0 | 14,0 | Yes |

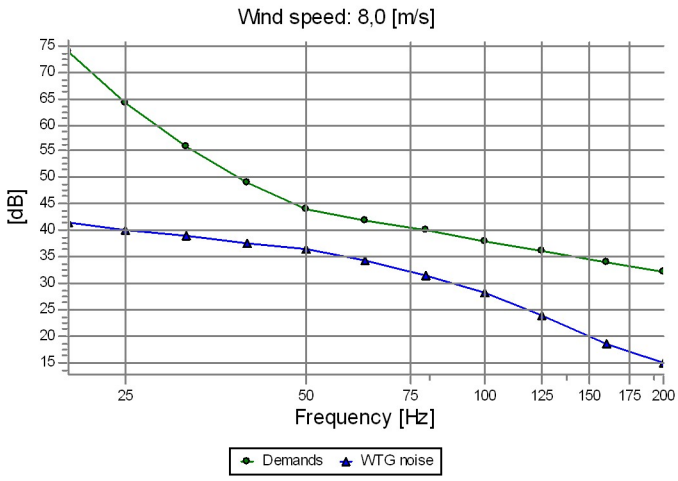
**K Asuinrakennus K (Takalo)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 46,2 | Yes |
| 25,0 | 64,0 | 43,7 | Yes |
| 31,5 | 56,0 | 42,7 | Yes |
| 40,0 | 49,0 | 40,5 | Yes |
| 50,0 | 44,0 | 39,5 | Yes |
| 63,0 | 42,0 | 35,8 | Yes |
| 80,0 | 40,0 | 32,6 | Yes |
| 100,0 | 38,0 | 30,1 | Yes |
| 125,0 | 36,0 | 23,7 | Yes |
| 160,0 | 34,0 | 17,7 | Yes |
| 200,0 | 32,0 | 13,7 | Yes |

**L Lomarakennus L (Haukijärvi)**




**Sound level**

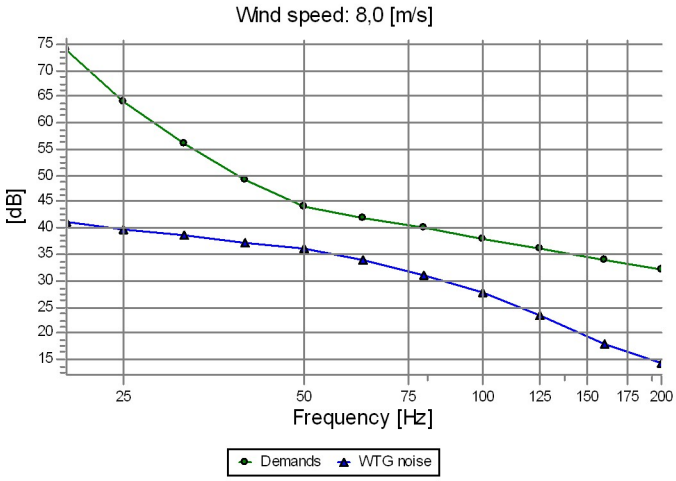
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,5 | Yes |
| 25,0 | 64,0 | 40,0 | Yes |
| 31,5 | 56,0 | 38,9 | Yes |
| 40,0 | 49,0 | 37,6 | Yes |
| 50,0 | 44,0 | 36,4 | Yes |
| 63,0 | 42,0 | 34,2 | Yes |
| 80,0 | 40,0 | 31,5 | Yes |
| 100,0 | 38,0 | 28,2 | Yes |
| 125,0 | 36,0 | 23,9 | Yes |
| 160,0 | 34,0 | 18,4 | Yes |
| 200,0 | 32,0 | 14,8 | Yes |

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

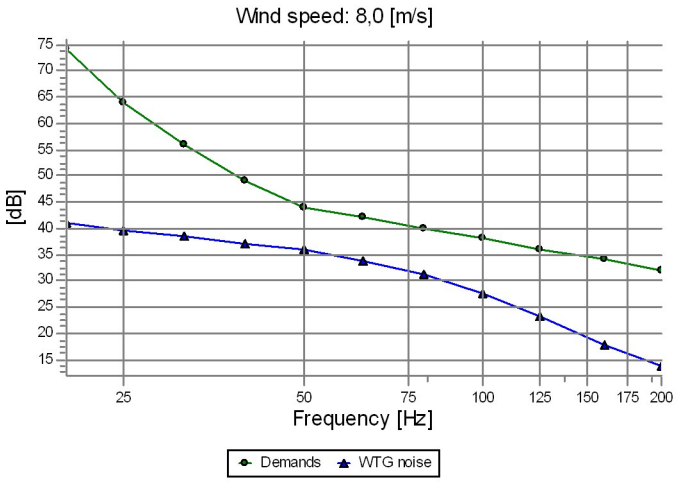
**M Lomarakennus M (Haukilahti)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,1 | Yes |
| 25,0 | 64,0 | 39,6 | Yes |
| 31,5 | 56,0 | 38,5 | Yes |
| 40,0 | 49,0 | 37,2 | Yes |
| 50,0 | 44,0 | 36,0 | Yes |
| 63,0 | 42,0 | 33,9 | Yes |
| 80,0 | 40,0 | 31,2 | Yes |
| 100,0 | 38,0 | 27,8 | Yes |
| 125,0 | 36,0 | 23,5 | Yes |
| 160,0 | 34,0 | 17,9 | Yes |
| 200,0 | 32,0 | 14,2 | Yes |

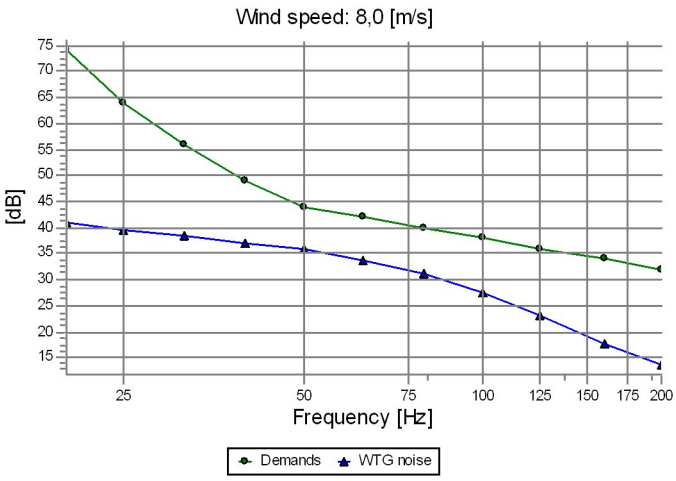
**N Lomarakennus N (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,1 | Yes |
| 25,0 | 64,0 | 39,6 | Yes |
| 31,5 | 56,0 | 38,5 | Yes |
| 40,0 | 49,0 | 37,2 | Yes |
| 50,0 | 44,0 | 36,0 | Yes |
| 63,0 | 42,0 | 33,8 | Yes |
| 80,0 | 40,0 | 31,1 | Yes |
| 100,0 | 38,0 | 27,7 | Yes |
| 125,0 | 36,0 | 23,3 | Yes |
| 160,0 | 34,0 | 17,7 | Yes |
| 200,0 | 32,0 | 13,9 | Yes |

**O Lomarakennus O (Kuusela)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,1 | Yes |
| 25,0 | 64,0 | 39,5 | Yes |
| 31,5 | 56,0 | 38,5 | Yes |
| 40,0 | 49,0 | 37,1 | Yes |
| 50,0 | 44,0 | 35,9 | Yes |
| 63,0 | 42,0 | 33,8 | Yes |
| 80,0 | 40,0 | 31,0 | Yes |
| 100,0 | 38,0 | 27,7 | Yes |
| 125,0 | 36,0 | 23,3 | Yes |
| 160,0 | 34,0 | 17,6 | Yes |
| 200,0 | 32,0 | 13,8 | Yes |

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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model 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 [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [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:** VESTAS V172-7.2 7200 250.0 !O!
**Noise:** V172 - 7,2 MW PO7200 STE + 2dB

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Vestas | 15.11.2022 | USER | 29.11.2022 14.53 |

DMS no.: 0128-4336_00

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 225,0 | 8,0 | 102,6 | 63,7 | 68,9 | 73,8 | 78,6 | 83,0 | 86,8 | 90,2 | 92,9 | 95,2 | 96,8 | 98,0 |

**WTG:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 214,0 | 8,0 | 102,8 | 60,4 | 66,1 | 71,5 | 76,7 | 81,5 | 85,8 | 89,5 | 92,6 | 95,2 | 97,2 | 98,6 |

**WTG:** NORDEX N149/4.0-4.5 4500 180.0 !O!
**Noise:** Serrations Mode 00 - 106.0 dB(A) octave data only

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| F008_271_A13_R01 | 30.6.2017 | USER | 9.5.2023 20.33 |

Mode available on request

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 190,0 | 8,0 | 96,4 | 62,8 | 66,7 | 72,2 | 75,8 | 80,9 | 82,2 | 85,0 | 89,7 | 88,2 | 89,5 | 90,8 |

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

## Noise sensitive area: A Lomarakennus A (Syvälahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: B Asuinrakennus B (Syvääänlahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: C Lomarakennus C (Mutalahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: D Lomarakennus D (Mutaniemi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: E Asuinrakennus E (Alanko)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: F Asuinrakennus F (Joensuu)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:**

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

| 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: G Asuinrakennus G (Heiniaho)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: H Asuinrakennus H (Mäkelä)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: I Lomarakennus I

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: K Asuinrakennus K (Takalo)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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Calculated:
9.5.2023 20.42/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE1_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**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: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: N Lomarakennus N (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: O Lomarakennus O (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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 10. Matalataajuisen melun yhteisvaikutuksen rakennuskohtaiset arvot - VE2

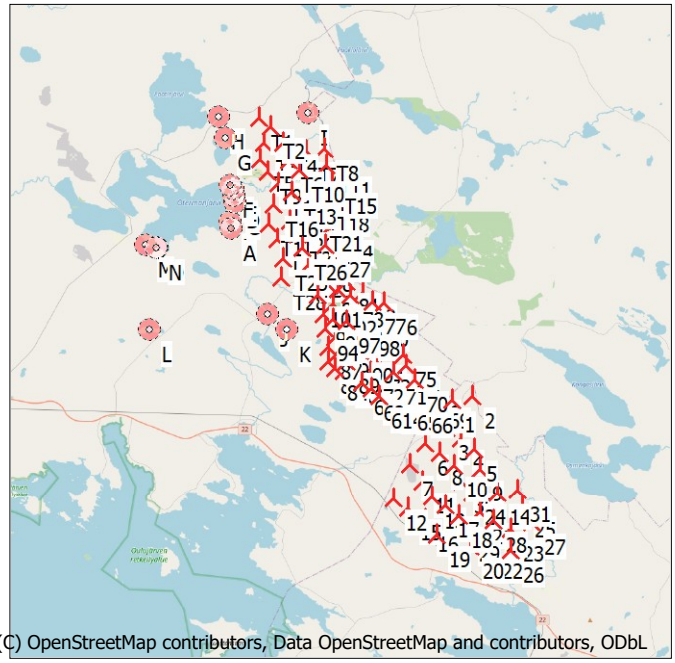
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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model has priority
**Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:**
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:400 000
New WTG
Noise sensitive area

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 100 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 101 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 102 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 61 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 62 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 63 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 64 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 65 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 66 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 67 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 68 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 69 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 70 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 71 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 72 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 73 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 74 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 75 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 76 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 77 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 78 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 79 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 80 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 81 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |

To be continued on next page...

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Main Result

## Calculation: Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Noise data Creator | Name | First wind speed | LwaRef | Last wind speed | LwaRef |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | | | [m/s] | [dB(A)] | [m/s] | [dB(A)] |
| 82 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 83 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 84 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 85 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 86 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 87 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 88 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 89 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0 !O! ... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | USER | V172 - 7,2 MW PO7200 STE + 2dB | 8,0 | 102,6 | 8,0 | 102,6 |
| 90 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 91 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 92 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 93 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 94 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 95 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 96 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 97 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 98 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| 99 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 180.... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | USER | Serrations Mode 00 - 106.0 dB(A) octave data only | 8,0 | 96,4 | 8,0 | 96,4 |
| T1 | 508 282 | 7 174 861 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T10 | 510 426 | 7 172 148 | 146,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T11 | 511 902 | 7 172 395 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T12 | 509 346 | 7 171 412 | 143,2 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T13 | 510 056 | 7 170 927 | 146,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T14 | 511 130 | 7 171 298 | 148,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T15 | 512 122 | 7 171 560 | 159,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T16 | 509 073 | 7 170 275 | 147,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T17 | 510 668 | 7 170 368 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T18 | 511 731 | 7 170 576 | 165,0 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T19 | 508 820 | 7 169 317 | 148,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T2 | 508 948 | 7 174 439 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T20 | 509 941 | 7 169 425 | 149,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T21 | 511 434 | 7 169 585 | 157,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T22 | 509 256 | 7 168 427 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T23 | 510 283 | 7 168 708 | 149,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T24 | 511 959 | 7 169 067 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T25 | 509 625 | 7 167 494 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T26 | 510 589 | 7 167 991 | 147,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T27 | 511 839 | 7 168 207 | 148,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T28 | 509 456 | 7 166 427 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T29 | 510 920 | 7 167 074 | 142,1 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T3 | 508 557 | 7 173 555 | 151,9 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T4 | 509 564 | 7 173 532 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T5 | 508 354 | 7 172 700 | 144,8 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T6 | 509 849 | 7 172 666 | 152,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T7 | 510 753 | 7 173 171 | 147,6 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T8 | 511 738 | 7 173 247 | 154,9 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |
| T9 | 508 756 | 7 172 027 | 142,5 | VESTAS V172-7.2 HH214 7200 17... | Yes | VESTAS | V172-7.2 HH214-7 200 | 7 200 | 172,0 | 214,0 | USER | Level 0S - Measured - PO7200-0S - 07-2022 | 8,0 | 102,8 | 8,0 | 102,8 |

# Calculation Results

## Sound level

| Noise sensitive area | | | | | | Most critical demand | | Predicted sound level |
|---|---|---|---|---|---|---|---|---|
| No. | Name | East | North | Z | Immission height | Frequency | Noise | WTG noise |
| | | | | [m] | [m] | [Hz] | [dB] | [dB] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 4,0 | 50,0 | 44,0 | 37,5 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 4,0 | 50,0 | 44,0 | 37,6 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 4,0 | 50,0 | 44,0 | 38,2 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 4,0 | 50,0 | 44,0 | 38,1 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 4,0 | 50,0 | 44,0 | 38,1 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 4,0 | 50,0 | 44,0 | 37,8 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 4,0 | 63,0 | 42,0 | 34,9 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 4,0 | 50,0 | 44,0 | 35,5 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 4,0 | 63,0 | 42,0 | 35,9 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 4,0 | 50,0 | 44,0 | 38,2 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 4,0 | 50,0 | 44,0 | 39,4 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 4,0 | 50,0 | 44,0 | 31,4 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 4,0 | 50,0 | 44,0 | 31,9 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 4,0 | 50,0 | 44,0 | 32,3 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 4,0 | 50,0 | 44,0 | 32,4 |

***)Spectral distribution, please see details in report "Detailed results"**

## Distances (m)

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14841 | 15043 | 15555 | 15832 | 16100 | 16350 | 18351 | 19383 | 16989 | 10816 | 9530 | 16500 | 18226 | 17629 | 17567 |
| 10 | 17232 | 17467 | 18116 | 18417 | 18710 | 18968 | 21130 | 22204 | 20165 | 12731 | 11401 | 17677 | 20098 | 19514 | 19459 |
| 100 | 8450 | 8631 | 9089 | 9361 | 9626 | 9875 | 11904 | 12958 | 11047 | 5208 | 4254 | 11513 | 12222 | 11625 | 11559 |
| 101 | 5792 | 5996 | 6570 | 6868 | 7160 | 7417 | 9634 | 10736 | 9635 | 2849 | 2455 | 9132 | 9499 | 8904 | 8837 |
| 102 | 6696 | 6896 | 7446 | 7737 | 8023 | 8279 | 10449 | 11539 | 10184 | 3475 | 2754 | 9806 | 10376 | 9779 | 9713 |
| 11 | 16785 | 17040 | 17781 | 18096 | 18406 | 18666 | 20940 | 22042 | 20393 | 12069 | 10755 | 16528 | 19284 | 18715 | 18664 |

To be continued on next page...

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9.5.2023 20.43/3.5.584

# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

...continued from previous page

| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 16716 | 16987 | 17809 | 18134 | 18455 | 18716 | 21074 | 22195 | 20906 | 11863 | 10596 | 15748 | 18831 | 18280 | 18234 |
| 13 | 17797 | 18053 | 18799 | 19114 | 19424 | 19684 | 21958 | 23061 | 21386 | 13066 | 11756 | 17412 | 20250 | 19684 | 19634 |
| 14 | 19986 | 20215 | 20832 | 21126 | 21413 | 21669 | 23776 | 24834 | 22562 | 15537 | 14207 | 20455 | 22912 | 22327 | 22272 |
| 15 | 17585 | 17853 | 18659 | 18982 | 19301 | 19562 | 21901 | 23018 | 21618 | 12753 | 11475 | 16689 | 19759 | 19206 | 19159 |
| 16 | 18564 | 18829 | 19614 | 19935 | 20250 | 20512 | 22827 | 23939 | 22411 | 13759 | 12470 | 17765 | 20810 | 20255 | 20207 |
| 17 | 18634 | 18887 | 19618 | 19931 | 20239 | 20499 | 22753 | 23851 | 22080 | 13928 | 12614 | 18305 | 21133 | 20565 | 20514 |
| 18 | 19479 | 19729 | 20447 | 20757 | 21062 | 21322 | 23558 | 24650 | 22793 | 14795 | 13478 | 19197 | 22016 | 21447 | 21397 |
| 19 | 19633 | 19898 | 20682 | 21002 | 21318 | 21579 | 23891 | 25002 | 23435 | 14825 | 13538 | 18758 | 21856 | 21303 | 21256 |
| 2 | 15625 | 15815 | 16273 | 16539 | 16796 | 17041 | 18961 | 19969 | 17355 | 11759 | 10494 | 17541 | 19141 | 18542 | 18479 |
| 20 | 21146 | 21401 | 22141 | 22455 | 22763 | 23023 | 25280 | 26378 | 24561 | 16409 | 15102 | 20564 | 23550 | 22989 | 22940 |
| 21 | 20039 | 20281 | 20958 | 21262 | 21560 | 21818 | 24002 | 25081 | 23038 | 15441 | 14115 | 20046 | 22735 | 22159 | 22107 |
| 22 | 21801 | 22049 | 22754 | 23063 | 23365 | 23625 | 25839 | 26925 | 24943 | 17129 | 15810 | 21464 | 24344 | 23776 | 23726 |
| 23 | 21818 | 22054 | 22702 | 23001 | 23293 | 23550 | 25691 | 26757 | 24542 | 17275 | 15946 | 21938 | 24596 | 24018 | 23964 |
| 24 | 19052 | 19290 | 19950 | 20251 | 20546 | 20804 | 22971 | 24046 | 21972 | 14503 | 13174 | 19263 | 21835 | 21255 | 21202 |
| 25 | 21363 | 21587 | 22180 | 22470 | 22751 | 23006 | 25075 | 26122 | 23715 | 16962 | 15633 | 21917 | 24349 | 23763 | 23708 |
| 26 | 22677 | 22919 | 23596 | 23900 | 24197 | 24455 | 26631 | 27707 | 25584 | 18060 | 16736 | 22518 | 25323 | 24751 | 24700 |
| 27 | 22360 | 22587 | 23193 | 23486 | 23770 | 24025 | 26109 | 27159 | 24772 | 17914 | 16584 | 22757 | 25282 | 24699 | 24644 |
| 28 | 20882 | 21122 | 21786 | 22088 | 22383 | 22641 | 24806 | 25880 | 23759 | 16307 | 14979 | 20931 | 23611 | 23035 | 22982 |
| 29 | 20297 | 20549 | 21271 | 21582 | 21888 | 22148 | 24387 | 25480 | 23617 | 15598 | 14283 | 19914 | 22795 | 22228 | 22178 |
| 3 | 15627 | 15848 | 16441 | 16733 | 17016 | 17271 | 19371 | 20431 | 18265 | 11315 | 9994 | 16648 | 18737 | 18145 | 18086 |
| 30 | 18129 | 18367 | 19031 | 19333 | 19629 | 19887 | 22062 | 23140 | 21115 | 13581 | 12252 | 18388 | 20920 | 20339 | 20285 |
| 31 | 20570 | 20789 | 21364 | 21651 | 21930 | 22183 | 24231 | 25272 | 22826 | 16227 | 14900 | 21305 | 23633 | 23044 | 22987 |
| 4 | 16498 | 16718 | 17304 | 17594 | 17876 | 18130 | 20215 | 21270 | 19032 | 12190 | 10868 | 17482 | 19610 | 19018 | 18960 |
| 5 | 17439 | 17658 | 18238 | 18527 | 18807 | 19061 | 21132 | 22182 | 19878 | 13130 | 11807 | 18378 | 20548 | 19957 | 19899 |
| 6 | 15344 | 15583 | 16254 | 16559 | 16857 | 17115 | 19313 | 20399 | 18535 | 10815 | 9484 | 15818 | 18181 | 17597 | 17542 |
| 61 | 11839 | 12081 | 12772 | 13080 | 13384 | 13643 | 15885 | 16984 | 15421 | 7339 | 6011 | 12678 | 14743 | 14154 | 14097 |
| 62 | 11301 | 11543 | 12239 | 12549 | 12853 | 13113 | 15365 | 16466 | 14966 | 6804 | 5477 | 12203 | 14213 | 13623 | 13565 |
| 63 | 10704 | 10950 | 11665 | 11978 | 12286 | 12546 | 14822 | 15929 | 14551 | 6172 | 4843 | 11585 | 13577 | 12987 | 12930 |
| 64 | 12280 | 12516 | 13179 | 13484 | 13782 | 14041 | 16250 | 17340 | 15644 | 7848 | 6523 | 13244 | 15263 | 14672 | 14614 |
| 65 | 12868 | 13096 | 13721 | 14019 | 14310 | 14567 | 16728 | 17806 | 15930 | 8536 | 7219 | 14016 | 15961 | 15368 | 15309 |
| 66 | 13535 | 13755 | 14347 | 14639 | 14923 | 15179 | 17293 | 18359 | 16319 | 9288 | 7977 | 14820 | 16714 | 16119 | 16060 |
| 67 | 12280 | 12501 | 13102 | 13396 | 13684 | 13940 | 16076 | 17149 | 15235 | 8053 | 6751 | 13693 | 15478 | 14882 | 14822 |
| 68 | 13397 | 13605 | 14145 | 14428 | 14703 | 14955 | 17007 | 18056 | 15854 | 9330 | 8045 | 15048 | 16741 | 16143 | 16082 |
| 69 | 14038 | 14245 | 14782 | 15065 | 15338 | 15590 | 17631 | 18677 | 16417 | 9956 | 8666 | 15628 | 17372 | 16775 | 16714 |
| 7 | 15707 | 15962 | 16705 | 17020 | 17330 | 17591 | 19869 | 20974 | 19379 | 10999 | 9683 | 15555 | 18235 | 17663 | 17612 |
| 70 | 12592 | 12802 | 13353 | 13638 | 13916 | 14169 | 16242 | 17298 | 15192 | 8526 | 7246 | 14291 | 15933 | 15335 | 15274 |
| 71 | 11494 | 11712 | 12299 | 12591 | 12877 | 13132 | 15261 | 16334 | 14441 | 7356 | 6073 | 13134 | 14769 | 14171 | 14111 |
| 72 | 10603 | 10836 | 11492 | 11796 | 12095 | 12353 | 14569 | 15663 | 14086 | 6271 | 4964 | 11944 | 13697 | 13102 | 13043 |
| 73 | 10505 | 10726 | 11335 | 11631 | 11921 | 12178 | 14343 | 15425 | 13696 | 6354 | 5079 | 12198 | 13763 | 13165 | 13104 |
| 74 | 11721 | 11925 | 12453 | 12735 | 13009 | 13261 | 15316 | 16368 | 14264 | 7790 | 6543 | 13706 | 15162 | 14563 | 14501 |
| 75 | 11329 | 11526 | 12030 | 12308 | 12578 | 12828 | 14860 | 15907 | 13767 | 7517 | 6301 | 13526 | 14850 | 14251 | 14187 |
| 76 | 8996 | 9149 | 9491 | 9740 | 9980 | 10220 | 12094 | 13107 | 10806 | 6182 | 5309 | 12510 | 12977 | 12386 | 12318 |
| 77 | 8413 | 8572 | 8943 | 9199 | 9447 | 9690 | 11617 | 12646 | 10516 | 5584 | 4749 | 11915 | 12365 | 11772 | 11705 |
| 78 | 7276 | 7444 | 7863 | 8130 | 8391 | 8638 | 10656 | 11711 | 9914 | 4522 | 3830 | 10845 | 11197 | 10605 | 10537 |
| 79 | 6548 | 6718 | 7154 | 7426 | 7691 | 7941 | 10001 | 11069 | 9468 | 3979 | 3457 | 10265 | 10486 | 9895 | 9827 |
| 8 | 16261 | 16497 | 17156 | 17458 | 17754 | 18012 | 20190 | 21270 | 19312 | 11749 | 10419 | 16730 | 19118 | 18533 | 18478 |
| 80 | 6013 | 6186 | 6641 | 6917 | 7188 | 7440 | 9539 | 10616 | 9186 | 3599 | 3233 | 9832 | 9956 | 9367 | 9299 |
| 81 | 6757 | 6905 | 7253 | 7507 | 7755 | 7999 | 9956 | 10999 | 9150 | 4542 | 4063 | 10793 | 10838 | 10253 | 10184 |
| 82 | 7770 | 7923 | 8276 | 8530 | 8776 | 9018 | 10944 | 11975 | 9920 | 5187 | 4480 | 11509 | 11786 | 11197 | 11129 |
| 83 | 8694 | 8953 | 9734 | 10056 | 10375 | 10636 | 12990 | 14113 | 13174 | 4047 | 2717 | 9588 | 11445 | 10855 | 10798 |
| 84 | 9275 | 9533 | 10304 | 10625 | 10942 | 11203 | 13544 | 14665 | 13629 | 4631 | 3301 | 10070 | 12019 | 11430 | 11374 |
| 85 | 9632 | 9884 | 10629 | 10946 | 11259 | 11520 | 13834 | 14949 | 13779 | 5054 | 3725 | 10542 | 12458 | 11868 | 11811 |
| 86 | 10061 | 10304 | 11009 | 11321 | 11627 | 11888 | 14159 | 15266 | 13911 | 5590 | 4269 | 11168 | 13012 | 12419 | 12361 |
| 87 | 8164 | 8414 | 9156 | 9474 | 9788 | 10049 | 12373 | 13492 | 12475 | 3695 | 2393 | 9541 | 11121 | 10526 | 10467 |
| 88 | 8690 | 8936 | 9660 | 9975 | 10286 | 10547 | 12850 | 13964 | 12822 | 4242 | 2936 | 10030 | 11669 | 11074 | 11015 |
| 89 | 9303 | 9547 | 10254 | 10567 | 10875 | 11135 | 13417 | 14526 | 13260 | 4869 | 3557 | 10585 | 12295 | 11701 | 11642 |
| 9 | 18381 | 18607 | 19214 | 19507 | 19792 | 20047 | 22149 | 23206 | 20958 | 13980 | 12651 | 19046 | 21376 | 20789 | 20732 |
| 90 | 9485 | 9710 | 10340 | 10640 | 10935 | 11193 | 13393 | 14485 | 12936 | 5336 | 4079 | 11272 | 12734 | 12136 | 12075 |
| 91 | 10019 | 10237 | 10830 | 11124 | 11412 | 11669 | 13822 | 14903 | 13178 | 5965 | 4719 | 11917 | 13350 | 12751 | 12689 |
| 92 | 8745 | 8978 | 9643 | 9950 | 10252 | 10511 | 12757 | 13860 | 12517 | 4524 | 3269 | 10487 | 11928 | 11330 | 11269 |
| 93 | 8012 | 8247 | 8925 | 9234 | 9538 | 9798 | 12065 | 13173 | 11964 | 3832 | 2618 | 9901 | 11214 | 10615 | 10554 |
| 94 | 7332 | 7570 | 8265 | 8577 | 8885 | 9145 | 11438 | 12551 | 11493 | 3186 | 2038 | 9346 | 10539 | 9940 | 9878 |
| 95 | 7264 | 7483 | 8101 | 8402 | 8698 | 8957 | 11180 | 12280 | 11007 | 3510 | 2516 | 9784 | 10713 | 10113 | 10049 |
| 96 | 6650 | 6875 | 7521 | 7827 | 8128 | 8388 | 10648 | 11756 | 10666 | 2929 | 2062 | 9240 | 10079 | 9480 | 9416 |
| 97 | 7868 | 8076 | 8648 | 8941 | 9228 | 9484 | 11649 | 12736 | 11231 | 4206 | 3174 | 10466 | 11398 | 10799 | 10735 |
| 98 | 8760 | 8953 | 9454 | 9734 | 10006 | 10258 | 12329 | 13392 | 11552 | 5261 | 4211 | 11512 | 12413 | 11815 | 11750 |

To be continued on next page...

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# DECIBEL - Main Result

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

...continued from previous page

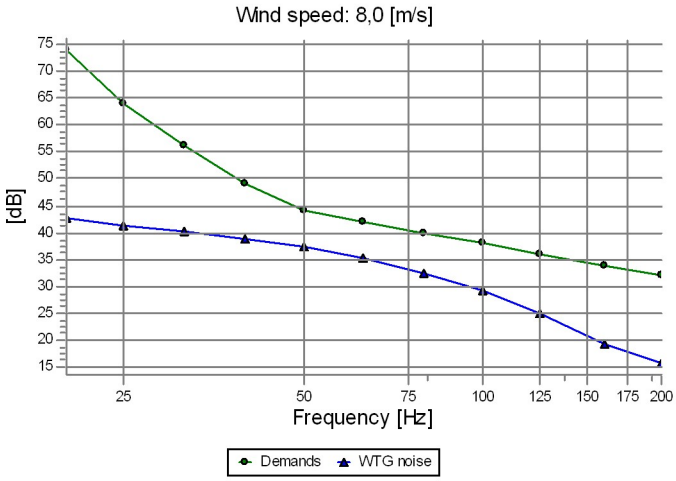
| WTG | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | 7965 | 8152 | 8636 | 8913 | 9184 | 9436 | 11505 | 12570 | 10808 | 4706 | 3789 | 11020 | 11707 | 11110 | 11044 |
| T1 | 6000 | 5708 | 4594 | 4300 | 3999 | 3835 | 2060 | 2090 | 2625 | 10347 | 11268 | 12636 | 8960 | 8779 | 8734 |
| T10 | 4760 | 4581 | 3787 | 3720 | 3660 | 3727 | 4264 | 5057 | 3049 | 7801 | 8473 | 11638 | 9035 | 8649 | 8587 |
| T11 | 6091 | 5943 | 5236 | 5193 | 5149 | 5222 | 5583 | 6241 | 2945 | 8471 | 8946 | 12857 | 10479 | 10073 | 10009 |
| T12 | 3465 | 3277 | 2497 | 2460 | 2446 | 2557 | 3725 | 4712 | 4055 | 6911 | 7729 | 10368 | 7744 | 7349 | 7286 |
| T13 | 3747 | 3619 | 3049 | 3088 | 3142 | 3291 | 4582 | 5551 | 4315 | 6530 | 7234 | 10507 | 8221 | 7785 | 7719 |
| T14 | 4867 | 4750 | 4173 | 4192 | 4216 | 4340 | 5269 | 6120 | 3870 | 7173 | 7715 | 11547 | 9357 | 8920 | 8854 |
| T15 | 5872 | 5764 | 5198 | 5211 | 5224 | 5338 | 6057 | 6813 | 3806 | 7793 | 8196 | 12471 | 10380 | 9939 | 9872 |
| T16 | 2570 | 2455 | 2032 | 2157 | 2307 | 2514 | 4379 | 5460 | 5213 | 5758 | 6619 | 9350 | 7082 | 6632 | 6565 |
| T17 | 4073 | 4001 | 3622 | 3717 | 3820 | 3995 | 5410 | 6379 | 4798 | 6144 | 6726 | 10591 | 8642 | 8172 | 8105 |
| T18 | 5148 | 5082 | 4686 | 4763 | 4841 | 4998 | 6152 | 7035 | 4661 | 6738 | 7142 | 11555 | 9724 | 9250 | 9182 |
| T19 | 2022 | 2021 | 2097 | 2348 | 2607 | 2857 | 5065 | 6182 | 6200 | 4792 | 5706 | 8505 | 6612 | 6113 | 6045 |
| T2 | 5802 | 5525 | 4431 | 4172 | 3906 | 3786 | 2521 | 2797 | 2072 | 9915 | 10776 | 12590 | 9123 | 8894 | 8844 |
| T20 | 3148 | 3143 | 3066 | 3258 | 3456 | 3682 | 5581 | 6647 | 5814 | 5038 | 5729 | 9434 | 7735 | 7232 | 7163 |
| T21 | 4649 | 4641 | 4469 | 4615 | 4763 | 4960 | 6500 | 7475 | 5603 | 5719 | 6108 | 10738 | 9235 | 8727 | 8658 |
| T22 | 2516 | 2624 | 2986 | 3268 | 3551 | 3807 | 6055 | 7173 | 6929 | 3932 | 4762 | 8288 | 6954 | 6413 | 6343 |
| T23 | 3482 | 3542 | 3668 | 3898 | 4128 | 4366 | 6358 | 7432 | 6481 | 4449 | 5033 | 9295 | 7994 | 7461 | 7391 |
| T24 | 5142 | 5168 | 5099 | 5268 | 5435 | 5642 | 7236 | 8212 | 6187 | 5551 | 5785 | 10912 | 9693 | 9167 | 9097 |
| T25 | 3207 | 3380 | 3912 | 4212 | 4509 | 4768 | 7055 | 8175 | 7771 | 3090 | 3801 | 8107 | 7352 | 6781 | 6711 |
| T26 | 3916 | 4026 | 4304 | 4559 | 4811 | 5057 | 7119 | 8201 | 7177 | 3915 | 4364 | 9191 | 8286 | 7729 | 7659 |
| T27 | 5092 | 5168 | 5286 | 5499 | 5709 | 5936 | 7745 | 8768 | 7019 | 4795 | 4946 | 10402 | 9533 | 8983 | 8913 |
| T28 | 3716 | 3949 | 4677 | 4999 | 5318 | 5579 | 7962 | 9092 | 8851 | 2023 | 2753 | 7498 | 7363 | 6771 | 6703 |
| T29 | 4551 | 4707 | 5129 | 5405 | 5677 | 5929 | 8064 | 9154 | 8087 | 3336 | 3555 | 9098 | 8685 | 8108 | 8039 |
| T3 | 4836 | 4558 | 3465 | 3209 | 2950 | 2843 | 2071 | 2728 | 2832 | 9032 | 9937 | 11631 | 8241 | 7988 | 7936 |
| T4 | 5263 | 5014 | 3990 | 3792 | 3593 | 3543 | 3074 | 3644 | 2100 | 9042 | 9838 | 12167 | 9015 | 8720 | 8664 |
| T5 | 3967 | 3694 | 2614 | 2378 | 2149 | 2081 | 2163 | 3094 | 3534 | 8186 | 9120 | 10799 | 7547 | 7259 | 7204 |
| T6 | 4724 | 4506 | 3581 | 3448 | 3322 | 3339 | 3538 | 4292 | 2703 | 8213 | 8970 | 11650 | 8773 | 8428 | 8368 |
| T7 | 5704 | 5500 | 4606 | 4482 | 4358 | 4371 | 4299 | 4883 | 1994 | 8871 | 9521 | 12619 | 9809 | 9461 | 9401 |
| T8 | 6472 | 6292 | 5469 | 5374 | 5275 | 5307 | 5266 | 5791 | 2093 | 9214 | 9743 | 13338 | 10705 | 10335 | 10274 |
| T9 | 3559 | 3317 | 2335 | 2185 | 2057 | 2087 | 2879 | 3860 | 3792 | 7502 | 8396 | 10475 | 7508 | 7165 | 7106 |

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9.5.2023 20.43/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

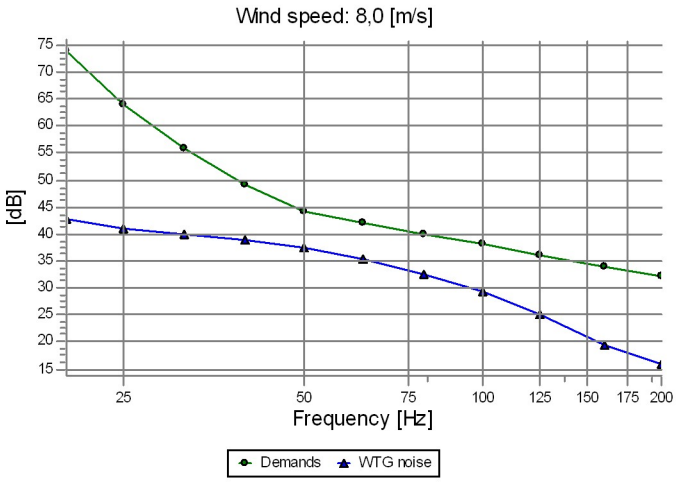
### A Lomarakennus A (Syvälahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,8 | Yes |
| 25,0 | 64,0 | 41,1 | Yes |
| 31,5 | 56,0 | 40,1 | Yes |
| 40,0 | 49,0 | 38,7 | Yes |
| 50,0 | 44,0 | 37,5 | Yes |
| 63,0 | 42,0 | 35,3 | Yes |
| 80,0 | 40,0 | 32,6 | Yes |
| 100,0 | 38,0 | 29,3 | Yes |
| 125,0 | 36,0 | 24,9 | Yes |
| 160,0 | 34,0 | 19,4 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

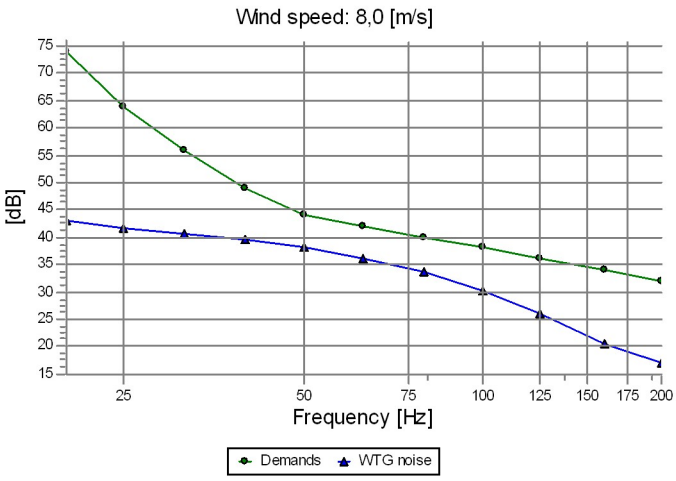
### B Asuinrakennus B (Syväänlahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,7 | Yes |
| 25,0 | 64,0 | 41,1 | Yes |
| 31,5 | 56,0 | 40,1 | Yes |
| 40,0 | 49,0 | 38,7 | Yes |
| 50,0 | 44,0 | 37,6 | Yes |
| 63,0 | 42,0 | 35,4 | Yes |
| 80,0 | 40,0 | 32,7 | Yes |
| 100,0 | 38,0 | 29,4 | Yes |
| 125,0 | 36,0 | 25,0 | Yes |
| 160,0 | 34,0 | 19,5 | Yes |
| 200,0 | 32,0 | 15,8 | Yes |

### C Lomarakennus C (Mutalahti)




**Sound level**

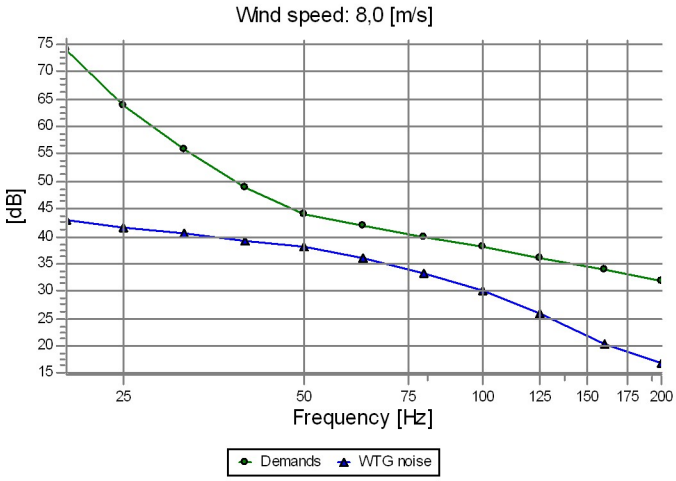
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,2 | Yes |
| 25,0 | 64,0 | 41,7 | Yes |
| 31,5 | 56,0 | 40,6 | Yes |
| 40,0 | 49,0 | 39,4 | Yes |
| 50,0 | 44,0 | 38,2 | Yes |
| 63,0 | 42,0 | 36,2 | Yes |
| 80,0 | 40,0 | 33,5 | Yes |
| 100,0 | 38,0 | 30,2 | Yes |
| 125,0 | 36,0 | 26,0 | Yes |
| 160,0 | 34,0 | 20,5 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

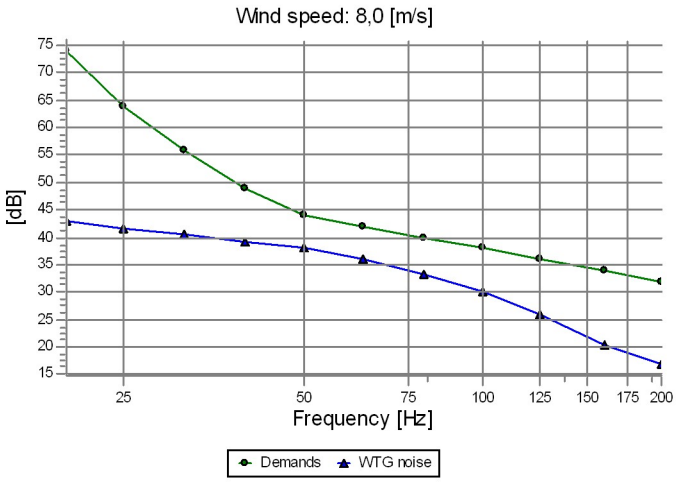
**D Lomarakennus D (Mutaniemi)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,1 | Yes |
| 25,0 | 64,0 | 41,6 | Yes |
| 31,5 | 56,0 | 40,5 | Yes |
| 40,0 | 49,0 | 39,3 | Yes |
| 50,0 | 44,0 | 38,1 | Yes |
| 63,0 | 42,0 | 36,1 | Yes |
| 80,0 | 40,0 | 33,4 | Yes |
| 100,0 | 38,0 | 30,1 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,8 | Yes |

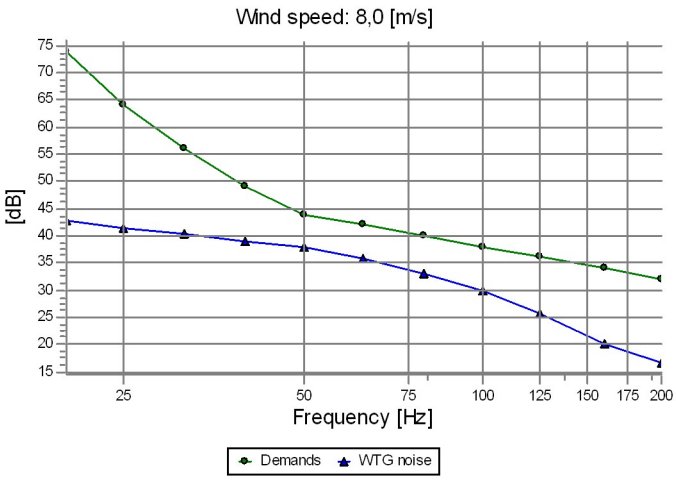
**E Asuinrakennus E (Alanko)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 43,0 | Yes |
| 25,0 | 64,0 | 41,5 | Yes |
| 31,5 | 56,0 | 40,5 | Yes |
| 40,0 | 49,0 | 39,2 | Yes |
| 50,0 | 44,0 | 38,1 | Yes |
| 63,0 | 42,0 | 36,0 | Yes |
| 80,0 | 40,0 | 33,4 | Yes |
| 100,0 | 38,0 | 30,1 | Yes |
| 125,0 | 36,0 | 25,9 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,8 | Yes |

**F Asuinrakennus F (Joensuu)**




**Sound level**

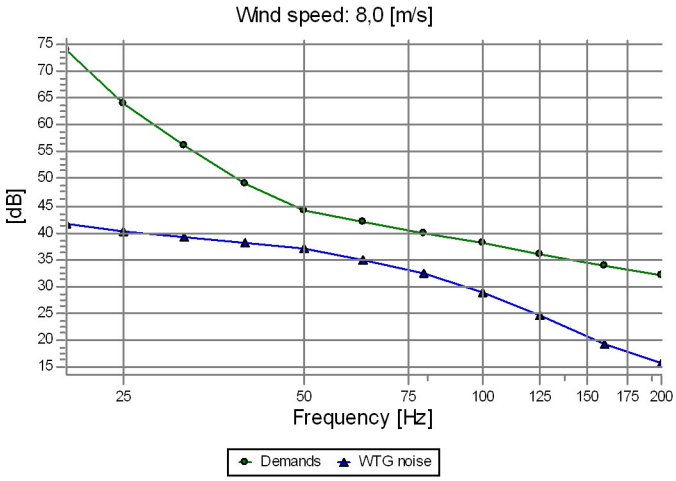
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,8 | Yes |
| 25,0 | 64,0 | 41,3 | Yes |
| 31,5 | 56,0 | 40,2 | Yes |
| 40,0 | 49,0 | 39,0 | Yes |
| 50,0 | 44,0 | 37,8 | Yes |
| 63,0 | 42,0 | 35,8 | Yes |
| 80,0 | 40,0 | 33,1 | Yes |
| 100,0 | 38,0 | 29,9 | Yes |
| 125,0 | 36,0 | 25,6 | Yes |
| 160,0 | 34,0 | 20,1 | Yes |
| 200,0 | 32,0 | 16,5 | Yes |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

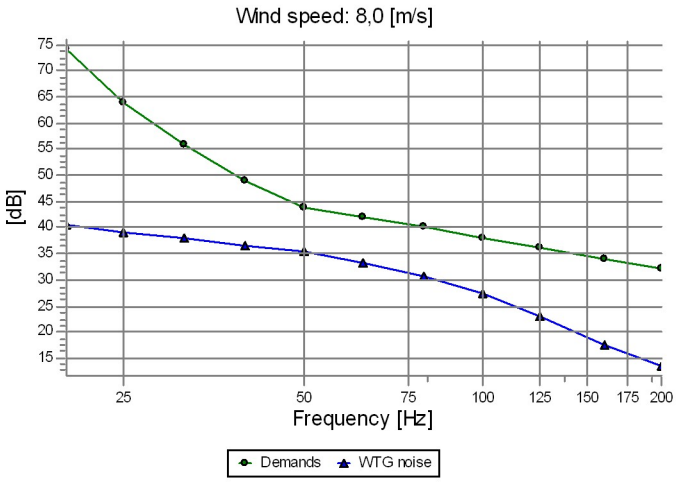
**G Asuinrakennus G (Heiniaho)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 41,8 | Yes |
| 25,0 | 64,0 | 40,4 | Yes |
| 31,5 | 56,0 | 39,3 | Yes |
| 40,0 | 49,0 | 38,1 | Yes |
| 50,0 | 44,0 | 36,9 | Yes |
| 63,0 | 42,0 | 34,9 | Yes |
| 80,0 | 40,0 | 32,3 | Yes |
| 100,0 | 38,0 | 29,0 | Yes |
| 125,0 | 36,0 | 24,8 | Yes |
| 160,0 | 34,0 | 19,3 | Yes |
| 200,0 | 32,0 | 15,7 | Yes |

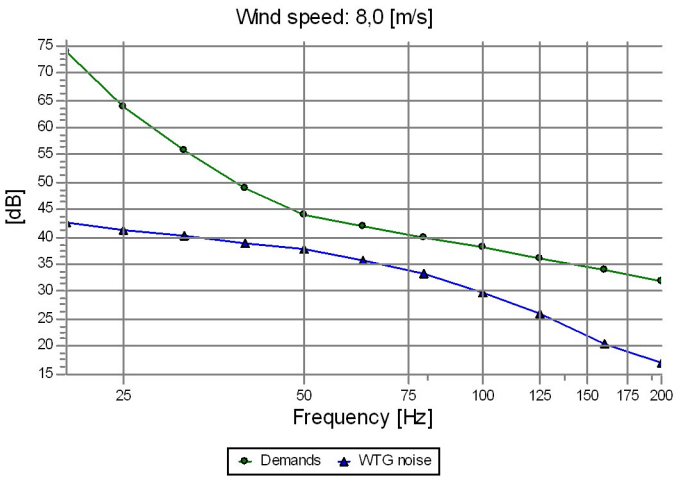
**H Asuinrakennus H (Mäkelä)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 40,5 | Yes |
| 25,0 | 64,0 | 39,0 | Yes |
| 31,5 | 56,0 | 37,9 | Yes |
| 40,0 | 49,0 | 36,7 | Yes |
| 50,0 | 44,0 | 35,5 | Yes |
| 63,0 | 42,0 | 33,4 | Yes |
| 80,0 | 40,0 | 30,7 | Yes |
| 100,0 | 38,0 | 27,3 | Yes |
| 125,0 | 36,0 | 23,0 | Yes |
| 160,0 | 34,0 | 17,4 | Yes |
| 200,0 | 32,0 | 13,7 | Yes |

**I Lomarakennus I**




**Sound level**

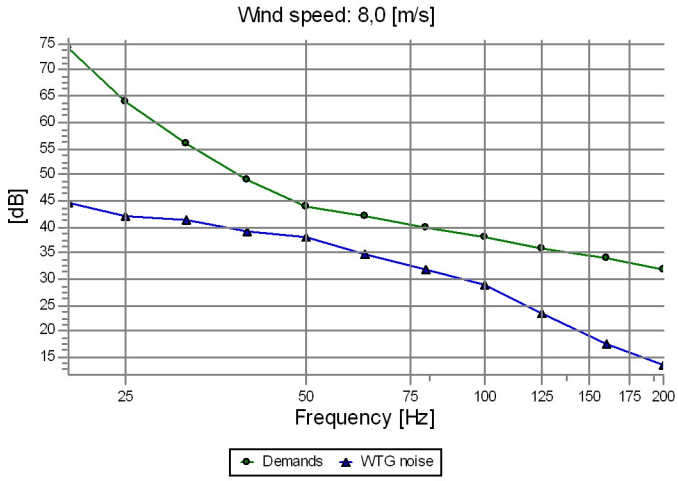
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 42,6 | Yes |
| 25,0 | 64,0 | 41,2 | Yes |
| 31,5 | 56,0 | 40,2 | Yes |
| 40,0 | 49,0 | 39,0 | Yes |
| 50,0 | 44,0 | 37,8 | Yes |
| 63,0 | 42,0 | 35,9 | Yes |
| 80,0 | 40,0 | 33,3 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 25,8 | Yes |
| 160,0 | 34,0 | 20,4 | Yes |
| 200,0 | 32,0 | 16,9 | Yes |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

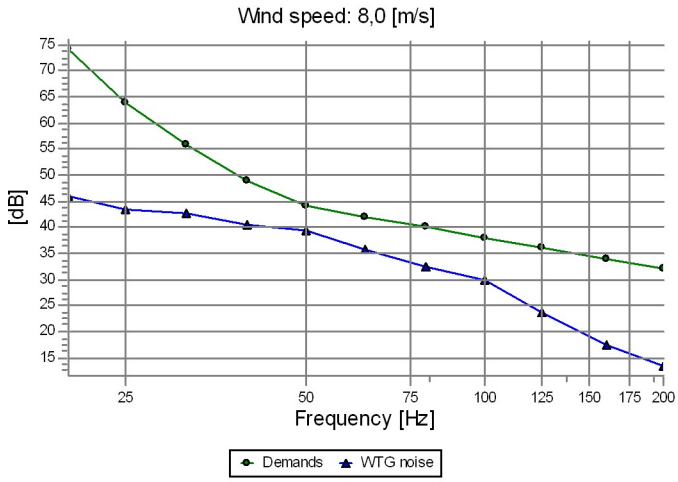
**J Lomarakennus J (Hautakaarto)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 44,5 | Yes |
| 25,0 | 64,0 | 42,2 | Yes |
| 31,5 | 56,0 | 41,2 | Yes |
| 40,0 | 49,0 | 39,2 | Yes |
| 50,0 | 44,0 | 38,2 | Yes |
| 63,0 | 42,0 | 34,9 | Yes |
| 80,0 | 40,0 | 31,9 | Yes |
| 100,0 | 38,0 | 29,1 | Yes |
| 125,0 | 36,0 | 23,5 | Yes |
| 160,0 | 34,0 | 17,7 | Yes |
| 200,0 | 32,0 | 13,8 | Yes |

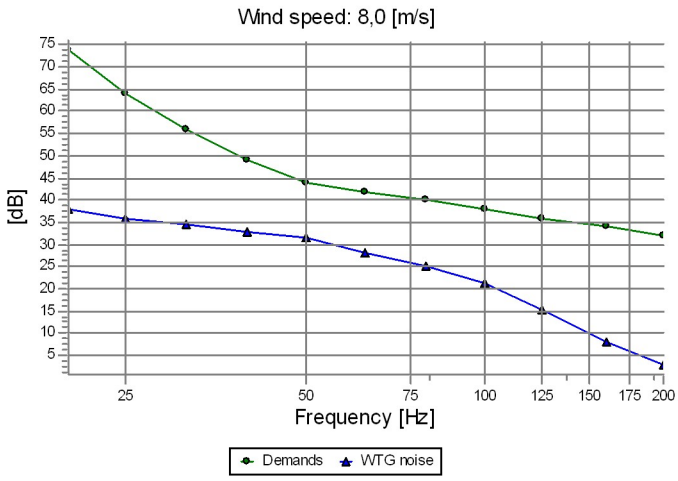
**K Asuinrakennus K (Takalo)**




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 46,1 | Yes |
| 25,0 | 64,0 | 43,6 | Yes |
| 31,5 | 56,0 | 42,6 | Yes |
| 40,0 | 49,0 | 40,4 | Yes |
| 50,0 | 44,0 | 39,4 | Yes |
| 63,0 | 42,0 | 35,6 | Yes |
| 80,0 | 40,0 | 32,5 | Yes |
| 100,0 | 38,0 | 30,0 | Yes |
| 125,0 | 36,0 | 23,5 | Yes |
| 160,0 | 34,0 | 17,5 | Yes |
| 200,0 | 32,0 | 13,6 | Yes |

**L Lomarakennus L (Haukijärvi)**




**Sound level**

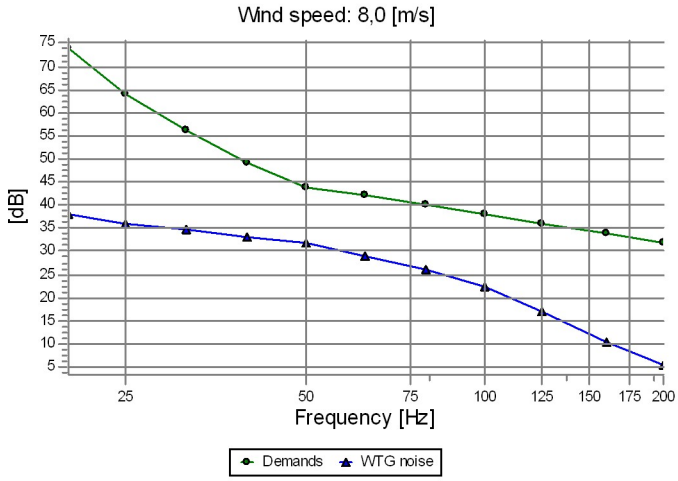
| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,1 | Yes |
| 25,0 | 64,0 | 35,8 | Yes |
| 31,5 | 56,0 | 34,7 | Yes |
| 40,0 | 49,0 | 32,7 | Yes |
| 50,0 | 44,0 | 31,4 | Yes |
| 63,0 | 42,0 | 28,2 | Yes |
| 80,0 | 40,0 | 24,9 | Yes |
| 100,0 | 38,0 | 21,3 | Yes |
| 125,0 | 36,0 | 15,2 | Yes |
| 160,0 | 34,0 | 8,2 | Yes |
| 200,0 | 32,0 | 2,8 | Yes |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Detailed results, graphic

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas **Noise calculation model:** Finland Low frequency

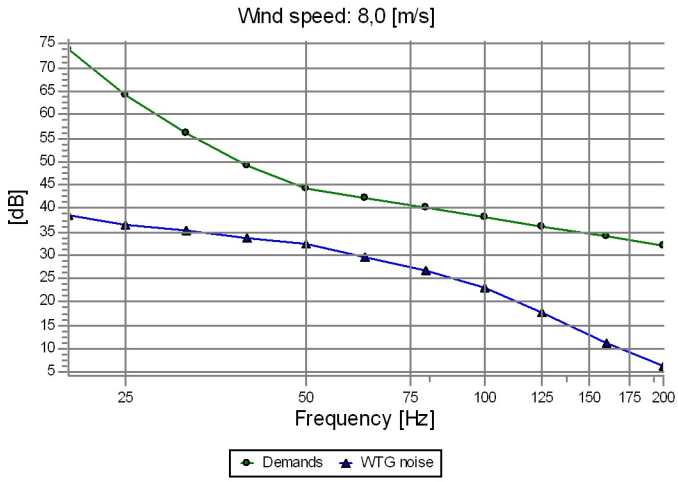
### M Lomarakennus M (Haukilahti)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,0 | Yes |
| 25,0 | 64,0 | 36,0 | Yes |
| 31,5 | 56,0 | 34,8 | Yes |
| 40,0 | 49,0 | 33,1 | Yes |
| 50,0 | 44,0 | 31,9 | Yes |
| 63,0 | 42,0 | 29,0 | Yes |
| 80,0 | 40,0 | 25,9 | Yes |
| 100,0 | 38,0 | 22,3 | Yes |
| 125,0 | 36,0 | 16,9 | Yes |
| 160,0 | 34,0 | 10,3 | Yes |
| 200,0 | 32,0 | 5,4 | Yes |

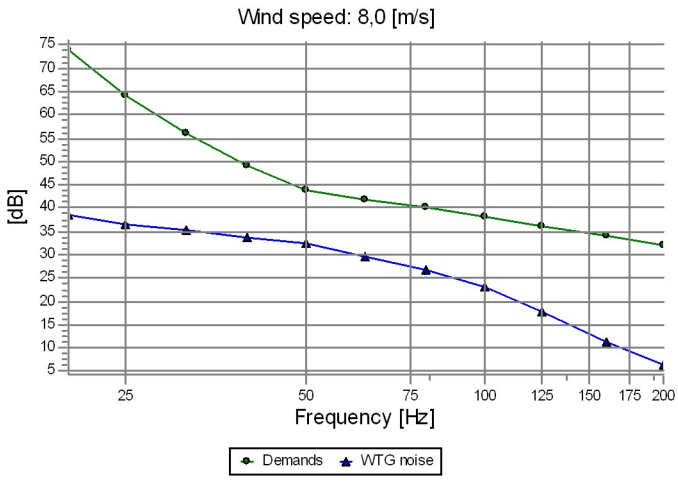
### N Lomarakennus N (Kuusela)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,5 | Yes |
| 25,0 | 64,0 | 36,4 | Yes |
| 31,5 | 56,0 | 35,3 | Yes |
| 40,0 | 49,0 | 33,6 | Yes |
| 50,0 | 44,0 | 32,3 | Yes |
| 63,0 | 42,0 | 29,5 | Yes |
| 80,0 | 40,0 | 26,5 | Yes |
| 100,0 | 38,0 | 22,9 | Yes |
| 125,0 | 36,0 | 17,5 | Yes |
| 160,0 | 34,0 | 11,1 | Yes |
| 200,0 | 32,0 | 6,2 | Yes |

### O Lomarakennus O (Kuusela)




**Sound level**

| Frequency [Hz] | Demands [dB] | WTG noise [dB] | Demands fulfilled ? |
|---|---|---|---|
| 20,0 | 74,0 | 38,5 | Yes |
| 25,0 | 64,0 | 36,5 | Yes |
| 31,5 | 56,0 | 35,4 | Yes |
| 40,0 | 49,0 | 33,7 | Yes |
| 50,0 | 44,0 | 32,4 | Yes |
| 63,0 | 42,0 | 29,6 | Yes |
| 80,0 | 40,0 | 26,6 | Yes |
| 100,0 | 38,0 | 23,0 | Yes |
| 125,0 | 36,0 | 17,6 | Yes |
| 160,0 | 34,0 | 11,2 | Yes |
| 200,0 | 32,0 | 6,4 | Yes |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**Noise calculation model:**
Finland Low frequency
**Wind speed (in 10 m height):**
Highest noise value at receptor
**Spectral distribution:**
From 20,0 Hz to 200,0 Hz
**Meteorological coefficient, C0:**
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 model 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 [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [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:** VESTAS V172-7.2 7200 250.0 !O!
**Noise:** V172 - 7,2 MW PO7200 STE + 2dB

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Vestas | 15.11.2022 | USER | 29.11.2022 14.53 |

DMS no.: 0128-4336_00

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 225,0 | 8,0 | 102,6 | 63,7 | 68,9 | 73,8 | 78,6 | 83,0 | 86,8 | 90,2 | 92,9 | 95,2 | 96,8 | 98,0 |

**WTG:** VESTAS V172-7.2 HH214 7200 172.0 !O!
**Noise:** Level 0S - Measured - PO7200-0S - 07-2022

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| Manufacturer | 8.7.2022 | USER | 8.5.2023 15.45 |

Based on Document no.: 0127-1584 V01.

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 214,0 | 8,0 | 102,8 | 60,4 | 66,1 | 71,5 | 76,7 | 81,5 | 85,8 | 89,5 | 92,6 | 95,2 | 97,2 | 98,6 |

**WTG:** NORDEX N149/4.0-4.5 4500 180.0 !O!
**Noise:** Serrations Mode 00 - 106.0 dB(A) octave data only

| Source | Source/Date | Creator | Edited |
|---|---|---|---|
| F008_271_A13_R01 | 30.6.2017 | USER | 9.5.2023 20.33 |

Mode available on request

| Status | Hub height [m] | Wind speed [m/s] | LwA,ref [dB(A)] | 20,0 Hz [dB] | 25,0 Hz [dB] | 31,5 Hz [dB] | 40,0 Hz [dB] | 50,0 Hz [dB] | 63,0 Hz [dB] | 80,0 Hz [dB] | 100,0 Hz [dB] | 125,0 Hz [dB] | 160,0 Hz [dB] | 200,0 Hz [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| From Windcat | 190,0 | 8,0 | 96,4 | 62,8 | 66,7 | 72,2 | 75,8 | 80,9 | 82,2 | 85,0 | 89,7 | 88,2 | 89,5 | 90,8 |

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Calculated:
9.5.2023 20.43/3.5.584

# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

## Noise sensitive area: A Lomarakennus A (Syvälahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: B Asuinrakennus B (Syväänlahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: C Lomarakennus C (Mutalahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: D Lomarakennus D (Mutaniemi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: E Asuinrakennus E (Alanko)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: F Asuinrakennus F (Joensuu)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**Noise demand:**

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

| 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: G Asuinrakennus G (Heiniaho)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: H Asuinrakennus H (Mäkelä)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: I Lomarakennus I

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: J Lomarakennus J (Hautakaarto)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: K Asuinrakennus K (Takalo)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: L Lomarakennus L (Haukijärvi)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

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# DECIBEL - Assumptions for noise calculation

**Calculation:** Matalataajuinen_Haarasuankangas_VE2_V172-7,2MW_No_STE+Turkkiselkä+Takiankangas

**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: M Lomarakennus M (Haukilahti)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: N Lomarakennus N (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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: O Lomarakennus O (Kuusela)

**Predefined calculation standard:** Residential health guide 2003, indoor - night
**Immission height(a.g.l.):** Use standard value from calculation model
**Uncertainty margin:** Use default value from calculation model

**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 11. Yhteisvaikutus varjostusmallinnuksen tulokset ”Real Case, No Forest” - VE1

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

## Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

| | |
|---|---|
| Minimum sun height over horizon for influence | 3 ° |
| Day step for calculation | 1 days |
| Time step for calculation | 1 minutes |

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA_N64,50_E027,335 (12)

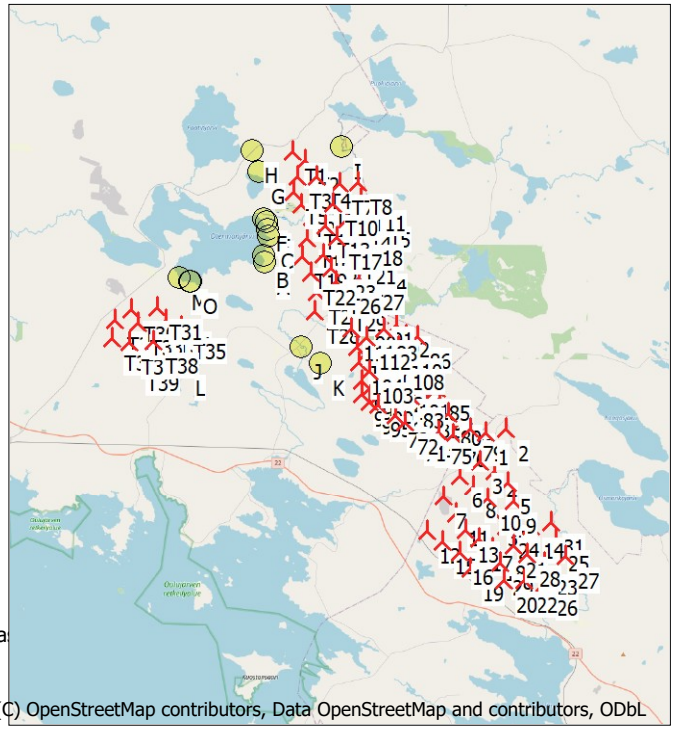
Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankanga
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:400 000
New WTG
Shadow receptor

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Shadow data Calculation distance | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 100 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 101 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 102 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 103 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 104 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 105 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 106 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 107 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 108 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 109 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 110 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 111 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 112 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |

To be continued on next page...

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | | | | | WTG type | | | | | | | Shadow data | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | East | North | Z | Row data/Description | Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Calculation distance | RPM |
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 71 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 72 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 73 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 74 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 75 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 76 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 77 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 78 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 79 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 80 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 81 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 82 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 83 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 84 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 85 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 86 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 87 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 88 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 89 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 90 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 91 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 92 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 93 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 94 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 95 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 96 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 97 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 98 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 99 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| T1 | 508 282 | 7 174 861 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T10 | 510 426 | 7 172 148 | 146,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T11 | 511 902 | 7 172 395 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T12 | 509 346 | 7 171 412 | 143,2 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T13 | 510 056 | 7 170 927 | 146,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T14 | 511 130 | 7 171 298 | 148,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T15 | 512 122 | 7 171 560 | 159,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T16 | 509 073 | 7 170 275 | 147,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T17 | 510 668 | 7 170 368 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T18 | 511 731 | 7 170 576 | 165,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T19 | 508 820 | 7 169 317 | 148,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T2 | 508 948 | 7 174 439 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T20 | 509 941 | 7 169 425 | 149,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T21 | 511 434 | 7 169 585 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T22 | 509 256 | 7 168 427 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T23 | 510 283 | 7 168 708 | 149,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T24 | 511 959 | 7 169 067 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T25 | 509 625 | 7 167 494 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T26 | 510 589 | 7 167 991 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T27 | 511 839 | 7 168 207 | 148,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T28 | 509 456 | 7 166 427 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T29 | 510 920 | 7 167 074 | 142,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

To be continued on next page...

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Shadow data Calculation distance | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| T3 | 508 557 | 7 173 555 | 151,9 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T30 | 499 777 | 7 166 541 | 137,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T31 | 501 112 | 7 166 571 | 140,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T32 | 498 884 | 7 165 924 | 140,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T33 | 500 060 | 7 165 826 | 146,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T34 | 501 577 | 7 165 939 | 141,7 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T35 | 502 368 | 7 165 645 | 147,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T36 | 498 706 | 7 164 985 | 147,2 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T37 | 499 643 | 7 164 765 | 154,4 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T38 | 500 913 | 7 164 850 | 150,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T39 | 499 856 | 7 163 927 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T4 | 509 564 | 7 173 532 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T5 | 508 354 | 7 172 700 | 144,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T6 | 509 849 | 7 172 666 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T7 | 510 753 | 7 173 171 | 147,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T8 | 511 738 | 7 173 247 | 154,9 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T9 | 508 756 | 7 172 027 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

## Shadow receptor-Input

| No. | Name | East | North | Z | Width | Height | Elevation a.g.l. | Slope of window | Direction mode | Eye height (ZVI) a.g.l. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | [m] | [m] | [m] | [m] | [°] | | [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |

## Calculation Results

Shadow receptor

| No. | Name | Shadow, expected values Shadow hours per year [h/year] |
|---|---|---|
| A | Lomarakennus A (Syvälahti) | 2:21 |
| B | Asuinrakennus B (Syväänlahti) | 2:01 |
| C | Lomarakennus C (Mutalahti) | 1:53 |
| D | Lomarakennus D (Mutaniemi) | 0:00 |
| E | Asuinrakennus E (Alanko) | 3:16 |
| F | Asuinrakennus F (Joensuu) | 0:00 |
| G | Asuinrakennus G (Heiniaho) | 5:44 |
| H | Asuinrakennus H (Mäkelä) | 0:00 |
| I | Lomarakennus I | 3:19 |
| J | Lomarakennus J (Hautakaarto) | 0:00 |
| K | Asuinrakennus K (Takalo) | 0:00 |
| L | Lomarakennus L (Haukijärvi) | 7:40 |
| M | Lomarakennus M (Haukilahti) | 1:53 |
| N | Lomarakennus N (Kuusela) | 0:00 |
| O | Lomarakennus O (Kuusela) | 0:00 |

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

Total amount of flickering on the shadow receptors caused by each WTG

| No. | Name | Expected [h/year] |
|---|---|---|
| 1 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (217) | 0:00 |
| 10 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (226) | 0:00 |
| 100 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (917) | 0:00 |
| 101 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (918) | 0:00 |
| 102 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (919) | 0:00 |
| 103 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (920) | 0:00 |
| 104 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (921) | 0:00 |
| 105 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (922) | 0:00 |
| 106 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (923) | 0:00 |
| 107 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (924) | 0:00 |
| 108 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (925) | 0:00 |
| 109 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (926) | 0:00 |
| 11 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (227) | 0:00 |
| 110 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (927) | 0:00 |
| 111 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (928) | 0:00 |
| 112 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (929) | 0:00 |
| 12 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (228) | 0:00 |
| 13 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (229) | 0:00 |
| 14 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (230) | 0:00 |
| 15 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (232) | 0:00 |
| 16 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (233) | 0:00 |
| 17 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (234) | 0:00 |
| 18 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (235) | 0:00 |
| 19 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (236) | 0:00 |
| 2 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (218) | 0:00 |
| 20 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (237) | 0:00 |
| 21 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (238) | 0:00 |
| 22 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (239) | 0:00 |
| 23 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (240) | 0:00 |
| 24 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (241) | 0:00 |
| 25 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (242) | 0:00 |
| 26 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (243) | 0:00 |
| 27 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (244) | 0:00 |
| 28 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (245) | 0:00 |
| 29 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (247) | 0:00 |
| 3 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (219) | 0:00 |
| 30 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (246) | 0:00 |
| 31 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (231) | 0:00 |
| 4 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (220) | 0:00 |
| 5 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (221) | 0:00 |
| 6 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (222) | 0:00 |
| 7 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (223) | 0:00 |
| 71 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (888) | 0:00 |
| 72 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (889) | 0:00 |
| 73 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (890) | 0:00 |
| 74 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (891) | 0:00 |
| 75 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (892) | 0:00 |
| 76 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (893) | 0:00 |
| 77 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (894) | 0:00 |
| 78 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (895) | 0:00 |
| 79 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (896) | 0:00 |
| 8 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (224) | 0:00 |
| 80 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (897) | 0:00 |
| 81 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (898) | 0:00 |
| 82 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (899) | 0:00 |
| 83 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (900) | 0:00 |
| 84 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (901) | 0:00 |
| 85 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (902) | 0:00 |
| 86 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (903) | 0:00 |
| 87 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (904) | 0:00 |
| 88 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (905) | 0:00 |
| 89 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (906) | 0:00 |
| 9 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (225) | 0:00 |
| 90 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (907) | 0:00 |
| 91 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (908) | 0:00 |

To be continued on next page...

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# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| No. | Name | Expected [h/year] |
|---|---|---|
| 92 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (909) | 0:00 |
| 93 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (910) | 0:00 |
| 94 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (911) | 0:00 |
| 95 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (912) | 0:00 |
| 96 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (913) | 0:00 |
| 97 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (914) | 0:00 |
| 98 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (915) | 0:00 |
| 99 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (916) | 0:00 |
| T1 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678) | 3:58 |
| T10 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (671) | 0:00 |
| T11 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (673) | 0:00 |
| T12 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (668) | 0:00 |
| T13 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (666) | 0:00 |
| T14 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (667) | 0:00 |
| T15 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (669) | 0:00 |
| T16 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663) | 1:53 |
| T17 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (664) | 0:00 |
| T18 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (665) | 0:00 |
| T19 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660) | 4:22 |
| T2 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677) | 1:39 |
| T20 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (662) | 0:00 |
| T21 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (661) | 0:00 |
| T22 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (657) | 0:00 |
| T23 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (658) | 0:00 |
| T24 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (659) | 0:00 |
| T25 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (654) | 0:00 |
| T26 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (655) | 0:00 |
| T27 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (656) | 0:00 |
| T28 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (651) | 0:00 |
| T29 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (653) | 0:00 |
| T3 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681) | 1:46 |
| T30 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (649) | 0:00 |
| T31 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (652) | 1:53 |
| T32 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (680) | 0:00 |
| T33 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (679) | 0:00 |
| T34 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (650) | 0:00 |
| T35 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (648) | 0:00 |
| T36 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (647) | 0:00 |
| T37 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (645) | 0:00 |
| T38 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (646) | 7:40 |
| T39 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (644) | 0:00 |
| T4 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (676) | 0:00 |
| T5 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (674) | 0:00 |
| T6 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (672) | 0:00 |
| T7 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682) | 1:37 |
| T8 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (675) | 0:00 |
| T9 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670) | 3:16 |

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** A - Lomarakennus A (Syvälahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 06.42 (T19) | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.37 | 23.21 | 23.55 | 22.24 | 20.33 23 | 07.05 (T19) | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.55 | 02.39 | 04.13 | 05.52 | 06.42 (T19) | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 23 | 07.05 (T19) | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.42 | 04.17 | 05.55 | 06.42 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | 21.43 | 23.28 | 23.51 | 22.17 | 20.26 22 | 07.04 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 06.54 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 06.41 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 6 07.00 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 22 | 07.03 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 06.51 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | 06.01 | 06.42 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 12 07.03 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 20 | 07.02 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 06.47 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 06.43 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 17 07.04 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 17 | 07.00 (T19) | 18.26 | 15.38 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 06.46 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 06.46 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 19 07.05 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 12 | 06.58 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 06.44 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | 06.10 | 06.49 (T19) | 07.39 | 08.18 | 09.53 |
| | 14.34 | 16.17 | 17.48 | 20.23 22 07.06 (T19) | 22.00 | 23.42 | 23.39 | 21.59 | 20.08 7 | 06.56 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 06.44 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | 06.13 | | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 22 07.06 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 06.43 (T19) | 04.12 | 02.36 | 03.01 | 04.40 | 06.16 | | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 23 07.06 (T19) | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 06.43 (T19) | 04.09 | 02.34 | 03.01 | 04.43 | 06.19 | | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 23 07.06 (T19) | 22.11 | 23.49 | 23.31 | 21.49 | 19.57 | | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 06.42 (T19) | 04.05 | 02.32 | 03.04 | 04.47 | 06.22 | | 07.51 | 08.32 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 24 07.06 (T19) | 22.14 | 23.51 | 23.29 | 21.45 | 19.53 | | 18.05 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.42 | 05.49 06.42 (T19) | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 24 07.06 (T19) | 22.17 | 23.53 | 23.26 | 21.42 | 19.49 | | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 06.42 (T19) | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 22 07.04 (T19) | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 06.43 (T19) | 03.55 | 02.28 | 03.13 | 04.56 | 06.31 | | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 21 07.04 (T19) | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 06.43 (T19) | 03.51 | 02.27 | 03.16 | 04.59 | 06.34 | | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 19 07.02 (T19) | 22.28 | 23.58 | 23.17 | 21.31 | 19.38 | | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 06.44 (T19) | 03.48 | 02.26 | 03.20 | 05.03 | 06.37 | | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 17 07.01 (T19) | 22.31 | 23.59 | 23.14 | 21.27 | 19.35 | | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 06.46 (T19) | 03.45 | 02.25 | 03.23 | 05.06 | 06.40 | | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 13 06.59 (T19) | 22.35 | 00.00 | 23.11 | 21.24 | 19.31 | | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 06.48 (T19) | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 8 06.56 (T19) | 22.38 | 00.01 | 23.07 | 21.20 | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | 03.38 | 02.25 | 03.30 | 05.12 | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.15 | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.31 | 02.25 | 03.36 | 05.19 | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.04 | 18.31 | 21.07 | 22.48 | 00.03 | 22.58 | 21.09 | 19.17 | | 17.29 | 14.49 | 14.05 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.26 | 03.40 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.52 | 00.02 | 22.54 | 21.06 | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 06.51 (T19) | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 9 07.00 (T19) | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.22 | 02.27 | 03.46 | 05.28 06.48 (T19) | 07.01 | | 07.32 | 09.15 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.58 14 07.02 (T19) | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 06.47 (T19) | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 17 07.04 (T19) | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 04.58 | 03.15 | 02.30 | 03.53 | 05.34 06.46 (T19) | 07.06 | | 07.39 | 09.22 | 10.16 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 19 07.05 (T19) | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 06.45 (T19) | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 21 07.06 (T19) | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 06.43 (T19) | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.34 | 20.44 22 07.05 (T19) | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.06 | 02.35 | 04.03 | 05.43 06.42 (T19) | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.33 | 23.15 | 23.56 | 22.31 | 20.40 23 07.05 (T19) | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.02 | | 06.36 | | 03.03 | | 04.07 | 05.46 06.42 (T19) | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | 23.18 | | 22.27 | 20.37 23 07.05 (T19) | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | | 292 | | | | 148 | 146 | | | | |
| Sun reduction | | | | 0,43 | | | | 0,42 | 0,32 | | | | |
| Oper. time red. | | | | 0,98 | | | | 0,98 | 0,98 | | | | |
| Wind dir. red. | | | | 0,62 | | | | 0,62 | 0,62 | | | | |
| Total reduction | | | | 0,26 | | | | 0,25 | 0,19 | | | | |
| Total, real | | | | 76 | | | | 37 | 28 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** B - Asuinrakennus B (Syväänlahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.17 (T19) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 23 07.40 (T19) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.17 (T19) | 04.40 | 02.55 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | 24 07.41 (T19) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.17 (T19) | 04.37 | 02.52 | 02.42 | 04.17 | 05.55 | 07.23 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | 23 07.40 (T19) | 21.43 | 23.28 | 23.51 | 22.17 | 20.26 | 3 07.26 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 07.17 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.17 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 | 22 07.39 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 12 07.29 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 07.17 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | 06.01 | 07.15 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 | 21 07.38 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 16 07.31 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 | 07.18 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.14 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 18 07.36 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18 07.32 (T19) | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 07.19 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.13 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 16 07.35 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 20 07.33 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 07.20 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | 06.10 | 07.12 (T19) | 07.39 | 08.18 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 12 07.32 (T19) | 22.00 | 23.42 | 23.39 | 22.00 | 20.08 | 22 07.34 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 07.24 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | 06.13 | 07.11 (T19) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 4 07.28 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 23 07.34 (T19) | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.36 | 03.01 | 04.40 | 06.16 | 07.10 (T19) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 23 07.33 (T19) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.34 | 03.01 | 04.43 | 06.19 | 07.09 (T19) | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.31 | 21.49 | 19.57 | 24 07.33 (T19) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.47 | 06.22 | 07.09 (T19) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.51 | 23.29 | 21.45 | 19.53 | 23 07.32 (T19) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.10 (T19) | 07.55 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 | | 22.18 | 23.53 | 23.26 | 21.42 | 19.49 | 22 07.32 (T19) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.10 (T19) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 21 07.31 (T19) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.28 | 03.13 | 04.56 | 06.31 | 07.11 (T19) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 19 07.30 (T19) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.27 | 03.16 | 04.59 | 06.34 | 07.12 (T19) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.58 | 23.17 | 21.31 | 19.38 | 16 07.28 (T19) | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.20 | 05.03 | 06.37 | 07.14 (T19) | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 11 07.25 (T19) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.45 | 02.25 | 03.23 | 05.06 | 06.40 | 07.17 (T19) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 4 07.21 (T19) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.01 | 23.07 | 21.20 | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | 19.17 | | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 06.27 (T19) | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 10 06.37 (T19) | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 06.23 (T19) | 04.58 | 03.15 | 02.30 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 15 06.38 (T19) | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.21 (T19) | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 19 06.40 (T19) | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.20 (T19) | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 20 07.40 (T19) | 21.30 | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 07.18 (T19) | 04.48 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 22 07.40 (T19) | 21.33 | 23.15 | 23.56 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.18 (T19) | | 03.03 | | 04.07 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 23 07.41 (T19) | | 23.18 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | | 576 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | 109 | 163 | | | | | | 277 | | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | | 0,32 | | | | |
| Oper. time red. | | | 0,98 | 0,98 | | | | | | 0,98 | | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | | 0,62 | | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | | 0,20 | | | | |
| Total, real | | | 24 | 43 | | | | | | 55 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

Project:
**Haarasuonkangas**

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** C - Lomarakennus C (Mutalahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.32 (T16) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.01 | 07.52 (T16) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.33 (T16) | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 07.51 (T16) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.34 (T16) | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 07.49 (T16) | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 07.35 (T16) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 07.46 (T16) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | 04.30 | 02.47 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.31 (T16) | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | 22.00 | 23.42 | 23.40 | 22.00 | 20.08 | 10 07.41 (T16) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | | 04.16 | 02.37 | 02.58 | 04.37 | 06.13 | 07.28 (T16) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 15 07.43 (T16) | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.25 (T16) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 18 07.43 (T16) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.24 (T16) | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 20 07.44 (T16) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.46 | 06.22 | 07.23 (T16) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 22 07.45 (T16) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.23 (T16) | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 22 07.45 (T16) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.22 (T16) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 23 07.45 (T16) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 07.22 (T16) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 23 07.45 (T16) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 07.22 (T16) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 22 07.44 (T16) | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 07.21 (T16) | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 22 07.43 (T16) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 07.21 (T16) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 21 07.42 (T16) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | 07.22 (T16) | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 19 07.41 (T16) | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 07.23 (T16) | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 16 07.39 (T16) | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 07.26 (T16) | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 11 07.37 (T16) | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 06.41 (T16) | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 07.29 (T16) | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 10 06.51 (T16) | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 5 07.34 (T16) | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 06.38 (T16) | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 15 06.53 (T16) | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 06.35 (T16) | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 19 06.54 (T16) | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 06.33 (T16) | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21 06.54 (T16) | 21.17 | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 06.33 (T16) | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 22 06.55 (T16) | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 06.32 (T16) | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 23 06.55 (T16) | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.31 (T16) | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 23 06.54 (T16) | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.31 (T16) | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 24 07.55 (T16) | 21.30 | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 07.31 (T16) | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 23 07.54 (T16) | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.32 (T16) | | 03.03 | | 04.06 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 21 07.53 (T16) | | 23.19 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | | 577 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | 201 | 64 | | | | | | 269 | | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | | 0,32 | | | | |
| Oper. time red. | | | 0,98 | 0,98 | | | | | | 0,98 | | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | | 0,62 | | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | | 0,20 | | | | |
| Total, real | | | 44 | 17 | | | | | | 53 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** D - Lomarakennus D (Mutaniemi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 04.16 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.34 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.32 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** E - Asuinrakennus E (Alanko)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | | May | | | June | July | | | August | | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | | 04.44 | | 05.28 (T9) | 03.00 | 02.37 | | | 04.10 | | 05.41 (T9) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | | | 21.37 | 22 | 05.50 (T9) | 23.22 | 23.55 | | | 22.24 | 16 | 05.57 (T9) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | | 04.40 | | 05.28 (T9) | 02.54 | 02.39 | | | 04.13 | | 05.39 (T9) | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | | | 21.40 | 23 | 05.51 (T9) | 23.25 | 23.53 | | | 22.21 | 19 | 05.58 (T9) | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | | 04.37 | | 05.27 (T9) | 02.52 | 02.41 | | | 04.17 | | 05.38 (T9) | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | | | 21.44 | 24 | 05.51 (T9) | 23.28 | 23.51 | | | 22.17 | 21 | 05.59 (T9) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | | | 04.33 | | 05.27 (T9) | 02.49 | 02.44 | | | 04.20 | | 05.38 (T9) | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | | | 21.47 | 24 | 05.51 (T9) | 23.31 | 23.49 | | | 22.14 | 21 | 05.59 (T9) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | | 04.30 | | 05.27 (T9) | 02.46 | 02.46 | | | 04.23 | | 05.38 (T9) | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | | 21.50 | 24 | 05.51 (T9) | 23.34 | 23.47 | | | 22.10 | 22 | 06.00 (T9) | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | | 04.26 | | 05.27 (T9) | 02.44 | 02.49 | | | 04.27 | | 05.36 (T9) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | | 21.54 | 24 | 05.51 (T9) | 23.37 | 23.45 | | | 22.07 | 24 | 06.00 (T9) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | | 04.23 | | 05.28 (T9) | 02.42 | 02.52 | | | 04.30 | | 05.36 (T9) | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | | 21.57 | 22 | 05.50 (T9) | 23.40 | 23.42 | | | 22.03 | 24 | 06.00 (T9) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | | | 04.19 | | 05.28 (T9) | 02.39 | 02.54 | | | 04.33 | | 05.36 (T9) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | | 22.01 | 22 | 05.50 (T9) | 23.42 | 23.40 | | | 22.00 | 24 | 06.00 (T9) | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | | | 04.15 | | 05.28 (T9) | 02.37 | 02.57 | | | 04.37 | | 05.36 (T9) | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | | 22.04 | 21 | 05.49 (T9) | 23.45 | 23.37 | | | 21.56 | 24 | 06.00 (T9) | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | | 04.12 | | 05.29 (T9) | 02.35 | 03.00 | | | 04.40 | | 05.36 (T9) | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | | 22.07 | 19 | 05.48 (T9) | 23.47 | 23.35 | | | 21.53 | 24 | 06.00 (T9) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | | 04.08 | | 05.29 (T9) | 02.33 | 03.00 | | | 04.43 | | 05.36 (T9) | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | | 22.11 | 18 | 05.47 (T9) | 23.50 | 23.32 | | | 21.49 | 23 | 05.59 (T9) | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | | 04.05 | | 05.30 (T9) | 02.31 | 03.03 | | | 04.46 | | 05.36 (T9) | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | | 22.14 | 16 | 05.46 (T9) | 23.52 | 23.29 | | | 21.45 | 22 | 05.58 (T9) | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | | 04.02 | | 05.31 (T9) | 02.30 | 03.07 | | | 04.50 | | 05.37 (T9) | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | | 22.18 | 13 | 05.44 (T9) | 23.54 | 23.26 | | | 21.42 | 21 | 05.58 (T9) | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | | 03.58 | | 05.33 (T9) | 02.29 | 03.10 | | | 04.53 | | 05.38 (T9) | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | | 22.21 | 9 | 05.42 (T9) | 23.56 | 23.23 | | | 21.38 | 19 | 05.57 (T9) | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | | 03.55 | | | 02.27 | 03.13 | | | 04.56 | | 05.41 (T9) | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | | 22.25 | | | 23.57 | 23.20 | | | 21.35 | 15 | 05.56 (T9) | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | | | 03.51 | | | 02.26 | 03.16 | | | 04.59 | | 05.44 (T9) | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | | 22.28 | | | 23.59 | 23.17 | | | 21.31 | 11 | 05.55 (T9) | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | | 03.48 | | | 02.25 | 03.19 | | | 05.03 | | 05.46 (T9) | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | | 22.31 | | | 00.00 | 23.14 | | | 21.27 | 6 | 05.52 (T9) | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | | 03.44 | | | 02.25 | 03.23 | | | 05.06 | | | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | | | 22.35 | | | 00.01 | 23.11 | | | 21.24 | | | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | | | 03.41 | | | 02.24 | 03.26 | | | 05.09 | | | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | | 22.38 | | | 00.02 | 23.08 | | | 21.20 | | | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | | 03.38 | | | 02.24 | 03.29 | | | 05.12 | | | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | | 22.42 | | | 00.03 | 23.05 | | | 21.17 | | | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | | 03.34 | | | 02.24 | 03.33 | | | 05.15 | | | 06.49 | 08.19 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | | 22.45 | | | 00.03 | 23.01 | | | 21.13 | | | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | | | 03.31 | | | 02.25 | 03.36 | | | 05.18 | | | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | | 22.49 | | | 00.03 | 22.58 | | | 21.09 | | | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | | 03.28 | | | 02.25 | 03.39 | | | 05.22 | | | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | | | 22.52 | | | 00.03 | 22.55 | | | 21.06 | | | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | | 03.25 | | | 02.26 | 03.43 | | | 05.25 | | | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | | 22.55 | | | 00.03 | 22.51 | | | 21.02 | | | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | | 03.21 | | | 02.27 | 03.46 | | | 05.28 | | | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | | 22.59 | | | 00.02 | 22.48 | | | 20.59 | | | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 05.39 (T9) | 03.18 | | | 02.28 | 03.49 | | | 05.31 | | | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 7 | 05.46 (T9) | 23.02 | | | 00.02 | 22.45 | | | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | | 05.36 (T9) | 03.15 | | | 02.29 | 03.53 | | | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 12 | 05.48 (T9) | 23.06 | | | 00.01 | 22.41 | | | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 05.33 (T9) | 03.12 | | | 02.31 | 03.56 | | | 05.37 | | | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 16 | 05.49 (T9) | 23.09 | | | 00.00 | 22.38 | | | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 05.29 (T9) | 03.09 | | | 02.33 | 04.00 | | 05.45 (T9) | 05.40 | | | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 20 | 05.49 (T9) | 23.12 | | | 23.58 | 22.35 | 6 | 05.51 (T9) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | | 05.28 (T9) | 03.06 | | | 02.34 | 04.03 | | 05.43 (T9) | 05.43 | | | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 22 | 05.50 (T9) | 23.15 | | | 23.57 | 22.31 | 11 | 05.54 (T9) | 20.40 | | | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | | | 03.03 | | | | 04.06 | | 05.42 (T9) | 05.46 | | | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | | | 23.19 | | | | 22.28 | 14 | 05.56 (T9) | 20.37 | | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | | | 577 | | | 639 | 618 | | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | | | 77 | | | 281 | | | | 31 | | | 336 | | | | | | |
| Sun reduction | | | | 0,43 | | | 0,47 | | | | 0,48 | | | 0,42 | | | | | | |
| Oper. time red. | | | | 0,98 | | | 0,98 | | | | 0,98 | | | 0,98 | | | | | | |
| Wind dir. red. | | | | 0,62 | | | 0,62 | | | | 0,62 | | | 0,62 | | | | | | |
| Total reduction | | | | 0,26 | | | 0,29 | | | | 0,29 | | | 0,26 | | | | | | |
| Total, real | | | | 20 | | | 82 | | | | 9 | | | 86 | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** F - Asuinrakennus F (Joensuu)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.24 | 06.33 | 04.44 | 03.00 | 02.36 | 04.10 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.09 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.40 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.19 | 02.39 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | 04.15 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.08 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.50 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.56 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.25 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.32 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.03 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.03 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.24 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.49 | 05.31 | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.02 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.17 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 00.00 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | | April | | May | | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | | 06.33 | 07.49 (T3) | 04.44 | 05.23 (T1) | 03.00 |
| | 14.17 | 15.52 | 17.26 | | 20.02 | 6 07.55 (T3) | 21.37 | 8 05.31 (T1) | 23.22 |
| 2 | 10.13 | 08.57 | 07.21 | | 06.29 | | 04.40 | 05.20 (T1) | 02.54 |
| | 14.19 | 15.56 | 17.29 | | 20.05 | | 21.40 | 13 05.33 (T1) | 23.25 |
| 3 | 10.12 | 08.53 | 07.17 | | 06.25 | | 04.37 | 05.18 (T1) | 02.51 |
| | 14.21 | 15.59 | 17.32 | | 20.08 | | 21.44 | 16 05.34 (T1) | 23.29 |
| 4 | 10.10 | 08.50 | 07.14 | | 06.22 | | 04.33 | 05.17 (T1) | 02.48 |
| | 14.23 | 16.03 | 17.35 | | 20.11 | | 21.47 | 18 05.35 (T1) | 23.32 |
| 5 | 10.09 | 08.47 | 07.10 | | 06.18 | | 04.29 | 05.15 (T1) | 02.46 |
| | 14.26 | 16.06 | 17.39 | | 20.14 | | 21.51 | 20 05.35 (T1) | 23.35 |
| 6 | 10.07 | 08.44 | 07.07 | | 06.14 | | 04.26 | 05.14 (T1) | 02.43 |
| | 14.28 | 16.10 | 17.42 | | 20.17 | | 21.54 | 22 05.36 (T1) | 23.37 |
| 7 | 10.05 | 08.40 | 07.03 | | 06.11 | | 04.22 | 05.14 (T1) | 02.41 |
| | 14.31 | 16.13 | 17.45 | | 20.20 | | 21.57 | 22 05.36 (T1) | 23.40 |
| 8 | 10.04 | 08.37 | 07.00 | | 06.07 | | 04.19 | 05.13 (T1) | 02.39 |
| | 14.34 | 16.16 | 17.48 | | 20.23 | | 22.01 | 23 05.36 (T1) | 23.43 |
| 9 | 10.02 | 08.34 | 06.56 | | 06.03 | | 04.15 | 05.14 (T1) | 02.37 |
| | 14.37 | 16.20 | 17.51 | | 20.26 | | 22.04 | 24 05.38 (T1) | 23.45 |
| 10 | 10.00 | 08.30 | 06.52 | | 06.00 | | 04.12 | 05.14 (T1) | 02.34 |
| | 14.39 | 16.23 | 17.54 | | 20.29 | | 22.08 | 24 05.38 (T1) | 23.48 |
| 11 | 09.58 | 08.27 | 06.49 | | 05.56 | | 04.08 | 05.13 (T1) | 02.33 |
| | 14.42 | 16.27 | 17.57 | | 20.33 | | 22.11 | 24 05.37 (T1) | 23.50 |
| 12 | 09.55 | 08.24 | 06.45 | | 05.52 | | 04.05 | 05.13 (T1) | 02.31 |
| | 14.45 | 16.30 | 18.00 | | 20.36 | | 22.15 | 24 05.37 (T1) | 23.52 |
| 13 | 09.53 | 08.20 | 06.42 | | 05.49 | | 04.01 | 05.13 (T1) | 02.29 |
| | 14.48 | 16.33 | 18.04 | | 20.39 | | 22.18 | 24 05.37 (T1) | 23.54 |
| 14 | 09.51 | 08.17 | 06.38 | | 05.45 | | 03.58 | 05.13 (T1) | 02.28 |
| | 14.52 | 16.37 | 18.07 | | 20.42 | | 22.21 | 23 05.36 (T1) | 23.56 |
| 15 | 09.48 | 08.13 | 06.34 | | 05.42 | | 03.54 | 05.15 (T1) | 02.27 |
| | 14.55 | 16.40 | 18.10 | | 20.45 | | 22.25 | 22 05.37 (T1) | 23.58 |
| 16 | 09.46 | 08.10 | 06.31 | | 05.38 | | 03.51 | 05.15 (T1) | 02.26 |
| | 14.58 | 16.44 | 18.13 | | 20.48 | | 22.28 | 21 05.36 (T1) | 23.59 |
| 17 | 09.43 | 08.07 | 06.27 | | 05.34 | | 03.48 | 05.15 (T1) | 02.25 |
| | 15.01 | 16.47 | 18.16 | | 20.51 | | 22.32 | 20 05.35 (T1) | 00.01 |
| 18 | 09.41 | 08.03 | 06.24 | 06.56 (T3) | 05.31 | | 03.44 | 05.16 (T1) | 02.24 |
| | 15.04 | 16.50 | 18.19 | 3 06.59 (T3) | 20.55 | | 22.35 | 19 05.35 (T1) | 00.02 |
| 19 | 09.38 | 08.00 | 06.20 | 06.52 (T3) | 05.27 | | 03.41 | 05.17 (T1) | 02.24 |
| | 15.08 | 16.54 | 18.22 | 10 07.02 (T3) | 20.58 | | 22.39 | 16 05.33 (T1) | 00.03 |
| 20 | 09.35 | 07.56 | 06.16 | 06.49 (T3) | 05.23 | | 03.37 | 05.18 (T1) | 02.23 |
| | 15.11 | 16.57 | 18.25 | 15 07.04 (T3) | 21.01 | | 22.42 | 15 05.33 (T1) | 00.03 |
| 21 | 09.33 | 07.53 | 06.13 | 06.46 (T3) | 05.20 | | 03.34 | 05.19 (T1) | 02.24 |
| | 15.14 | 17.00 | 18.28 | 19 07.05 (T3) | 21.04 | | 22.46 | 12 05.31 (T1) | 00.04 |
| 22 | 09.30 | 07.49 | 06.09 | 06.44 (T3) | 05.16 | | 03.31 | 05.21 (T1) | 02.24 |
| | 15.18 | 17.03 | 18.31 | 21 07.05 (T3) | 21.08 | | 22.49 | 8 05.29 (T1) | 00.04 |
| 23 | 09.27 | 07.46 | 06.05 | 06.44 (T3) | 05.12 | | 03.27 | | 02.24 |
| | 15.21 | 17.07 | 18.34 | 22 07.06 (T3) | 21.11 | | 22.52 | | 00.04 |
| 24 | 09.24 | 07.42 | 06.02 | 06.43 (T3) | 05.09 | | 03.24 | | 02.25 |
| | 15.25 | 17.10 | 18.37 | 23 07.06 (T3) | 21.14 | | 22.56 | | 00.04 |
| 25 | 09.21 | 07.39 | 05.58 | 06.42 (T3) | 05.05 | | 03.21 | | 02.26 |
| | 15.28 | 17.13 | 18.40 | 23 07.05 (T3) | 21.17 | | 22.59 | | 00.03 |
| 26 | 09.18 | 07.35 | 05.54 | 06.43 (T3) | 05.02 | | 03.18 | | 02.27 |
| | 15.31 | 17.16 | 18.43 | 22 07.05 (T3) | 21.21 | | 23.03 | | 00.02 |
| 27 | 09.15 | 07.32 | 05.51 | 06.42 (T3) | 04.58 | | 03.15 | | 02.29 |
| | 15.35 | 17.20 | 18.46 | 22 07.04 (T3) | 21.24 | | 23.06 | | 00.01 |
| 28 | 09.12 | 07.28 | 05.47 | 06.43 (T3) | 04.54 | | 03.12 | | 02.30 |
| | 15.38 | 17.23 | 18.49 | 21 07.04 (T3) | 21.27 | | 23.09 | | 00.00 |
| 29 | 09.09 | | 06.44 | 07.44 (T3) | 04.51 | | 03.08 | | 02.32 |
| | 15.42 | | 19.52 | 18 08.02 (T3) | 21.30 | | 23.13 | | 23.59 |
| 30 | 09.06 | | 06.40 | 07.44 (T3) | 04.47 | | 03.05 | | 02.34 |
| | 15.45 | | 19.55 | 16 08.00 (T3) | 21.34 | | 23.16 | | 23.57 |
| 31 | 09.03 | | 06.36 | 07.46 (T3) | | | 03.02 | | |
| | 15.49 | | 19.59 | 13 07.59 (T3) | | | 23.19 | | |
| Potential sun hours | 163 | 235 | 363 | | 454 | | 577 | | 639 |
| Total, worst case | | | | 248 | | 6 | | 418 | |
| Sun reduction | | | | 0,36 | | 0,43 | | 0,47 | |
| Oper. time red. | | | | 0,98 | | 0,98 | | 0,98 | |
| Wind dir. red. | | | | 0,62 | | 0,62 | | 0,63 | |
| Total reduction | | | | 0,22 | | 0,26 | | 0,29 | |
| Total, real | | | | 54 | | 2 | | 122 | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.36 | | 04.10 | | 05.23 (T1) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 23.56 | | 22.25 | 24 | 05.47 (T1) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 02.38 | | 04.13 | | 05.23 (T1) | 05.52 | 07.21 | 07.59 | 09.38 |
| | 23.54 | | 22.21 | 24 | 05.47 (T1) | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 02.40 | | 04.16 | | 05.24 (T1) | 05.55 | 07.24 | 08.02 | 09.41 |
| | 23.52 | | 22.18 | 23 | 05.47 (T1) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 02.43 | | 04.20 | | 05.24 (T1) | 05.58 | 07.27 | 08.05 | 09.44 |
| | 23.50 | | 22.14 | 23 | 05.47 (T1) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 02.46 | | 04.23 | | 05.23 (T1) | 06.01 | 07.30 | 08.09 | 09.46 |
| | 23.48 | | 22.11 | 23 | 05.46 (T1) | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 02.48 | | 04.26 | | 05.24 (T1) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 23.45 | | 22.07 | 22 | 05.46 (T1) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 02.51 | | 04.30 | | 05.24 (T1) | 06.07 | 07.36 | 08.15 | 09.52 |
| | 23.43 | | 22.03 | 22 | 05.46 (T1) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 02.54 | | 04.33 | | 05.25 (T1) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 23.40 | | 22.00 | 20 | 05.45 (T1) | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 02.57 | | 04.36 | | 05.26 (T1) | 06.13 | 07.42 | 08.22 | 09.57 |
| | 23.38 | | 21.56 | 18 | 05.44 (T1) | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 03.00 | | 04.40 | | 05.27 (T1) | 06.16 | 07.45 | 08.26 | 09.59 |
| | 23.35 | | 21.53 | 16 | 05.43 (T1) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 03.00 | | 04.43 | | 05.29 (T1) | 06.19 07.42 (T3) | 07.48 | 08.29 | 10.01 |
| | 23.32 | | 21.49 | 12 | 05.41 (T1) | 19.57 4 07.46 (T3) | 18.08 | 15.22 | 14.08 |
| 12 | 03.03 | | 04.46 | | 05.32 (T1) | 06.22 07.38 (T3) | 07.52 | 08.32 | 10.03 |
| | 23.29 | | 21.46 | 6 | 05.38 (T1) | 19.53 12 07.50 (T3) | 18.04 | 15.19 | 14.07 |
| 13 | 03.06 | | 04.49 | | | 06.25 07.36 (T3) | 07.55 | 08.36 | 10.05 |
| | 23.27 | | 21.42 | | | 19.49 16 07.52 (T3) | 18.01 | 15.16 | 14.06 |
| 14 | 03.09 | | 04.53 | | | 06.28 07.34 (T3) | 07.58 | 08.39 | 10.07 |
| | 23.24 | | 21.38 | | | 19.46 19 07.53 (T3) | 17.57 | 15.13 | 14.05 |
| 15 | 03.12 | | 04.56 | | | 06.31 07.33 (T3) | 08.01 | 08.43 | 10.09 |
| | 23.21 | | 21.35 | | | 19.42 21 07.54 (T3) | 17.54 | 15.09 | 14.04 |
| 16 | 03.16 | | 04.59 | | | 06.34 07.32 (T3) | 08.04 | 08.46 | 10.10 |
| | 23.18 | | 21.31 | | | 19.38 22 07.54 (T3) | 17.50 | 15.06 | 14.04 |
| 17 | 03.19 | | 05.02 | | | 06.37 07.31 (T3) | 08.07 | 08.49 | 10.12 |
| | 23.14 | | 21.28 | | | 19.35 22 07.53 (T3) | 17.47 | 15.03 | 14.03 |
| 18 | 03.22 | | 05.06 | | | 06.40 07.30 (T3) | 08.10 | 08.53 | 10.13 |
| | 23.11 | | 21.24 | | | 19.31 23 07.53 (T3) | 17.43 | 15.00 | 14.03 |
| 19 | 03.26 | | 05.09 | | | 06.43 07.30 (T3) | 08.13 | 08.56 | 10.14 |
| | 23.08 | | 21.20 | | | 19.28 23 07.53 (T3) | 17.40 | 14.58 | 14.03 |
| 20 | 03.29 | | 05.12 | | | 06.46 07.30 (T3) | 08.16 | 08.59 | 10.15 |
| | 23.05 | | 21.17 | | | 19.24 22 07.52 (T3) | 17.36 | 14.55 | 14.03 |
| 21 | 03.32 | 05.32 (T1) | 05.15 | | | 06.49 07.30 (T3) | 08.20 | 09.03 | 10.16 |
| | 23.02 | 5 05.37 (T1) | 21.13 | | | 19.20 21 07.51 (T3) | 17.33 | 14.52 | 14.03 |
| 22 | 03.36 | 05.30 (T1) | 05.18 | | | 06.52 07.31 (T3) | 08.23 | 09.06 | 10.17 |
| | 22.58 | 10 05.40 (T1) | 21.10 | | | 19.17 19 07.50 (T3) | 17.29 | 14.49 | 14.04 |
| 23 | 03.39 | 05.28 (T1) | 05.21 | | | 06.55 07.32 (T3) | 08.26 | 09.09 | 10.17 |
| | 22.55 | 13 05.41 (T1) | 21.06 | | | 19.13 17 07.49 (T3) | 17.26 | 14.46 | 14.04 |
| 24 | 03.42 | 05.28 (T1) | 05.25 | | | 06.58 07.35 (T3) | 08.29 | 09.13 | 10.17 |
| | 22.52 | 15 05.43 (T1) | 21.02 | | | 19.09 12 07.47 (T3) | 17.22 | 14.43 | 14.05 |
| 25 | 03.46 | 05.27 (T1) | 05.28 | | | 07.01 07.38 (T3) | 07.32 | 09.16 | 10.17 |
| | 22.48 | 18 05.45 (T1) | 20.59 | | | 19.06 6 07.44 (T3) | 16.19 | 14.41 | 14.06 |
| 26 | 03.49 | 05.26 (T1) | 05.31 | | | 07.04 | 07.36 | 09.19 | 10.17 |
| | 22.45 | 19 05.45 (T1) | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 03.53 | 05.26 (T1) | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 22.42 | 20 05.46 (T1) | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 03.56 | 05.25 (T1) | 05.37 | | | 07.09 | 07.42 | 09.26 | 10.17 |
| | 22.38 | 22 05.47 (T1) | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 03.59 | 05.24 (T1) | 05.40 | | | 07.12 | 07.45 | 09.29 | 10.16 |
| | 22.35 | 23 05.47 (T1) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 04.03 | 05.24 (T1) | 05.43 | | | 07.15 | 07.49 | 09.32 | 10.16 |
| | 22.31 | 23 05.47 (T1) | 20.40 | | | 18.48 | 16.02 | 14.28 | 14.13 |
| 31 | 04.06 | 05.24 (T1) | 05.46 | | | | 07.52 | | 10.15 |
| | 22.28 | 24 05.48 (T1) | 20.37 | | | | 15.58 | | 14.14 |
| Potential sun hours | 619 | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | 192 | | 233 | | 259 | | | |
| Sun reduction | | 0,48 | | 0,42 | | 0,32 | | | |
| Oper. time red. | | 0,98 | | 0,98 | | 0,98 | | | |
| Wind dir. red. | | 0,63 | | 0,63 | | 0,62 | | | |
| Total reduction | | 0,29 | | 0,26 | | 0,20 | | | |
| Total, real | | 56 | | 60 | | 51 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** H - Asuinrakennus H (Mäkelä)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | 06.33 | 04.44 | 02.56 | 02.36 | 04.09 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.23 | 23.56 | 22.25 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.13 | 08.57 | 07.21 | 06.29 | 04.40 | 02.54 | 02.38 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.41 | 23.26 | 23.54 | 22.21 | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 10.12 | 08.53 | 07.18 | 06.25 | 04.36 | 02.51 | 02.40 | 04.16 | 05.55 | 07.24 | 08.02 | 09.41 |
| | 14.21 | 15.59 | 17.32 | 20.08 | 21.44 | 23.29 | 23.52 | 22.18 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.48 | 02.43 | 04.20 | 05.58 | 07.27 | 08.05 | 09.44 |
| | 14.23 | 16.03 | 17.35 | 20.11 | 21.47 | 23.32 | 23.50 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.09 | 08.47 | 07.10 | 06.18 | 04.29 | 02.46 | 02.45 | 04.23 | 06.01 | 07.30 | 08.09 | 09.47 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.51 | 23.35 | 23.48 | 22.11 | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 10.07 | 08.44 | 07.07 | 06.14 | 04.26 | 02.43 | 02.48 | 04.26 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.28 | 16.10 | 17.42 | 20.17 | 21.54 | 23.38 | 23.46 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.06 | 08.40 | 07.03 | 06.11 | 04.22 | 02.41 | 02.51 | 04.30 | 06.07 | 07.36 | 08.16 | 09.52 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.58 | 23.40 | 23.43 | 22.04 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.04 | 08.37 | 07.00 | 06.07 | 04.19 | 02.38 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.16 | 17.48 | 20.23 | 22.01 | 23.43 | 23.41 | 22.00 | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 10.02 | 08.34 | 06.56 | 06.03 | 04.15 | 02.36 | 02.57 | 04.36 | 06.13 | 07.42 | 08.22 | 09.57 |
| | 14.36 | 16.20 | 17.51 | 20.26 | 22.04 | 23.46 | 23.38 | 21.56 | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 10.00 | 08.30 | 06.52 | 06.00 | 04.12 | 02.34 | 03.00 | 04.40 | 06.16 | 07.45 | 08.26 | 09.59 |
| | 14.39 | 16.23 | 17.54 | 20.29 | 22.08 | 23.48 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.09 |
| 11 | 09.58 | 08.27 | 06.49 | 05.56 | 04.08 | 02.32 | 03.00 | 04.43 | 06.19 | 07.49 | 08.29 | 10.01 |
| | 14.42 | 16.27 | 17.57 | 20.33 | 22.11 | 23.51 | 23.33 | 21.49 | 19.57 | 18.08 | 15.22 | 14.08 |
| 12 | 09.56 | 08.24 | 06.45 | 05.52 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.52 | 08.32 | 10.03 |
| | 14.45 | 16.30 | 18.00 | 20.36 | 22.15 | 23.53 | 23.30 | 21.46 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.01 | 02.29 | 03.06 | 04.49 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.48 | 16.33 | 18.04 | 20.39 | 22.18 | 23.55 | 23.27 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.51 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.09 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.51 | 16.37 | 18.07 | 20.42 | 22.22 | 23.57 | 23.24 | 21.39 | 19.46 | 17.57 | 15.13 | 14.05 |
| 15 | 09.49 | 08.14 | 06.34 | 05.42 | 03.54 | 02.26 | 03.12 | 04.56 | 06.31 | 08.01 | 08.43 | 10.09 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.58 | 23.21 | 21.35 | 19.42 | 17.54 | 15.09 | 14.04 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.25 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.11 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.29 | 00.00 | 23.18 | 21.31 | 19.38 | 17.50 | 15.06 | 14.04 |
| 17 | 09.43 | 08.07 | 06.27 | 05.34 | 03.47 | 02.24 | 03.19 | 05.02 | 06.37 | 08.07 | 08.49 | 10.12 |
| | 15.01 | 16.47 | 18.16 | 20.52 | 22.32 | 00.01 | 23.15 | 21.28 | 19.35 | 17.47 | 15.03 | 14.03 |
| 18 | 09.41 | 08.03 | 06.24 | 05.31 | 03.44 | 02.24 | 03.22 | 05.06 | 06.40 | 08.10 | 08.53 | 10.13 |
| | 15.04 | 16.50 | 18.19 | 20.55 | 22.35 | 00.02 | 23.11 | 21.24 | 19.31 | 17.43 | 15.00 | 14.03 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.23 | 03.25 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.53 | 18.22 | 20.58 | 22.39 | 00.03 | 23.08 | 21.21 | 19.28 | 17.40 | 14.57 | 14.03 |
| 20 | 09.36 | 07.56 | 06.16 | 05.23 | 03.37 | 02.23 | 03.29 | 05.12 | 06.46 | 08.17 | 09.00 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.04 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.03 |
| 21 | 09.33 | 07.53 | 06.13 | 05.20 | 03.34 | 02.23 | 03.32 | 05.15 | 06.49 | 08.20 | 09.03 | 10.16 |
| | 15.14 | 17.00 | 18.28 | 21.04 | 22.46 | 00.04 | 23.02 | 21.13 | 19.20 | 17.33 | 14.52 | 14.03 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.23 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.17 |
| | 15.18 | 17.03 | 18.31 | 21.08 | 22.49 | 00.04 | 22.59 | 21.10 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.12 | 03.27 | 02.24 | 03.39 | 05.21 | 06.55 | 08.26 | 09.10 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.53 | 00.04 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.04 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.24 | 02.25 | 03.42 | 05.25 | 06.58 | 08.29 | 09.13 | 10.18 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.04 | 22.52 | 21.02 | 19.09 | 17.22 | 14.43 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.26 | 03.46 | 05.28 | 07.01 | 07.33 | 09.16 | 10.18 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.03 | 22.49 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.27 | 03.49 | 05.31 | 07.04 | 07.36 | 09.19 | 10.18 |
| | 15.31 | 17.16 | 18.43 | 21.21 | 23.03 | 00.03 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.28 | 03.52 | 05.34 | 07.06 | 07.39 | 09.23 | 10.18 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.02 | 22.42 | 20.51 | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 09.12 | 07.28 | 05.47 | 04.54 | 03.11 | 02.30 | 03.56 | 05.37 | 07.09 | 07.42 | 09.26 | 10.17 |
| | 15.38 | 17.23 | 18.49 | 21.27 | 23.10 | 00.01 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.08 | 02.32 | 03.59 | 05.40 | 07.12 | 07.46 | 09.29 | 10.17 |
| | 15.42 | | 19.52 | 21.31 | 23.13 | 23.59 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.05 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.16 |
| | 15.45 | | 19.56 | 21.34 | 23.16 | 23.58 | 22.32 | 20.41 | 18.48 | 16.02 | 14.28 | 14.12 |
| 31 | 09.03 | | 06.36 | | 03.02 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.14 |
| Potential sun hours | 163 | 235 | 363 | 454 | 577 | 640 | 619 | 513 | 394 | 303 | 192 | 126 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas**Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | April | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 08.59 | 12.37 (T7) | 07.24 | | 06.32 | 04.43 | 02.56 |
| | 14.16 | | 15.52 9 | 12.46 (T7) | 17.26 | | 20.01 | 21.37 | 23.22 |
| 2 | 10.13 | | 08.56 | | 07.21 | | 06.29 | 04.40 | 02.53 |
| | 14.18 | | 15.55 | | 17.29 | | 20.04 | 21.40 | 23.25 |
| 3 | 10.11 | | 08.53 | | 07.17 | | 06.25 | 04.36 | 02.50 |
| | 14.21 | | 15.59 | | 17.32 | | 20.07 | 21.44 | 23.28 |
| 4 | 10.10 | | 08.50 | | 07.14 | | 06.21 | 04.33 | 02.48 |
| | 14.23 | | 16.02 | | 17.35 | | 20.10 | 21.47 | 23.31 |
| 5 | 10.09 | | 08.47 | | 07.10 | 16.55 (T2) | 06.18 | 04.29 | 02.45 |
| | 14.25 | | 16.06 | | 17.38 6 | 17.01 (T2) | 20.14 | 21.50 | 23.34 |
| 6 | 10.07 | | 08.43 | | 07.06 | 16.52 (T2) | 06.14 | 04.25 | 02.43 |
| | 14.28 | | 16.09 | | 17.41 12 | 17.04 (T2) | 20.17 | 21.54 | 23.37 |
| 7 | 10.05 | | 08.40 | | 07.03 | 16.51 (T2) | 06.10 | 04.22 | 02.40 |
| | 14.30 | | 16.13 | | 17.44 17 | 17.08 (T2) | 20.20 | 21.57 | 23.40 |
| 8 | 10.03 | 12.27 (T7) | 08.37 | | 06.59 | 16.50 (T2) | 06.07 | 04.18 | 02.38 |
| | 14.33 5 | 12.32 (T7) | 16.16 | | 17.48 20 | 17.10 (T2) | 20.23 | 22.01 | 23.43 |
| 9 | 10.01 | 12.26 (T7) | 08.33 | | 06.56 | 16.49 (T2) | 06.03 | 04.15 | 02.36 |
| | 14.36 16 | 12.42 (T7) | 16.19 | | 17.51 21 | 17.10 (T2) | 20.26 | 22.04 | 23.45 |
| 10 | 09.59 | 12.26 (T7) | 08.30 | | 06.52 | 16.48 (T2) | 05.59 | 04.11 | 02.34 |
| | 14.39 18 | 12.44 (T7) | 16.23 | | 17.54 22 | 17.10 (T2) | 20.29 | 22.07 | 23.48 |
| 11 | 09.57 | 12.26 (T7) | 08.27 | | 06.48 | 16.48 (T2) | 05.56 | 04.08 | 02.32 |
| | 14.42 19 | 12.45 (T7) | 16.26 | | 17.57 22 | 17.10 (T2) | 20.32 | 22.11 | 23.50 |
| 12 | 09.55 | 12.25 (T7) | 08.23 | | 06.45 | 16.47 (T2) | 05.52 | 04.04 | 02.30 |
| | 14.45 20 | 12.45 (T7) | 16.30 | | 18.00 23 | 17.10 (T2) | 20.35 | 22.14 | 23.52 |
| 13 | 09.53 | 12.26 (T7) | 08.20 | | 06.41 | 16.47 (T2) | 05.48 | 04.01 | 02.29 |
| | 14.48 20 | 12.46 (T7) | 16.33 | | 18.03 22 | 17.09 (T2) | 20.38 | 22.18 | 23.54 |
| 14 | 09.51 | 12.25 (T7) | 08.17 | | 06.38 | 16.48 (T2) | 05.45 | 03.57 | 02.27 |
| | 14.51 22 | 12.47 (T7) | 16.36 | | 18.06 21 | 17.09 (T2) | 20.42 | 22.21 | 23.56 |
| 15 | 09.48 | 12.26 (T7) | 08.13 | | 06.34 | 16.48 (T2) | 05.41 | 03.54 | 02.26 |
| | 14.54 22 | 12.48 (T7) | 16.40 | | 18.09 20 | 17.08 (T2) | 20.45 | 22.25 | 23.58 |
| 16 | 09.46 | 12.25 (T7) | 08.10 | | 06.30 | 16.48 (T2) | 05.37 | 03.50 | 02.25 |
| | 14.57 23 | 12.48 (T7) | 16.43 | | 18.12 18 | 17.06 (T2) | 20.48 | 22.28 | 00.00 |
| 17 | 09.43 | 12.25 (T7) | 08.06 | | 06.27 | 16.49 (T2) | 05.34 | 03.47 | 02.24 |
| | 15.01 24 | 12.49 (T7) | 16.46 | | 18.15 15 | 17.04 (T2) | 20.51 | 22.32 | 00.01 |
| 18 | 09.41 | 12.25 (T7) | 08.03 | | 06.23 | 16.52 (T2) | 05.30 | 03.44 | 02.23 |
| | 15.04 25 | 12.50 (T7) | 16.50 | | 18.18 11 | 17.03 (T2) | 20.54 | 22.35 | 00.02 |
| 19 | 09.38 | 12.25 (T7) | 07.59 | | 06.20 | | 05.27 | 03.40 | 02.23 |
| | 15.07 25 | 12.50 (T7) | 16.53 | | 18.22 | | 20.58 | 22.39 | 00.03 |
| 20 | 09.35 | 12.26 (T7) | 07.56 | | 06.16 | | 05.23 | 03.37 | 02.23 |
| | 15.11 25 | 12.51 (T7) | 16.56 | | 18.25 | | 21.01 | 22.42 | 00.03 |
| 21 | 09.32 | 12.26 (T7) | 07.52 | | 06.12 | | 05.19 | 03.34 | 02.23 |
| | 15.14 25 | 12.51 (T7) | 17.00 | | 18.28 | | 21.04 | 22.45 | 00.04 |
| 22 | 09.30 | 12.26 (T7) | 07.49 | | 06.09 | | 05.16 | 03.30 | 02.23 |
| | 15.17 25 | 12.51 (T7) | 17.03 | | 18.31 | | 21.07 | 22.49 | 00.04 |
| 23 | 09.27 | 12.27 (T7) | 07.45 | | 06.05 | | 05.12 | 03.27 | 02.24 |
| | 15.21 25 | 12.52 (T7) | 17.06 | | 18.34 | | 21.10 | 22.52 | 00.04 |
| 24 | 09.24 | 12.27 (T7) | 07.42 | | 06.01 | | 05.08 | 03.24 | 02.24 |
| | 15.24 24 | 12.51 (T7) | 17.09 | | 18.37 | | 21.14 | 22.56 | 00.04 |
| 25 | 09.21 | 12.28 (T7) | 07.38 | | 05.58 | | 05.05 | 03.20 | 02.25 |
| | 15.28 24 | 12.52 (T7) | 17.13 | | 18.40 | | 21.17 | 22.59 | 00.03 |
| 26 | 09.18 | 12.29 (T7) | 07.35 | | 05.54 | | 05.01 | 03.17 | 02.26 |
| | 15.31 23 | 12.52 (T7) | 17.16 | | 18.43 | | 21.20 | 23.03 | 00.02 |
| 27 | 09.15 | 12.29 (T7) | 07.31 | | 05.50 | | 04.58 | 03.14 | 02.28 |
| | 15.34 22 | 12.51 (T7) | 17.19 | | 18.46 | | 21.24 | 23.06 | 00.01 |
| 28 | 09.12 | 12.30 (T7) | 07.28 | | 05.47 | | 04.54 | 03.11 | 02.29 |
| | 15.38 21 | 12.51 (T7) | 17.22 | | 18.49 | | 21.27 | 23.09 | 00.00 |
| 29 | 09.09 | 12.31 (T7) | | | 06.43 | | 04.50 | 03.08 | 02.31 |
| | 15.41 19 | 12.50 (T7) | | | 19.52 | | 21.30 | 23.13 | 23.59 |
| 30 | 09.06 | 12.33 (T7) | | | 06.39 | | 04.47 | 03.05 | 02.33 |
| | 15.45 17 | 12.50 (T7) | | | 19.55 | | 21.34 | 23.16 | 23.57 |
| 31 | 09.03 | 12.34 (T7) | | | 06.36 | | | 03.02 | |
| | 15.48 14 | 12.48 (T7) | | | 19.58 | | | 23.19 | |
| Potential sun hours | 163 | | 235 | | 363 | | 454 | 577 | 640 |
| Total, worst case | | 503 | | 9 | | 250 | | | |
| Sun reduction | | 0,11 | | 0,31 | | 0,36 | | | |
| Oper. time red. | | 0,98 | | 0,98 | | 0,98 | | | |
| Wind dir. red. | | 0,66 | | 0,66 | | 0,61 | | | |
| Total reduction | | 0,08 | | 0,21 | | 0,22 | | | |
| Total, real | | 38 | | 2 | | 55 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas**Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | | October | | | November | | | December | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.35 | | 04.09 | | 05.49 | | | 07.18 | | 17.27 (T2) | 07.55 | | | 09.35 | | 12.08 (T7) |
| | 23.56 | | 22.24 | | 20.33 | | | 18.44 | 22 | 17.49 (T2) | 15.54 | | | 14.25 | 19 | 12.27 (T7) |
| 2 | 02.37 | | 04.12 | | 05.52 | | | 07.21 | | 17.26 (T2) | 07.58 | | | 09.38 | | 12.09 (T7) |
| | 23.54 | | 22.21 | | 20.29 | | | 18.40 | 23 | 17.49 (T2) | 15.51 | | | 14.23 | 18 | 12.27 (T7) |
| 3 | 02.40 | | 04.16 | | 05.55 | | | 07.24 | | 17.26 (T2) | 08.02 | | | 09.41 | | 12.10 (T7) |
| | 23.52 | | 22.17 | | 20.26 | | | 18.36 | 22 | 17.48 (T2) | 15.48 | | | 14.21 | 16 | 12.26 (T7) |
| 4 | 02.42 | | 04.19 | | 05.58 | | | 07.27 | | 17.26 (T2) | 08.05 | | | 09.43 | | 12.11 (T7) |
| | 23.50 | | 22.14 | | 20.22 | | | 18.33 | 22 | 17.48 (T2) | 15.44 | | | 14.19 | 6 | 12.17 (T7) |
| 5 | 02.45 | | 04.23 | | 06.01 | | | 07.30 | | 17.26 (T2) | 08.08 | | | 09.46 | | |
| | 23.48 | | 22.10 | | 20.18 | | | 18.29 | 21 | 17.47 (T2) | 15.41 | | | 14.17 | | |
| 6 | 02.48 | | 04.26 | | 06.04 | | | 07.33 | | 17.27 (T2) | 08.12 | | | 09.49 | | |
| | 23.45 | | 22.07 | | 20.15 | | | 18.26 | 18 | 17.45 (T2) | 15.38 | | | 14.15 | | |
| 7 | 02.50 | | 04.29 | | 06.07 | | | 07.36 | | 17.27 (T2) | 08.15 | | | 09.52 | | |
| | 23.43 | | 22.03 | | 20.11 | | | 18.22 | 14 | 17.41 (T2) | 15.34 | | | 14.14 | | |
| 8 | 02.53 | | 04.33 | | 06.10 | | | 07.39 | | 17.30 (T2) | 08.19 | | | 09.54 | | |
| | 23.40 | | 22.00 | | 20.07 | | | 18.18 | 8 | 17.38 (T2) | 15.31 | | | 14.12 | | |
| 9 | 02.56 | | 04.36 | | 06.13 | | | 07.42 | | 17.33 (T2) | 08.22 | | | 09.56 | | |
| | 23.38 | | 21.56 | | 20.04 | | | 18.15 | 1 | 17.34 (T2) | 15.28 | | | 14.10 | | |
| 10 | 02.59 | | 04.39 | | 06.16 | | | 07.45 | | | 08.25 | | 12.07 (T7) | 09.59 | | |
| | 23.35 | | 21.53 | | 20.00 | | | 18.11 | | | 15.25 | 10 | 12.17 (T7) | 14.09 | | |
| 11 | 03.02 | | 04.42 | | 06.19 | | | 07.48 | | | 08.29 | | 12.05 (T7) | 10.01 | | |
| | 23.32 | | 21.49 | | 19.56 | | | 18.08 | | | 15.22 | 14 | 12.19 (T7) | 14.08 | | |
| 12 | 03.02 | | 04.46 | | 06.22 | | | 07.51 | | | 08.32 | | 12.04 (T7) | 10.03 | | |
| | 23.29 | | 21.45 | | 19.53 | | | 18.04 | | | 15.18 | 17 | 12.21 (T7) | 14.07 | | |
| 13 | 03.05 | | 04.49 | | 06.25 | | | 07.54 | | | 08.35 | | 12.03 (T7) | 10.05 | | |
| | 23.26 | | 21.42 | | 19.49 | | | 18.00 | | | 15.15 | 19 | 12.22 (T7) | 14.06 | | |
| 14 | 03.09 | | 04.52 | | 06.28 | | | 07.57 | | | 08.39 | | 12.03 (T7) | 10.07 | | |
| | 23.23 | | 21.38 | | 19.45 | | | 17.57 | | | 15.12 | 21 | 12.24 (T7) | 14.05 | | |
| 15 | 03.12 | | 04.56 | | 06.31 | | | 08.00 | | | 08.42 | | 12.02 (T7) | 10.09 | | |
| | 23.20 | | 21.35 | | 19.42 | | | 17.53 | | | 15.09 | 22 | 12.24 (T7) | 14.04 | | |
| 16 | 03.15 | | 04.59 | | 06.34 | | | 08.04 | | | 08.46 | | 12.02 (T7) | 10.10 | | |
| | 23.17 | | 21.31 | | 19.38 | | | 17.50 | | | 15.06 | 23 | 12.25 (T7) | 14.03 | | |
| 17 | 03.18 | | 05.02 | | 06.37 | | | 08.07 | | | 08.49 | | 12.02 (T7) | 10.12 | | |
| | 23.14 | | 21.27 | | 19.34 | | | 17.46 | | | 15.03 | 24 | 12.26 (T7) | 14.03 | | |
| 18 | 03.22 | | 05.05 | | 06.40 | | | 08.10 | | | 08.52 | | 12.01 (T7) | 10.13 | | |
| | 23.11 | | 21.24 | | 19.31 | | | 17.43 | | | 15.00 | 24 | 12.25 (T7) | 14.03 | | |
| 19 | 03.25 | | 05.08 | | 06.42 | | | 08.13 | | | 08.56 | | 12.01 (T7) | 10.14 | | |
| | 23.08 | | 21.20 | | 19.27 | | | 17.39 | | | 14.57 | 25 | 12.26 (T7) | 14.02 | | |
| 20 | 03.28 | | 05.12 | | 06.45 | | | 08.16 | | | 08.59 | | 12.01 (T7) | 10.15 | | |
| | 23.05 | | 21.17 | | 19.24 | | | 17.36 | | | 14.54 | 25 | 12.26 (T7) | 14.03 | | |
| 21 | 03.32 | | 05.15 | | 06.48 | | | 08.19 | | | 09.03 | | 12.01 (T7) | 10.16 | | |
| | 23.01 | | 21.13 | | 19.20 | | | 17.32 | | | 14.51 | 25 | 12.26 (T7) | 14.03 | | |
| 22 | 03.35 | | 05.18 | | 06.51 | | | 08.22 | | | 09.06 | | 12.02 (T7) | 10.16 | | |
| | 22.58 | | 21.09 | | 19.16 | | | 17.29 | | | 14.48 | 25 | 12.27 (T7) | 14.03 | | |
| 23 | 03.38 | | 05.21 | | 06.54 | | | 08.26 | | | 09.09 | | 12.03 (T7) | 10.17 | | |
| | 22.55 | | 21.06 | | 19.13 | | | 17.25 | | | 14.46 | 24 | 12.27 (T7) | 14.04 | | |
| 24 | 03.42 | | 05.24 | | 06.57 | | | 08.29 | | | 09.13 | | 12.03 (T7) | 10.17 | | |
| | 22.52 | | 21.02 | | 19.09 | | | 17.22 | | | 14.43 | 24 | 12.27 (T7) | 14.04 | | |
| 25 | 03.45 | | 05.27 | | 07.00 | | 17.36 (T2) | 07.32 | | | 09.16 | | 12.04 (T7) | 10.17 | | |
| | 22.48 | | 20.58 | | 19.05 | 9 | 17.45 (T2) | 16.18 | | | 14.40 | 23 | 12.27 (T7) | 14.05 | | |
| 26 | 03.49 | | 05.30 | | 07.03 | | 17.33 (T2) | 07.35 | | | 09.19 | | 12.04 (T7) | 10.17 | | |
| | 22.45 | | 20.55 | | 19.02 | 14 | 17.47 (T2) | 16.15 | | | 14.38 | 24 | 12.28 (T7) | 14.06 | | |
| 27 | 03.52 | | 05.33 | | 07.06 | | 17.31 (T2) | 07.39 | | | 09.22 | | 12.04 (T7) | 10.17 | | |
| | 22.41 | | 20.51 | | 18.58 | 17 | 17.48 (T2) | 16.11 | | | 14.35 | 23 | 12.27 (T7) | 14.08 | | |
| 28 | 03.55 | | 05.37 | | 07.09 | | 17.29 (T2) | 07.42 | | | 09.25 | | 12.06 (T7) | 10.17 | | |
| | 22.38 | | 20.47 | | 18.54 | 20 | 17.49 (T2) | 16.08 | | | 14.33 | 22 | 12.28 (T7) | 14.09 | | |
| 29 | 03.59 | | 05.40 | | 07.12 | | 17.28 (T2) | 07.45 | | | 09.29 | | 12.06 (T7) | 10.16 | | |
| | 22.35 | | 20.44 | | 18.51 | 21 | 17.49 (T2) | 16.05 | | | 14.30 | 21 | 12.27 (T7) | 14.10 | | |
| 30 | 04.02 | | 05.43 | | 07.15 | | 17.27 (T2) | 07.48 | | | 09.32 | | 12.07 (T7) | 10.16 | | |
| | 22.31 | | 20.40 | | 18.47 | 22 | 17.49 (T2) | 16.01 | | | 14.28 | 20 | 12.27 (T7) | 14.12 | | |
| 31 | 04.06 | | 05.46 | | | | | 07.52 | | | | | | 10.15 | | |
| | 22.28 | | 20.37 | | | | | 15.58 | | | | | | 14.14 | | |
| Potential sun hours | 619 | | 513 | | 394 | | | 303 | | | 192 | | | 126 | | |
| Total, worst case | | | | | 103 | | | 151 | | | 455 | | | 59 | | |
| Sun reduction | | | | | 0,32 | | | 0,28 | | | 0,19 | | | 0,04 | | |
| Oper. time red. | | | | | 0,98 | | | 0,98 | | | 0,98 | | | 0,98 | | |
| Wind dir. red. | | | | | 0,61 | | | 0,61 | | | 0,66 | | | 0,66 | | |
| Total reduction | | | | | 0,20 | | | 0,17 | | | 0,13 | | | 0,03 | | |
| Total, real | | | | | 20 | | | 26 | | | 57 | | | 2 | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** J - Lomarakennus J (Hautakaarto)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.40 | 23.24 | 23.52 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.17 | 06.25 | 04.37 | 02.53 | 02.42 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.27 | 23.50 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.09 | 08.49 | 07.14 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.05 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.30 | 23.48 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.47 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.10 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.48 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.53 | 23.35 | 23.43 | 22.06 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.15 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.53 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.01 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.49 | 05.56 | 04.09 | 02.35 | 03.01 | 04.43 | 06.19 | 07.48 | 08.28 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.48 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.04 | 04.47 | 06.22 | 07.51 | 08.31 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.28 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.41 | 05.49 | 04.02 | 02.31 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.54 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.42 | 10.07 |
| | 14.56 | 16.40 | 18.10 | 20.45 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.45 | 08.09 | 06.31 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.57 | 23.16 | 21.31 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.07 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.01 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.32 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.13 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.57 | 08.29 | 09.12 | 10.16 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.01 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.16 |
| | 15.29 | 17.13 | 18.40 | 21.17 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.16 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 00.00 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.16 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.59 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.32 | 03.57 | 05.37 | 07.09 | 07.42 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.08 | 23.58 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.44 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.31 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** K - Asuinrakennus K (Takalo)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.32 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.33 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.20 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.39 | 23.23 | 23.51 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.52 | 07.17 | 06.25 | 04.37 | 02.53 | 02.43 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.26 | 23.49 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.08 | 08.49 | 07.13 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.04 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.29 | 23.47 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.48 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.09 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.05 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.47 |
| | 14.30 | 16.10 | 17.42 | 20.16 | 21.53 | 23.35 | 23.43 | 22.06 | 20.14 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.39 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.14 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.02 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.52 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.40 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.02 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.06 | 23.45 | 23.33 | 21.52 | 20.00 | 18.11 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.48 | 05.56 | 04.09 | 02.35 | 03.02 | 04.43 | 06.19 | 07.48 | 08.28 | 09.59 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.47 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.05 | 04.47 | 06.22 | 07.51 | 08.31 | 10.01 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.27 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.19 | 06.41 | 05.49 | 04.02 | 02.32 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.03 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.53 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.41 | 10.07 |
| | 14.56 | 16.40 | 18.09 | 20.44 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.44 | 08.09 | 06.30 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.08 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.56 | 23.16 | 21.30 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.06 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.30 | 23.58 | 23.13 | 21.27 | 19.34 | 17.47 | 15.04 | 14.05 |
| 18 | 09.39 | 08.02 | 06.23 | 05.31 | 03.45 | 02.27 | 03.24 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.06 | 21.20 | 19.27 | 17.40 | 14.58 | 14.05 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.00 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.31 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.12 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.51 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.03 | 18.31 | 21.07 | 22.47 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.28 | 03.43 | 05.25 | 06.57 | 08.29 | 09.11 | 10.15 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.00 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.29 | 03.47 | 05.28 | 07.00 | 07.32 | 09.15 | 10.15 |
| | 15.29 | 17.13 | 18.40 | 21.16 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.15 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 23.59 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.15 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.58 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.33 | 03.57 | 05.37 | 07.09 | 07.41 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.07 | 23.57 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.43 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.30 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** L - Lomarakennus L (Haukijärvi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | | June | | July | | August | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.25 | 06.33 | 04.45 | | 03.02 | | 21.08 (T38) | 02.39 | 21.19 (T38) | 04.11 | 21.23 (T38) | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.19 | 15.53 | 17.27 | 20.02 | 21.37 | | 23.21 | 23 | 21.31 (T38) | 23.54 | 21.33 (T38) | 22.24 | 21.32 (T38) | 20.33 | 18.44 | 15.56 | 14.28 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | | 02.56 | | 21.09 (T38) | 02.41 | 21.18 (T38) | 04.14 | 21.27 (T38) | 05.53 | 07.22 | 07.58 | 09.37 |
| | 14.21 | 15.57 | 17.30 | 20.05 | 21.40 | | 23.24 | 21 | 21.30 (T38) | 23.52 | 21.33 (T38) | 22.20 | 21.29 (T38) | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.18 | 06.26 | 04.38 | | 02.53 | | 21.10 (T38) | 02.43 | 21.18 (T38) | 04.18 | | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.23 | 16.00 | 17.33 | 20.08 | 21.43 | | 23.27 | 21 | 21.31 (T38) | 23.50 | 21.34 (T38) | 22.17 | | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 04.34 | | 02.51 | | 21.10 (T38) | 02.46 | 21.18 (T38) | 04.21 | | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.04 | 17.36 | 20.11 | 21.47 | | 23.30 | 20 | 21.30 (T38) | 23.48 | 21.35 (T38) | 22.13 | | 20.22 | 18.34 | 15.46 | 14.21 |
| 5 | 10.08 | 08.47 | 07.10 | 06.19 | 04.31 | | 02.48 | | 21.11 (T38) | 02.48 | 21.17 (T38) | 04.24 | | 06.02 | 07.31 | 08.08 | 09.45 |
| | 14.28 | 16.07 | 17.39 | 20.14 | 21.50 | | 23.33 | 19 | 21.30 (T38) | 23.46 | 21.35 (T38) | 22.10 | | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.07 | 06.15 | 04.27 | | 02.46 | | 21.11 (T38) | 02.51 | 21.18 (T38) | 04.28 | | 06.05 | 07.34 | 08.12 | 09.48 |
| | 14.30 | 16.11 | 17.42 | 20.17 | 21.54 | | 23.36 | 18 | 21.29 (T38) | 23.44 | 21.36 (T38) | 22.06 | | 20.15 | 18.26 | 15.39 | 14.18 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | | 02.44 | | 21.12 (T38) | 02.54 | 21.18 (T38) | 04.31 | | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.33 | 16.14 | 17.45 | 20.20 | 21.57 | | 23.38 | 17 | 21.29 (T38) | 23.41 | 21.37 (T38) | 22.03 | | 20.11 | 18.23 | 15.36 | 14.16 |
| 8 | 10.02 | 08.37 | 07.00 | 06.08 | 04.20 | | 02.41 | | 21.12 (T38) | 02.56 | 21.17 (T38) | 04.34 | | 06.11 | 07.40 | 08.18 | 09.53 |
| | 14.36 | 16.17 | 17.48 | 20.23 | 22.00 | | 23.41 | 17 | 21.29 (T38) | 23.39 | 21.37 (T38) | 21.59 | | 20.08 | 18.19 | 15.33 | 14.14 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 04.16 | | 02.39 | | 21.13 (T38) | 02.59 | 21.17 (T38) | 04.37 | | 06.14 | 07.43 | 08.22 | 09.55 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | | 23.43 | 16 | 21.29 (T38) | 23.36 | 21.37 (T38) | 21.56 | | 20.04 | 18.16 | 15.29 | 14.13 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | | 02.37 | | 21.14 (T38) | 03.02 | 21.16 (T38) | 04.41 | | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.29 | 22.07 | | 23.46 | 15 | 21.29 (T38) | 23.33 | 21.38 (T38) | 21.52 | | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.10 | 21.15 (T38) | 02.35 | | 21.14 (T38) | 03.02 | 21.16 (T38) | 04.44 | | 06.20 | 07.49 | 08.29 | 10.00 |
| | 14.44 | 16.28 | 17.58 | 20.33 | 22.10 | 6 21.21 (T38) | 23.48 | 15 | 21.29 (T38) | 23.31 | 21.38 (T38) | 21.49 | | 19.57 | 18.09 | 15.23 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.06 | 21.12 (T38) | 02.34 | | 21.15 (T38) | 03.05 | 21.16 (T38) | 04.47 | | 06.23 | 07.52 | 08.32 | 10.02 |
| | 14.47 | 16.31 | 18.01 | 20.36 | 22.14 | 12 21.24 (T38) | 23.50 | 13 | 21.28 (T38) | 23.28 | 21.39 (T38) | 21.45 | | 19.53 | 18.05 | 15.20 | 14.09 |
| 13 | 09.52 | 08.20 | 06.42 | 05.50 | 04.03 | 21.10 (T38) | 02.32 | | 21.15 (T38) | 03.08 | 21.16 (T38) | 04.51 | | 06.26 | 07.55 | 08.35 | 10.04 |
| | 14.50 | 16.34 | 18.04 | 20.39 | 22.17 | 16 21.26 (T38) | 23.52 | 13 | 21.28 (T38) | 23.25 | 21.39 (T38) | 21.42 | | 19.50 | 18.01 | 15.17 | 14.08 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 21.09 (T38) | 02.31 | | 21.16 (T38) | 03.11 | 21.16 (T38) | 04.54 | | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.38 | 18.07 | 20.42 | 22.21 | 18 21.27 (T38) | 23.54 | 12 | 21.28 (T38) | 23.22 | 21.39 (T38) | 21.38 | | 19.46 | 17.58 | 15.14 | 14.07 |
| 15 | 09.47 | 08.13 | 06.35 | 05.42 | 03.56 | 21.09 (T38) | 02.30 | | 21.17 (T38) | 03.14 | 21.15 (T38) | 04.57 | | 06.32 | 08.01 | 08.42 | 10.07 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.24 | 19 21.28 (T38) | 23.56 | 11 | 21.28 (T38) | 23.19 | 21.39 (T38) | 21.35 | | 19.42 | 17.54 | 15.11 | 14.06 |
| 16 | 09.45 | 08.10 | 06.31 | 05.39 | 03.52 | 21.08 (T38) | 02.29 | | 21.18 (T38) | 03.18 | 21.16 (T38) | 05.00 | | 06.34 | 08.04 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 21 21.29 (T38) | 23.57 | 10 | 21.28 (T38) | 23.16 | 21.41 (T38) | 21.31 | | 19.39 | 17.51 | 15.08 | 14.06 |
| 17 | 09.43 | 08.06 | 06.27 | 05.35 | 03.49 | 21.07 (T38) | 02.28 | | 21.18 (T38) | 03.21 | 21.16 (T38) | 05.03 | | 06.37 | 08.07 | 08.49 | 10.10 |
| | 15.03 | 16.48 | 18.16 | 20.51 | 22.31 | 22 21.29 (T38) | 23.58 | 10 | 21.28 (T38) | 23.13 | 21.40 (T38) | 21.27 | | 19.35 | 17.47 | 15.05 | 14.06 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.46 | 21.07 (T38) | 02.27 | | 21.18 (T38) | 03.24 | 21.15 (T38) | 05.07 | | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.06 | 16.51 | 18.19 | 20.55 | 22.34 | 23 21.30 (T38) | 23.59 | 9 | 21.27 (T38) | 23.10 | 21.40 (T38) | 21.24 | | 19.31 | 17.44 | 15.02 | 14.05 |
| 19 | 09.37 | 08.00 | 06.20 | 05.28 | 03.42 | 21.06 (T38) | 02.27 | | 21.19 (T38) | 03.27 | 21.16 (T38) | 05.10 | | 06.43 | 08.13 | 08.55 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 24 21.30 (T38) | 00.00 | 8 | 21.27 (T38) | 23.07 | 21.41 (T38) | 21.20 | | 19.28 | 17.40 | 14.59 | 14.05 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.39 | 21.07 (T38) | 02.27 | | 21.19 (T38) | 03.31 | 21.16 (T38) | 05.13 | | 06.46 | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.58 | 18.25 | 21.01 | 22.41 | 24 21.31 (T38) | 00.01 | 8 | 21.27 (T38) | 23.04 | 21.41 (T38) | 21.17 | | 19.24 | 17.37 | 14.56 | 14.05 |
| 21 | 09.32 | 07.53 | 06.13 | 05.21 | 03.36 | 21.06 (T38) | 02.27 | | 21.20 (T38) | 03.34 | 21.16 (T38) | 05.16 | | 06.49 | 08.20 | 09.02 | 10.15 |
| | 15.16 | 17.01 | 18.28 | 21.04 | 22.45 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 23.01 | 21.41 (T38) | 21.13 | | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.17 | 03.32 | 21.06 (T38) | 02.27 | | 21.20 (T38) | 03.37 | 21.16 (T38) | 05.19 | | 06.52 | 08.23 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 22.57 | 21.41 (T38) | 21.09 | | 19.17 | 17.30 | 14.50 | 14.06 |
| 23 | 09.26 | 07.46 | 06.06 | 05.13 | 03.29 | 21.06 (T38) | 02.28 | | 21.20 (T38) | 03.41 | 21.17 (T38) | 05.22 | | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.23 | 17.07 | 18.34 | 21.11 | 22.51 | 25 21.31 (T38) | 00.01 | 8 | 21.28 (T38) | 22.54 | 21.41 (T38) | 21.06 | | 19.13 | 17.26 | 14.48 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.10 | 03.26 | 21.06 (T38) | 02.28 | | 21.20 (T38) | 03.44 | 21.17 (T38) | 05.25 | | 06.58 | 08.29 | 09.12 | 10.16 |
| | 15.26 | 17.11 | 18.37 | 21.14 | 22.55 | 25 21.31 (T38) | 00.01 | 9 | 21.29 (T38) | 22.51 | 21.41 (T38) | 21.02 | | 19.10 | 17.23 | 14.45 | 14.07 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.23 | 21.06 (T38) | 02.29 | | 21.20 (T38) | 03.47 | 21.17 (T38) | 05.28 | | 07.01 | 07.32 | 09.15 | 10.16 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.58 | 25 21.31 (T38) | 00.01 | 9 | 21.29 (T38) | 22.48 | 21.41 (T38) | 20.59 | | 19.06 | 16.19 | 14.42 | 14.08 |
| 26 | 09.18 | 07.35 | 05.55 | 05.03 | 03.20 | 21.07 (T38) | 02.30 | | 21.20 (T38) | 03.51 | 21.17 (T38) | 05.32 | | 07.04 | 07.36 | 09.18 | 10.16 |
| | 15.33 | 17.17 | 18.44 | 21.20 | 23.01 | 24 21.31 (T38) | 00.00 | 10 | 21.30 (T38) | 22.44 | 21.40 (T38) | 20.55 | | 19.02 | 16.16 | 14.40 | 14.09 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.17 | 21.07 (T38) | 02.32 | | 21.20 (T38) | 03.54 | 21.18 (T38) | 05.35 | | 07.07 | 07.39 | 09.22 | 10.16 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 25 21.32 (T38) | 23.59 | 11 | 21.31 (T38) | 22.41 | 21.40 (T38) | 20.51 | | 18.59 | 16.13 | 14.37 | 14.10 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 21.07 (T38) | 02.33 | | 21.19 (T38) | 03.57 | 21.19 (T38) | 05.38 | | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.40 | 17.23 | 18.50 | 21.27 | 23.08 | 25 21.32 (T38) | 23.58 | 11 | 21.30 (T38) | 22.38 | 21.39 (T38) | 20.48 | | 18.55 | 16.09 | 14.35 | 14.12 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 21.08 (T38) | 02.35 | | 21.19 (T38) | 04.01 | 21.19 (T38) | 05.41 | | 07.13 | 07.45 | 09.28 | 10.15 |
| | 15.43 | | 19.53 | 21.30 | 23.11 | 23 21.31 (T38) | 23.57 | 12 | 21.31 (T38) | 22.34 | 21.38 (T38) | 20.44 | | 18.52 | 16.06 | 14.32 | 14.13 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 21.08 (T38) | 02.37 | | 21.19 (T38) | 04.04 | 21.20 (T38) | 05.44 | | 07.16 | 07.49 | 09.31 | 10.14 |
| | 15.46 | | 19.56 | 21.33 | 23.15 | 23 21.31 (T38) | 23.55 | 14 | 21.33 (T38) | 22.31 | 21.37 (T38) | 20.40 | | 18.48 | 16.02 | 14.30 | 14.15 |
| 31 | 09.02 | | 06.37 | | 03.05 | 21.08 (T38) | | | | 04.08 | 21.22 (T38) | 05.47 | | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | 23 21.31 (T38) | | | | 22.27 | 21.36 (T38) | 20.37 | | | 15.59 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | | 637 | | 617 | | 512 | | 394 | 303 | 193 | 128 | |
| Total, worst case | | | | | 453 | | 396 | | 655 | | 11 | | | | | | |
| Sun reduction | | | | | 0,47 | | 0,50 | | 0,48 | | 0,42 | | | | | | |
| Oper. time red. | | | | | 0,98 | | 0,98 | | 0,98 | | 0,98 | | | | | | |
| Wind dir. red. | | | | | 0,64 | | 0,64 | | 0,64 | | 0,64 | | | | | | |
| Total reduction | | | | | 0,30 | | 0,31 | | 0,30 | | 0,26 | | | | | | |
| Total, real | | | | | 135 | | 125 | | 197 | | 3 | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** M - Lomarakennus M (Haukilahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | April | May | June | July | August | September | October | | November | | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | | 09.00 | 14.48 (T31) | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | | 07.55 | 14.14 (T31) | 09.35 |
| | 14.18 | | 15.53 11 | 14.59 (T31) | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | | 15.55 24 | 14.38 (T31) | 14.27 |
| 2 | 10.12 | | 08.56 | 14.47 (T31) | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | | 07.59 | 14.14 (T31) | 09.37 |
| | 14.20 | | 15.57 17 | 15.04 (T31) | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | | 15.52 25 | 14.39 (T31) | 14.25 |
| 3 | 10.11 | | 08.53 | 14.46 (T31) | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | | 08.02 | 14.14 (T31) | 09.40 |
| | 14.22 | | 16.00 20 | 15.06 (T31) | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | | 15.49 25 | 14.39 (T31) | 14.23 |
| 4 | 10.10 | | 08.50 | 14.45 (T31) | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | | 08.05 | 14.15 (T31) | 09.43 |
| | 14.25 | | 16.03 21 | 15.06 (T31) | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.34 | | 15.45 23 | 14.38 (T31) | 14.21 |
| 5 | 10.08 | | 08.47 | 14.45 (T31) | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | | 08.09 | 14.15 (T31) | 09.46 |
| | 14.27 | | 16.07 22 | 15.07 (T31) | 17.39 | 20.14 | 21.51 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | | 15.42 23 | 14.38 (T31) | 14.19 |
| 6 | 10.07 | | 08.44 | 14.44 (T31) | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | | 08.12 | 14.15 (T31) | 09.49 |
| | 14.30 | | 16.10 24 | 15.08 (T31) | 17.42 | 20.17 | 21.54 | 23.37 | 23.44 | 22.07 | 20.15 | 18.26 | | 15.39 23 | 14.38 (T31) | 14.17 |
| 7 | 10.05 | | 08.40 | 14.44 (T31) | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | | 08.15 | 14.16 (T31) | 09.51 |
| | 14.32 | | 16.14 24 | 15.08 (T31) | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.12 | 18.23 | | 15.36 21 | 14.37 (T31) | 14.15 |
| 8 | 10.03 | | 08.37 | 14.44 (T31) | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | | 08.19 | 14.16 (T31) | 09.54 |
| | 14.35 | | 16.17 24 | 15.08 (T31) | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | | 15.32 20 | 14.36 (T31) | 14.14 |
| 9 | 10.01 | | 08.34 | 14.44 (T31) | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | | 08.22 | 14.17 (T31) | 09.56 |
| | 14.38 | | 16.21 24 | 15.08 (T31) | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | | 15.29 17 | 14.34 (T31) | 14.12 |
| 10 | 09.59 | | 08.30 | 14.45 (T31) | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | | 08.26 | 14.19 (T31) | 09.58 |
| | 14.41 | | 16.24 24 | 15.09 (T31) | 17.55 | 20.30 | 22.08 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | | 15.26 12 | 14.31 (T31) | 14.11 |
| 11 | 09.57 | | 08.27 | 14.45 (T31) | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | | 08.29 | 14.21 (T31) | 10.01 |
| | 14.43 | | 16.27 24 | 15.09 (T31) | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | | 15.23 5 | 14.26 (T31) | 14.09 |
| 12 | 09.55 | | 08.24 | 14.46 (T31) | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | | 08.32 | | 10.03 |
| | 14.46 | | 16.31 22 | 15.08 (T31) | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | | 15.20 | | 14.08 |
| 13 | 09.53 | | 08.20 | 14.46 (T31) | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | | 08.36 | | 10.05 |
| | 14.49 | | 16.34 21 | 15.07 (T31) | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | | 15.16 | | 14.07 |
| 14 | 09.50 | | 08.17 | 14.47 (T31) | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | | 08.39 | | 10.07 |
| | 14.53 | | 16.37 19 | 15.06 (T31) | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | | 15.13 | | 14.06 |
| 15 | 09.48 | | 08.14 | 14.48 (T31) | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | | 08.42 | | 10.08 |
| | 14.56 | | 16.41 17 | 15.05 (T31) | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | | 15.10 | | 14.06 |
| 16 | 09.46 | | 08.10 | 14.50 (T31) | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | | 08.46 | | 10.10 |
| | 14.59 | | 16.44 13 | 15.03 (T31) | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | | 15.07 | | 14.05 |
| 17 | 09.43 | | 08.07 | 14.54 (T31) | 06.27 | 05.35 | 03.49 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | | 08.49 | | 10.11 |
| | 15.02 | | 16.47 5 | 14.59 (T31) | 18.16 | 20.52 | 22.32 | 00.00 | 23.14 | 21.28 | 19.35 | 17.47 | | 15.04 | | 14.05 |
| 18 | 09.40 | | 08.03 | | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | | 08.53 | | 10.12 |
| | 15.05 | | 16.51 | | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | | 15.01 | | 14.05 |
| 19 | 09.38 | | 08.00 | | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | | 08.56 | | 10.14 |
| | 15.09 | | 16.54 | | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | | 14.58 | | 14.04 |
| 20 | 09.35 | | 07.56 | | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | | 08.59 | | 10.15 |
| | 15.12 | | 16.57 | | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | | 14.56 | | 14.04 |
| 21 | 09.32 | | 07.53 | | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | | 09.03 | | 10.15 |
| | 15.15 | | 17.01 | | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.21 | 17.33 | | 14.53 | | 14.05 |
| 22 | 09.30 | | 07.49 | | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | | 09.06 | | 10.16 |
| | 15.19 | | 17.04 | | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | | 14.50 | | 14.05 |
| 23 | 09.27 | | 07.46 | | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | | 09.09 | | 10.16 |
| | 15.22 | | 17.07 | | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | | 14.47 | | 14.06 |
| 24 | 09.24 | | 07.42 | | 06.02 | 05.10 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | | 09.13 | | 10.17 |
| | 15.25 | | 17.10 | | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | | 14.44 | | 14.06 |
| 25 | 09.21 | | 07.39 | | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.33 | 14.23 (T31) | 09.16 | | 10.17 |
| | 15.29 | | 17.14 | | 18.41 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 8 | 14.31 (T31) | 14.42 | | 14.07 |
| 26 | 09.18 | | 07.35 | | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 14.20 (T31) | 09.19 | | 10.17 |
| | 15.32 | | 17.17 | | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 14 | 14.34 (T31) | 14.39 | | 14.08 |
| 27 | 09.15 | | 07.32 | | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 14.18 (T31) | 09.22 | | 10.17 |
| | 15.36 | | 17.20 | | 18.47 | 21.24 | 23.06 | 00.00 | 22.41 | 20.52 | 18.59 | 16.12 17 | 14.35 (T31) | 14.37 | | 14.09 |
| 28 | 09.12 | | 07.28 | | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 14.16 (T31) | 09.25 | | 10.16 |
| | 15.39 | | 17.23 | | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 20 | 14.36 (T31) | 14.34 | | 14.11 |
| 29 | 09.09 | | | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.46 | 14.15 (T31) | 09.28 | | 10.16 |
| | 15.43 | | | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 22 | 14.37 (T31) | 14.32 | | 14.12 |
| 30 | 09.06 | | | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 14.15 (T31) | 09.32 | | 10.15 |
| | 15.46 | | | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 22 | 14.37 (T31) | 14.29 | | 14.14 |
| 31 | 09.03 | 14.50 (T31) | | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | 14.15 (T31) | | | 10.14 |
| | 15.50 | 6 14.56 (T31) | | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.59 23 | 14.38 (T31) | | | 14.16 |
| Potential sun hours | 164 | | 235 | | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | | 193 | | 128 |
| Total, worst case | | 6 | | 332 | | | | | | | | | 126 | | 218 | |
| Sun reduction | | 0,11 | | 0,31 | | | | | | | | | 0,28 | | 0,19 | |
| Oper. time red. | | 0,98 | | 0,98 | | | | | | | | | 0,98 | | 0,98 | |
| Wind dir. red. | | 0,64 | | 0,64 | | | | | | | | | 0,64 | | 0,64 | |
| Total reduction | | 0,07 | | 0,20 | | | | | | | | | 0,18 | | 0,12 | |
| Total, real | | 0 | | 65 | | | | | | | | | 22 | | 26 | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm) | | First time (hh:mm) with flicker | (WTG causing flicker first time) |
| | Sun set (hh:mm) | Minutes with flicker | Last time (hh:mm) with flicker | (WTG causing flicker last time) |

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** N - Lomarakennus N (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.26 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** O - Lomarakennus O (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 418 | 482 | 543 | 576 | 834 | 1 108 | 1 065 | 893 | 815 | 711 | 642 | 8 619 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.51 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

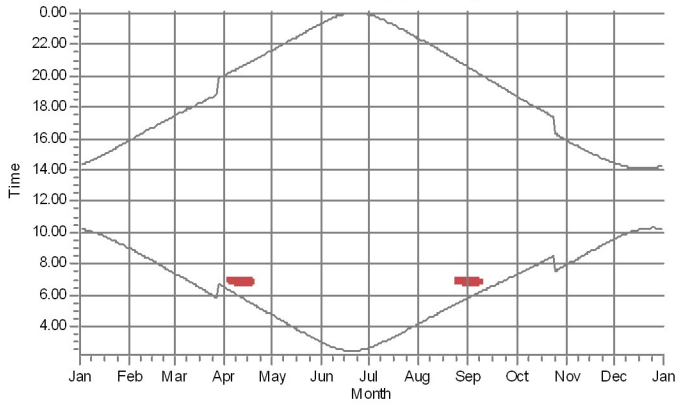
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.20/3.5.584

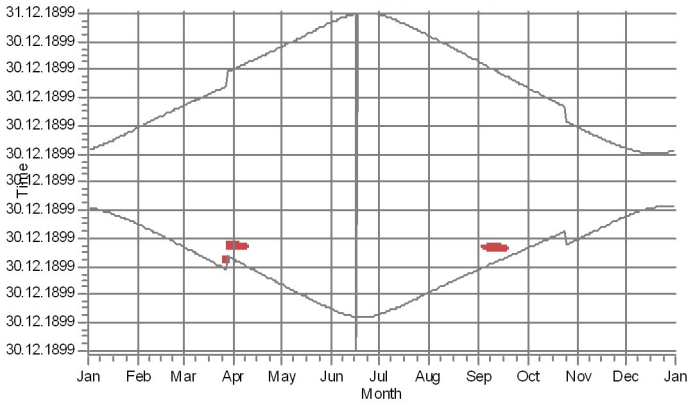
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

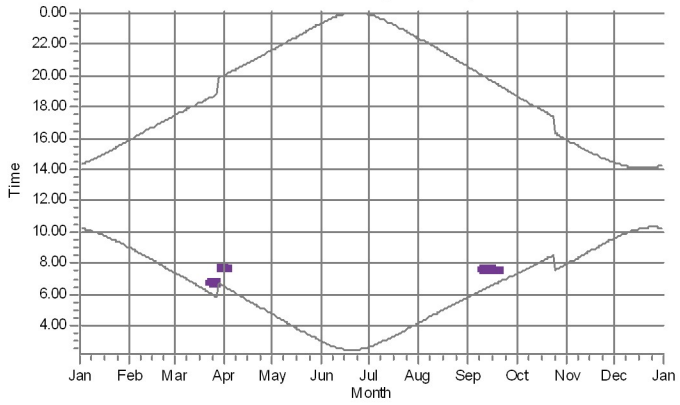
A: Lomarakennus A (Syvälahti)



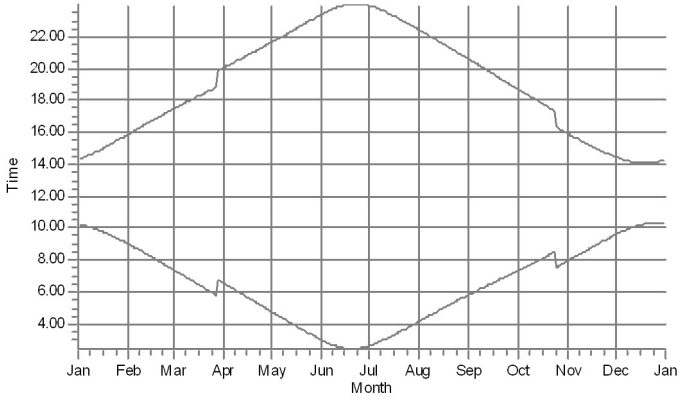

B: Asuinrakennus B (Syväänlahti)



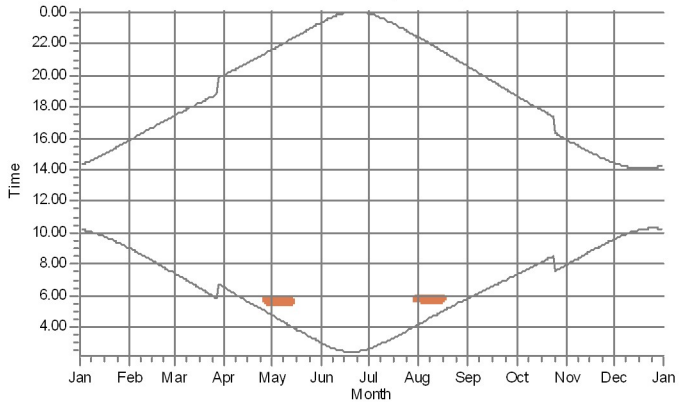

C: Lomarakennus C (Mutalahti)



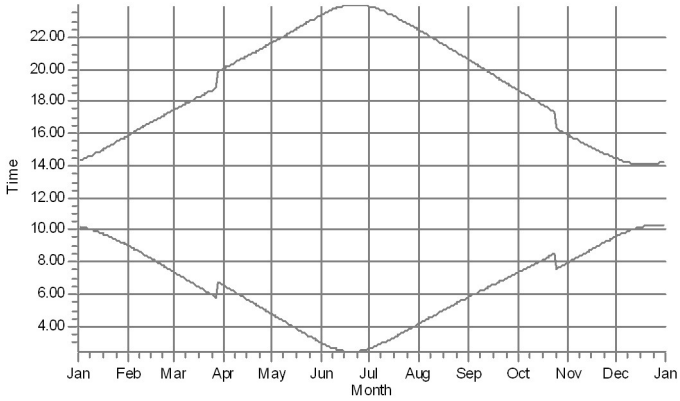

D: Lomarakennus D (Mutaniemi)




E: Asuinrakennus E (Alanko)




F: Asuinrakennus F (Joensuu)



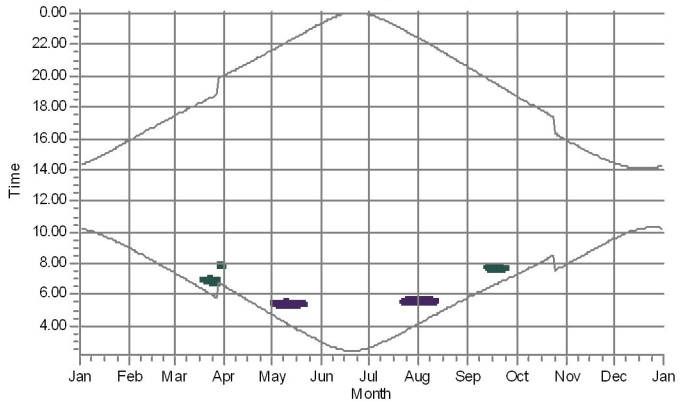



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9.5.2023 19.20/3.5.584

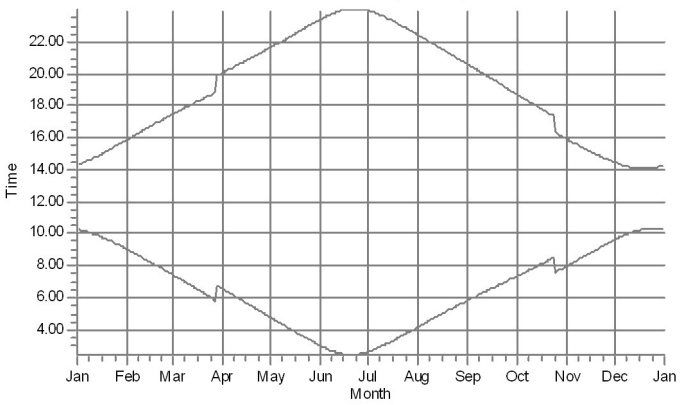
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

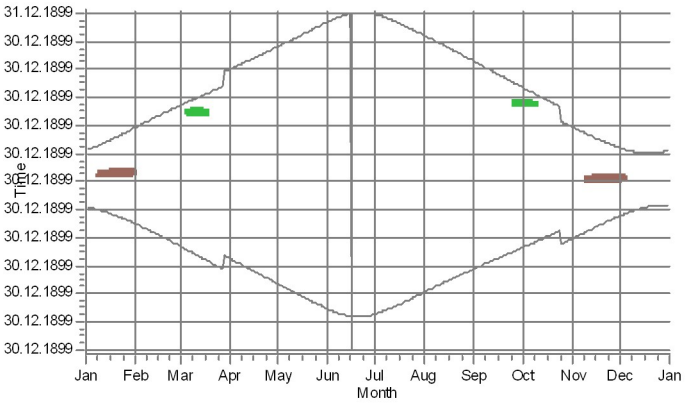
G: Asuinrakennus G (Heiniaho)



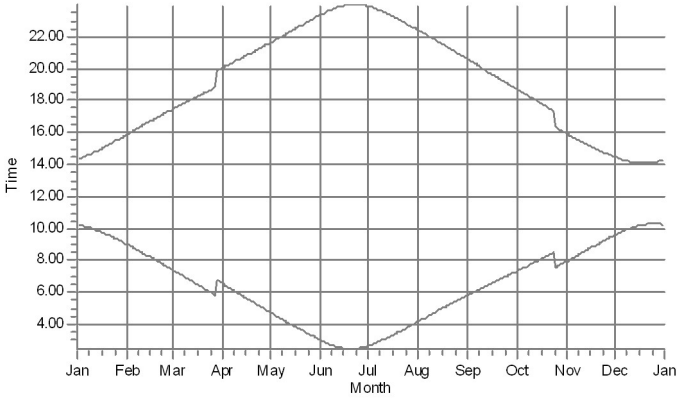

H: Asuinrakennus H (Mäkelä)



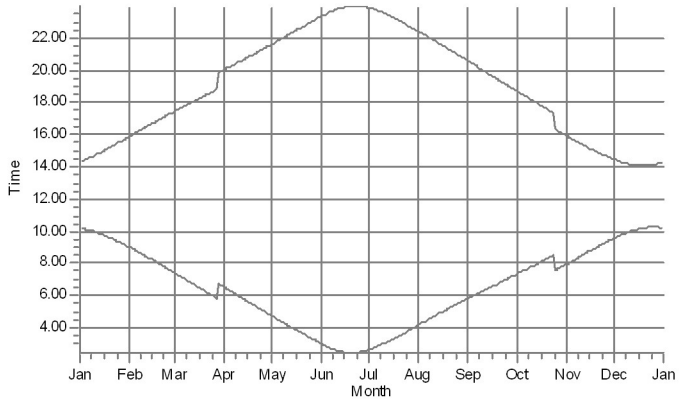

I: Lomarakennus I



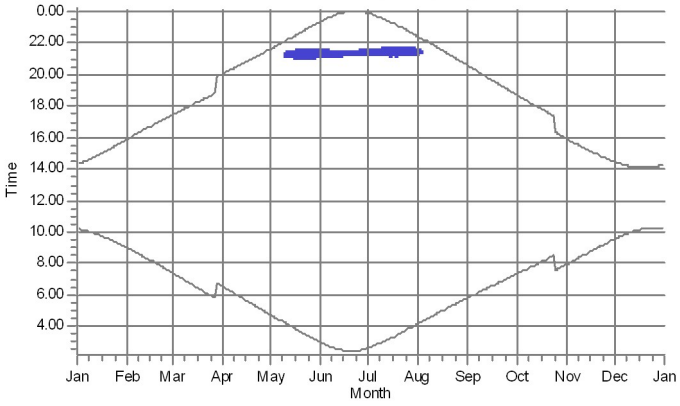

J: Lomarakennus J (Hautakaarto)




K: Asuinrakennus K (Takalo)




L: Lomarakennus L (Haukijärvi)



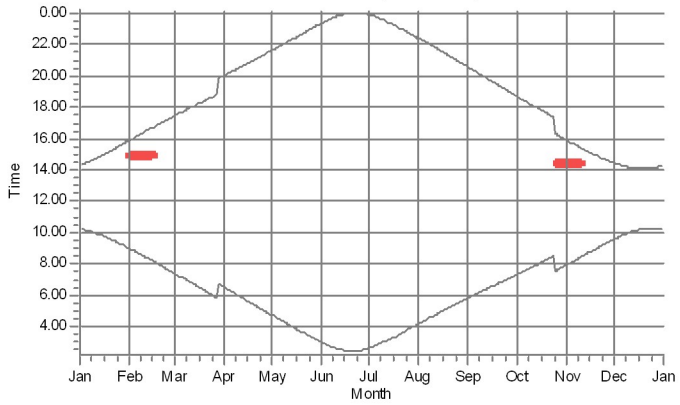



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Calculated:
9.5.2023 19.20/3.5.584

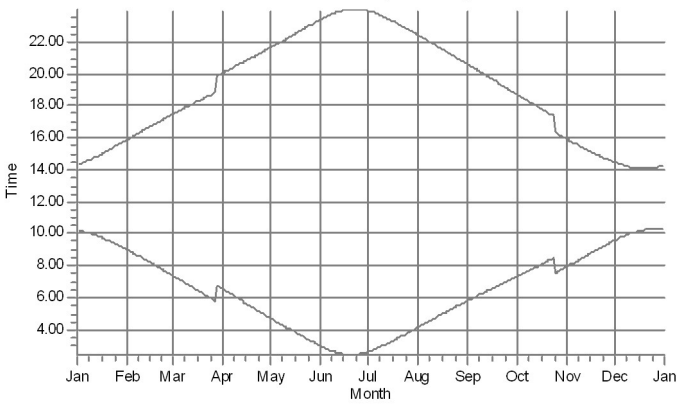
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas

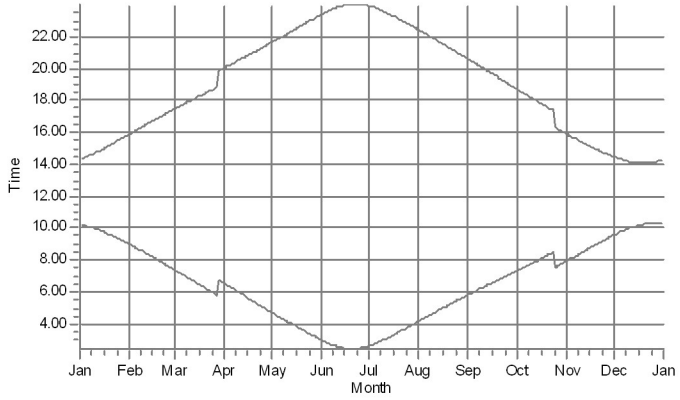
M: Lomarakennus M (Haukilahti)




N: Lomarakennus N (Kuusela)




O: Lomarakennus O (Kuusela)



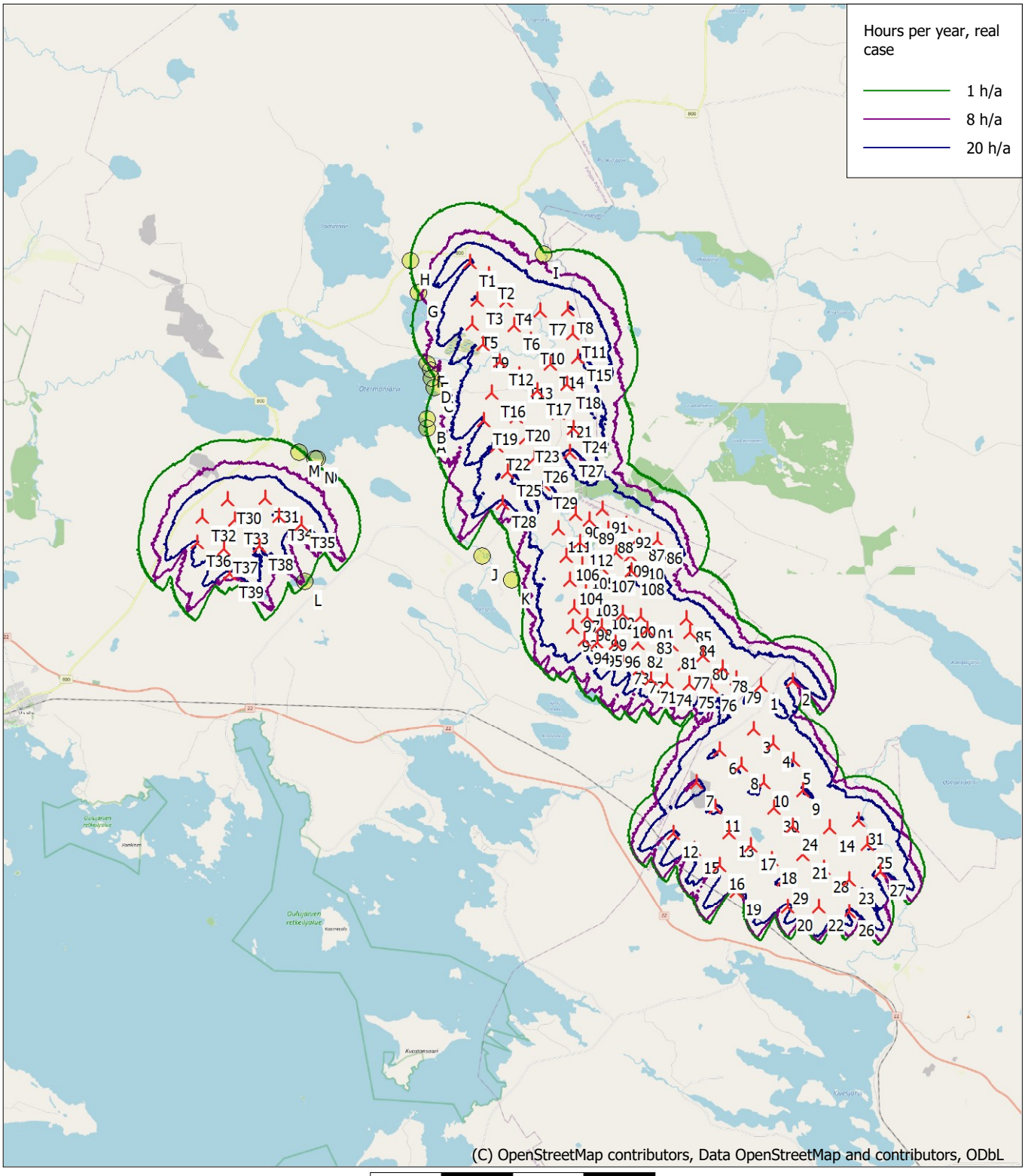

WTGs

T31: Generic RD200 7200 200,0 !O! hub: 200,0 m (TOT: 300,0 m) (652)

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Calculated:
9.5.2023 19.20/3.5.584

# SHADOW - Map

**Calculation:** Haarasuonkangas_VE1_RD200x39xHH200_2023058 + Turkkiselkä + Takiankangas




0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 509 790 North: 7 163 490

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (2)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

## Liite 12. Yhteisvaikutus varjostusmallinnuksen tulokset ”Real Case, No Forest” - VE2

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

## Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

| | |
|---|---|
| Minimum sun height over horizon for influence | 3 ° |
| Day step for calculation | 1 days |
| Time step for calculation | 1 minutes |

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA_N64,50_E027,335 (12)

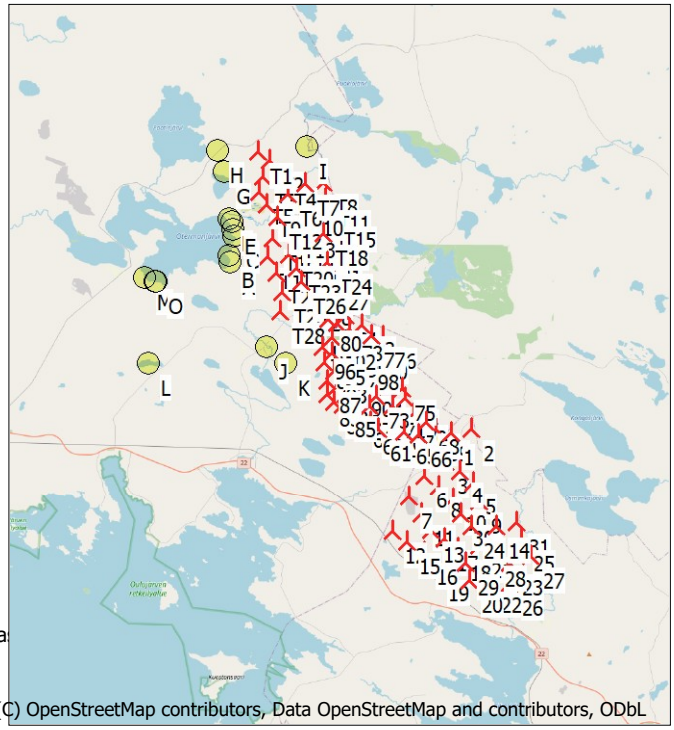
Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankanga
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89




Scale 1:400 000
New WTG
Shadow receptor

## WTGs

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Shadow data Calculation distance | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| 1 | 518 603 | 7 160 024 | 164,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 10 | 518 711 | 7 156 574 | 157,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 100 | 513 976 | 7 164 554 | 141,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 101 | 511 430 | 7 165 541 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 102 | 512 201 | 7 165 062 | 137,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 11 | 517 010 | 7 155 708 | 145,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 12 | 515 527 | 7 154 776 | 152,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 13 | 517 530 | 7 154 832 | 146,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 14 | 521 058 | 7 155 020 | 164,8 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 15 | 516 293 | 7 154 229 | 165,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 16 | 517 207 | 7 153 659 | 146,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 17 | 518 286 | 7 154 356 | 145,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 18 | 519 036 | 7 153 873 | 147,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 19 | 517 798 | 7 152 768 | 147,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 2 | 519 707 | 7 160 212 | 181,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 20 | 519 595 | 7 152 194 | 138,1 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 21 | 520 112 | 7 154 049 | 153,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 22 | 520 685 | 7 152 221 | 143,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 23 | 521 787 | 7 153 171 | 156,9 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 24 | 519 754 | 7 155 057 | 147,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 25 | 522 393 | 7 154 422 | 158,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 26 | 521 798 | 7 152 019 | 160,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 27 | 522 872 | 7 153 480 | 157,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 28 | 520 875 | 7 153 602 | 157,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 29 | 519 434 | 7 153 144 | 142,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 3 | 518 335 | 7 158 482 | 177,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 30 | 519 097 | 7 155 706 | 152,4 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 31 | 522 104 | 7 155 279 | 160,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 4 | 519 041 | 7 157 963 | 170,0 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 5 | 519 788 | 7 157 386 | 171,2 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 6 | 517 177 | 7 157 725 | 162,5 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |

To be continued on next page...

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | | | | | WTG type | | | | | | | Shadow data | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | East | North | Z | Row data/Description | Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Calculation distance | RPM |
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| 61 | 514 713 | 7 160 221 | 138,9 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 62 | 514 322 | 7 160 594 | 136,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 63 | 513 760 | 7 160 896 | 134,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 64 | 515 280 | 7 160 145 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 65 | 516 065 | 7 160 095 | 148,9 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 66 | 516 865 | 7 159 975 | 150,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 67 | 515 893 | 7 160 771 | 145,1 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 68 | 517 250 | 7 160 639 | 147,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 69 | 517 760 | 7 160 250 | 152,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 7 | 516 365 | 7 156 572 | 143,6 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 70 | 516 561 | 7 161 067 | 145,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 71 | 515 455 | 7 161 460 | 140,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 72 | 514 251 | 7 161 482 | 138,1 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 73 | 514 587 | 7 161 973 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 74 | 516 095 | 7 161 880 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 75 | 515 968 | 7 162 365 | 143,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 76 | 514 920 | 7 165 135 | 143,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 77 | 514 309 | 7 165 216 | 143,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 78 | 513 180 | 7 165 515 | 143,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 79 | 512 525 | 7 165 835 | 140,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 8 | 517 940 | 7 157 182 | 154,8 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 80 | 512 030 | 7 166 046 | 139,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 81 | 512 970 | 7 166 250 | 144,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 82 | 513 824 | 7 165 685 | 143,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 83 | 511 955 | 7 162 030 | 134,6 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 84 | 512 368 | 7 161 612 | 135,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 85 | 512 831 | 7 161 519 | 136,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 86 | 513 463 | 7 161 490 | 137,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 87 | 512 000 | 7 162 735 | 139,8 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 88 | 512 460 | 7 162 435 | 142,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 89 | 512 970 | 7 162 065 | 141,5 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 9 | 520 096 | 7 156 333 | 164,3 | VESTAS V172-7.2 7200 250.0... | Yes | VESTAS | V172-7.2-7 200 | 7 200 | 250,0 | 225,0 | 1 541 | 10,4 |
| 90 | 513 720 | 7 162 538 | 142,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 91 | 514 360 | 7 162 448 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 92 | 512 957 | 7 162 816 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 93 | 512 396 | 7 163 292 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 94 | 511 847 | 7 163 708 | 136,2 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 95 | 512 266 | 7 164 240 | 144,4 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 96 | 511 697 | 7 164 525 | 140,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 97 | 512 955 | 7 164 121 | 140,7 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 98 | 514 006 | 7 164 037 | 145,0 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| 99 | 513 472 | 7 164 666 | 141,3 | NORDEX N149/4.0-4.5 4500 ... | Yes | NORDEX | N149/4.0-4.5-4 500 | 4 500 | 180,0 | 190,0 | 1 802 | 10,7 |
| T1 | 508 282 | 7 174 861 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T10 | 510 426 | 7 172 148 | 146,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T11 | 511 902 | 7 172 395 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T12 | 509 346 | 7 171 412 | 143,2 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T13 | 510 056 | 7 170 927 | 146,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T14 | 511 130 | 7 171 298 | 148,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T15 | 512 122 | 7 171 560 | 159,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T16 | 509 073 | 7 170 275 | 147,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T17 | 510 668 | 7 170 368 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T18 | 511 731 | 7 170 576 | 165,0 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T19 | 508 820 | 7 169 317 | 148,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T2 | 508 948 | 7 174 439 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T20 | 509 941 | 7 169 425 | 149,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T21 | 511 434 | 7 169 585 | 157,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T22 | 509 256 | 7 168 427 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T23 | 510 283 | 7 168 708 | 149,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T24 | 511 959 | 7 169 067 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T25 | 509 625 | 7 167 494 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T26 | 510 589 | 7 167 991 | 147,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T27 | 511 839 | 7 168 207 | 148,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T28 | 509 456 | 7 166 427 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T29 | 510 920 | 7 167 074 | 142,1 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

To be continued on next page...

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9.5.2023 19.45/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| | East | North | Z | Row data/Description | WTG type Valid | Manufact. | Type-generator | Power, rated | Rotor diameter | Hub height | Shadow data Calculation distance | RPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [RPM] |
| T3 | 508 557 | 7 173 555 | 151,9 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T4 | 509 564 | 7 173 532 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T5 | 508 354 | 7 172 700 | 144,8 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T6 | 509 849 | 7 172 666 | 152,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T7 | 510 753 | 7 173 171 | 147,6 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T8 | 511 738 | 7 173 247 | 154,9 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |
| T9 | 508 756 | 7 172 027 | 142,5 | Generic RD200 7200 200.0 !... | Yes | Generic | RD200-7 200 | 7 200 | 200,0 | 200,0 | 2 075 | 10,4 |

## Shadow receptor-Input

| No. | Name | East | North | Z | Width | Height | Elevation a.g.l. | Slope of window | Direction mode | Eye height (ZVI) a.g.l. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | [m] | [m] | [m] | [m] | [°] | | [m] |
| A | Lomarakennus A (Syvälahti) | 506 817 | 7 169 043 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| B | Asuinrakennus B (Syväänlahti) | 506 799 | 7 169 349 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| C | Lomarakennus C (Mutalahti) | 507 047 | 7 170 436 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| D | Lomarakennus D (Mutaniemi) | 506 972 | 7 170 765 | 142,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| E | Asuinrakennus E (Alanko) | 506 919 | 7 171 101 | 145,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| F | Asuinrakennus F (Joensuu) | 506 790 | 7 171 328 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| G | Asuinrakennus G (Heiniaho) | 506 504 | 7 173 821 | 147,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| H | Asuinrakennus H (Mäkelä) | 506 192 | 7 174 913 | 150,9 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| I | Lomarakennus I | 510 890 | 7 175 161 | 155,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| J | Lomarakennus J (Hautakaarto) | 508 768 | 7 164 525 | 132,5 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| K | Asuinrakennus K (Takalo) | 509 809 | 7 163 697 | 133,1 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| L | Lomarakennus L (Haukijärvi) | 502 501 | 7 163 625 | 140,0 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| M | Lomarakennus M (Haukilahti) | 502 306 | 7 168 185 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| N | Lomarakennus N (Kuusela) | 502 860 | 7 167 956 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |
| O | Lomarakennus O (Kuusela) | 502 930 | 7 167 959 | 142,6 | 5,0 | 5,0 | 1,0 | 90,0 | "Green house mode" | 6,0 |

## Calculation Results

Shadow receptor

| No. | Name | Shadow, expected values Shadow hours per year [h/year] |
|---|---|---|
| A | Lomarakennus A (Syvälahti) | 2:21 |
| B | Asuinrakennus B (Syväänlahti) | 2:01 |
| C | Lomarakennus C (Mutalahti) | 1:54 |
| D | Lomarakennus D (Mutaniemi) | 0:00 |
| E | Asuinrakennus E (Alanko) | 3:17 |
| F | Asuinrakennus F (Joensuu) | 0:00 |
| G | Asuinrakennus G (Heiniaho) | 5:45 |
| H | Asuinrakennus H (Mäkelä) | 0:00 |
| I | Lomarakennus I | 3:19 |
| J | Lomarakennus J (Hautakaarto) | 0:00 |
| K | Asuinrakennus K (Takalo) | 0:00 |
| L | Lomarakennus L (Haukijärvi) | 0:00 |
| M | Lomarakennus M (Haukilahti) | 0:00 |
| N | Lomarakennus N (Kuusela) | 0:00 |
| O | Lomarakennus O (Kuusela) | 0:00 |

Total amount of flickering on the shadow receptors caused by each WTG

| No. | Name | Expected [h/year] |
|---|---|---|
| 1 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (217) | 0:00 |
| 10 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (226) | 0:00 |
| 100 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (927) | 0:00 |
| 101 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (928) | 0:00 |
| 102 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (929) | 0:00 |
| 11 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (227) | 0:00 |
| 12 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (228) | 0:00 |

To be continued on next page...

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9.5.2023 19.45/3.5.584

# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| No. | Name | Expected [h/year] |
|---|---|---|
| 13 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (229) | 0:00 |
| 14 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (230) | 0:00 |
| 15 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (232) | 0:00 |
| 16 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (233) | 0:00 |
| 17 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (234) | 0:00 |
| 18 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (235) | 0:00 |
| 19 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (236) | 0:00 |
| 2 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (218) | 0:00 |
| 20 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (237) | 0:00 |
| 21 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (238) | 0:00 |
| 22 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (239) | 0:00 |
| 23 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (240) | 0:00 |
| 24 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (241) | 0:00 |
| 25 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (242) | 0:00 |
| 26 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (243) | 0:00 |
| 27 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (244) | 0:00 |
| 28 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (245) | 0:00 |
| 29 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (247) | 0:00 |
| 3 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (219) | 0:00 |
| 30 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (246) | 0:00 |
| 31 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (231) | 0:00 |
| 4 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (220) | 0:00 |
| 5 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (221) | 0:00 |
| 6 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (222) | 0:00 |
| 61 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (888) | 0:00 |
| 62 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (889) | 0:00 |
| 63 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (890) | 0:00 |
| 64 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (891) | 0:00 |
| 65 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (892) | 0:00 |
| 66 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (893) | 0:00 |
| 67 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (894) | 0:00 |
| 68 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (895) | 0:00 |
| 69 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (896) | 0:00 |
| 7 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (223) | 0:00 |
| 70 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (897) | 0:00 |
| 71 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (898) | 0:00 |
| 72 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (899) | 0:00 |
| 73 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (900) | 0:00 |
| 74 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (901) | 0:00 |
| 75 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (902) | 0:00 |
| 76 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (903) | 0:00 |
| 77 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (904) | 0:00 |
| 78 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (905) | 0:00 |
| 79 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (906) | 0:00 |
| 8 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (224) | 0:00 |
| 80 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (907) | 0:00 |
| 81 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (908) | 0:00 |
| 82 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (909) | 0:00 |
| 83 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (910) | 0:00 |
| 84 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (911) | 0:00 |
| 85 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (912) | 0:00 |
| 86 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (913) | 0:00 |
| 87 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (914) | 0:00 |
| 88 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (915) | 0:00 |
| 89 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (916) | 0:00 |
| 9 | VESTAS V172-7.2 7200 250.0 !O! hub: 225,0 m (TOT: 350,0 m) (225) | 0:00 |
| 90 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (917) | 0:00 |
| 91 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (918) | 0:00 |
| 92 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (919) | 0:00 |
| 93 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (920) | 0:00 |
| 94 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (921) | 0:00 |
| 95 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (922) | 0:00 |
| 96 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (923) | 0:00 |
| 97 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (924) | 0:00 |
| 98 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (925) | 0:00 |

To be continued on next page...

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# SHADOW - Main Result

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

...continued from previous page

| No. | Name | Expected [h/year] |
|---|---|---|
| 99 | NORDEX N149/4.0-4.5 4500 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (926) | 0:00 |
| T1 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (709) | 3:58 |
| T10 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (702) | 0:00 |
| T11 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (704) | 0:00 |
| T12 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (699) | 0:00 |
| T13 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (697) | 0:00 |
| T14 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (698) | 0:00 |
| T15 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (700) | 0:00 |
| T16 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (694) | 1:54 |
| T17 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (695) | 0:00 |
| T18 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (696) | 0:00 |
| T19 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (691) | 4:23 |
| T2 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (708) | 1:39 |
| T20 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (693) | 0:00 |
| T21 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (692) | 0:00 |
| T22 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (688) | 0:00 |
| T23 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (689) | 0:00 |
| T24 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (690) | 0:00 |
| T25 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (685) | 0:00 |
| T26 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (686) | 0:00 |
| T27 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (687) | 0:00 |
| T28 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (683) | 0:00 |
| T29 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (684) | 0:00 |
| T3 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (710) | 1:46 |
| T4 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (707) | 0:00 |
| T5 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (705) | 0:00 |
| T6 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (703) | 0:00 |
| T7 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (711) | 1:37 |
| T8 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (706) | 0:00 |
| T9 | Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (701) | 3:17 |

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** A - Lomarakennus A (Syvälahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | May | June | July | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | 04.44 | 03.00 | 02.37 | 04.10 | | 05.49 | 06.42 (T19) | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | | 21.37 | 23.21 | 23.55 | 22.24 | | 20.33 23 | 07.05 (T19) | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | 04.40 | 02.55 | 02.39 | 04.13 | | 05.52 | 06.42 (T19) | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | 20.05 | | 21.40 | 23.25 | 23.53 | 22.21 | | 20.29 23 | 07.05 (T19) | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | 04.37 | 02.52 | 02.42 | 04.17 | | 05.55 | 06.42 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | 20.08 | | 21.43 | 23.28 | 23.51 | 22.17 | | 20.26 22 | 07.04 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 06.54 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | | 05.58 | 06.41 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | 20.11 6 | 07.00 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | | 20.22 22 | 07.03 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 06.51 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | | 06.01 | 06.42 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | 20.14 12 | 07.03 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | | 20.18 20 | 07.02 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | 06.14 | 06.47 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | | 06.04 | 06.43 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | 20.17 17 | 07.04 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | | 20.15 17 | 07.00 (T19) | 18.26 | 15.38 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 06.46 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | | 06.07 | 06.46 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | 20.20 19 | 07.05 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | | 20.11 12 | 06.58 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 06.44 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | | 06.10 | 06.49 (T19) | 07.39 | 08.18 | 09.53 |
| | 14.34 | 16.17 | 17.48 | 20.23 22 | 07.06 (T19) | 22.00 | 23.42 | 23.39 | 21.59 | | 20.08 7 | 06.56 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 06.44 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | | 06.13 | | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 22 | 07.06 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | | 20.04 | | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 06.43 (T19) | 04.12 | 02.36 | 03.01 | 04.40 | | 06.16 | | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | 20.29 23 | 07.06 (T19) | 22.07 | 23.47 | 23.34 | 21.52 | | 20.00 | | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 06.43 (T19) | 04.09 | 02.34 | 03.01 | 04.43 | | 06.19 | | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 23 | 07.06 (T19) | 22.11 | 23.49 | 23.31 | 21.49 | | 19.57 | | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 06.42 (T19) | 04.05 | 02.32 | 03.04 | 04.47 | | 06.22 | | 07.51 | 08.32 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 24 | 07.06 (T19) | 22.14 | 23.51 | 23.29 | 21.45 | | 19.53 | | 18.05 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.42 | 05.49 | 06.42 (T19) | 04.02 | 02.30 | 03.07 | 04.50 | | 06.25 | | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | 20.39 24 | 07.06 (T19) | 22.17 | 23.53 | 23.26 | 21.42 | | 19.49 | | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 06.42 (T19) | 03.58 | 02.29 | 03.10 | 04.53 | | 06.28 | | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 22 | 07.04 (T19) | 22.21 | 23.55 | 23.23 | 21.38 | | 19.46 | | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 06.43 (T19) | 03.55 | 02.28 | 03.13 | 04.56 | | 06.31 | | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 21 | 07.04 (T19) | 22.24 | 23.57 | 23.20 | 21.35 | | 19.42 | | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 06.43 (T19) | 03.51 | 02.27 | 03.16 | 04.59 | | 06.34 | | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 19 | 07.02 (T19) | 22.28 | 23.58 | 23.17 | 21.31 | | 19.38 | | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 06.44 (T19) | 03.48 | 02.26 | 03.20 | 05.03 | | 06.37 | | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.51 17 | 07.01 (T19) | 22.31 | 23.59 | 23.14 | 21.27 | | 19.35 | | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 06.46 (T19) | 03.45 | 02.25 | 03.23 | 05.06 | | 06.40 | | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 13 | 06.59 (T19) | 22.35 | 00.00 | 23.11 | 21.24 | | 19.31 | | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 06.48 (T19) | 03.41 | 02.25 | 03.26 | 05.09 | | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | 20.58 8 | 06.56 (T19) | 22.38 | 00.01 | 23.07 | 21.20 | | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | | 03.31 | 02.25 | 03.36 | 05.19 | | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.04 | 18.31 | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | | 19.17 | | 17.29 | 14.49 | 14.05 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.10 | | 22.52 | 00.02 | 22.54 | 21.06 | | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.51 (T19) | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 9 | 07.00 (T19) | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 06.48 (T19) | 07.01 | | 07.32 | 09.15 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 14 | 07.02 (T19) | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 06.47 (T19) | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 17 | 07.04 (T19) | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 04.58 | | 03.15 | 02.30 | 03.53 | 05.34 | 06.46 (T19) | 07.06 | | 07.39 | 09.22 | 10.16 |
| | 15.35 | 17.20 | 18.46 | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 19 | 07.05 (T19) | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 06.45 (T19) | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 21 | 07.06 (T19) | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 06.43 (T19) | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 22 | 07.05 (T19) | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | | 03.06 | 02.35 | 04.03 | 05.43 | 06.42 (T19) | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.33 | | 23.15 | 23.56 | 22.31 | 20.40 23 | 07.05 (T19) | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.02 | | 06.36 | | | 03.03 | | 04.07 | 05.46 | 06.42 (T19) | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | | 23.18 | | 22.27 | 20.37 23 | 07.05 (T19) | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 453 | | 576 | 638 | 618 | 512 | | 394 | | 303 | 193 | 127 |
| Total, worst case | | | | 292 | | | | | 148 | | 146 | | | | |
| Sun reduction | | | | 0,43 | | | | | 0,42 | | 0,32 | | | | |
| Oper. time red. | | | | 0,99 | | | | | 0,99 | | 0,99 | | | | |
| Wind dir. red. | | | | 0,62 | | | | | 0,62 | | 0,62 | | | | |
| Total reduction | | | | 0,26 | | | | | 0,25 | | 0,19 | | | | |
| Total, real | | | | 76 | | | | | 37 | | 28 | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** B - Asuinrakennus B (Syväänlahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | | April | | May | June | July | August | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | | 06.33 | 07.17 (T19) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | | 20.01 | 23 07.40 (T19) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | | 06.29 | 07.17 (T19) | 04.40 | 02.55 | 02.39 | 04.13 | 05.52 | | 07.21 | 07.58 | 09.37 |
| | 14.20 | 15.56 | 17.29 | | 20.05 | 24 07.41 (T19) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | | 06.25 | 07.17 (T19) | 04.37 | 02.52 | 02.42 | 04.17 | 05.55 | 07.23 (T19) | 07.24 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.32 | | 20.08 | 23 07.40 (T19) | 21.43 | 23.28 | 23.51 | 22.17 | 20.26 | 3 07.26 (T19) | 18.37 | 15.48 | 14.22 |
| 4 | 10.09 | 08.50 | 07.14 | | 06.22 | 07.17 (T19) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.17 (T19) | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.36 | | 20.11 | 22 07.39 (T19) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 12 07.29 (T19) | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | | 06.18 | 07.17 (T19) | 04.30 | 02.47 | 02.47 | 04.23 | 06.01 | 07.15 (T19) | 07.30 | 08.08 | 09.46 |
| | 14.27 | 16.06 | 17.39 | | 20.14 | 21 07.38 (T19) | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 16 07.31 (T19) | 18.30 | 15.42 | 14.18 |
| 6 | 10.06 | 08.43 | 07.07 | | 06.14 | 07.18 (T19) | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.14 (T19) | 07.33 | 08.12 | 09.48 |
| | 14.29 | 16.10 | 17.42 | | 20.17 | 18 07.36 (T19) | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18 07.32 (T19) | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | | 06.11 | 07.19 (T19) | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.13 (T19) | 07.36 | 08.15 | 09.51 |
| | 14.32 | 16.13 | 17.45 | | 20.20 | 16 07.35 (T19) | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 20 07.33 (T19) | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | | 06.07 | 07.20 (T19) | 04.19 | 02.40 | 02.55 | 04.33 | 06.10 | 07.12 (T19) | 07.39 | 08.18 | 09.54 |
| | 14.34 | 16.17 | 17.48 | | 20.23 | 12 07.32 (T19) | 22.00 | 23.42 | 23.39 | 22.00 | 20.08 | 22 07.34 (T19) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | | 06.03 | 07.24 (T19) | 04.16 | 02.38 | 02.58 | 04.37 | 06.13 | 07.11 (T19) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | | 20.26 | 4 07.28 (T19) | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 23 07.34 (T19) | 18.15 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.52 | | 06.00 | | 04.12 | 02.36 | 03.01 | 04.40 | 06.16 | 07.10 (T19) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.54 | | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 23 07.33 (T19) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | | 05.56 | | 04.09 | 02.34 | 03.01 | 04.43 | 06.19 | 07.09 (T19) | 07.48 | 08.29 | 10.00 |
| | 14.43 | 16.27 | 17.57 | | 20.32 | | 22.11 | 23.49 | 23.31 | 21.49 | 19.57 | 24 07.33 (T19) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | | 05.53 | | 04.05 | 02.32 | 03.04 | 04.47 | 06.22 | 07.09 (T19) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | | 20.36 | | 22.14 | 23.51 | 23.29 | 21.45 | 19.53 | 23 07.32 (T19) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.10 (T19) | 07.55 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.04 | | 20.39 | | 22.18 | 23.53 | 23.26 | 21.42 | 19.49 | 22 07.32 (T19) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.10 (T19) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 21 07.31 (T19) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | | 05.42 | | 03.55 | 02.28 | 03.13 | 04.56 | 06.31 | 07.11 (T19) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 19 07.30 (T19) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | | 05.38 | | 03.51 | 02.27 | 03.16 | 04.59 | 06.34 | 07.12 (T19) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | | 20.48 | | 22.28 | 23.58 | 23.17 | 21.31 | 19.38 | 16 07.28 (T19) | 17.50 | 15.07 | 14.05 |
| 17 | 09.43 | 08.06 | 06.27 | | 05.34 | | 03.48 | 02.26 | 03.20 | 05.03 | 06.37 | 07.14 (T19) | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 11 07.25 (T19) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | | 05.31 | | 03.45 | 02.25 | 03.23 | 05.06 | 06.40 | 07.17 (T19) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 4 07.21 (T19) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | | 08.13 | 08.56 | 10.13 |
| | 15.08 | 16.54 | 18.22 | | 20.58 | | 22.38 | 00.01 | 23.07 | 21.20 | 19.27 | | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | | 05.24 | | 03.38 | 02.25 | 03.30 | 05.12 | 06.46 | | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | | 05.20 | | 03.35 | 02.25 | 03.33 | 05.15 | 06.49 | | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | | 21.04 | | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | | 05.16 | | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | | 21.07 | | 22.48 | 00.03 | 22.58 | 21.09 | 19.17 | | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | | 05.13 | | 03.28 | 02.26 | 03.40 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | | 21.10 | | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.47 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | | 05.09 | | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | | 21.14 | | 22.55 | 00.02 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | | 05.05 | | 03.22 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | | 21.17 | | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.07 |
| 26 | 09.18 | 07.35 | 05.54 | 06.27 (T19) | 05.02 | | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 10 06.37 (T19) | 21.20 | | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.39 | 14.08 |
| 27 | 09.15 | 07.31 | 05.51 | 06.23 (T19) | 04.58 | | 03.15 | 02.30 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 15 06.38 (T19) | 21.24 | | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.21 (T19) | 04.55 | | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 19 06.40 (T19) | 21.27 | | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.09 | 14.34 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.20 (T19) | 04.51 | | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 20 07.40 (T19) | 21.30 | | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.12 |
| 30 | 09.06 | | 06.40 | 07.18 (T19) | 04.48 | | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.48 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 22 07.40 (T19) | 21.33 | | 23.15 | 23.56 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.18 (T19) | | | 03.03 | | 04.07 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 23 07.41 (T19) | | | 23.18 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | | 453 | | 576 | 638 | 618 | 512 | 394 | | 303 | 193 | 127 |
| Total, worst case | | | | 109 | | 163 | | | | | | 277 | | | |
| Sun reduction | | | | 0,36 | | 0,43 | | | | | | 0,32 | | | |
| Oper. time red. | | | | 0,99 | | 0,99 | | | | | | 0,99 | | | |
| Wind dir. red. | | | | 0,62 | | 0,62 | | | | | | 0,62 | | | |
| Total reduction | | | | 0,22 | | 0,26 | | | | | | 0,20 | | | |
| Total, real | | | | 24 | | 43 | | | | | | 55 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** C - Lomarakennus C (Mutalahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 07.32 (T16) | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.01 | 20 07.52 (T16) | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 07.33 (T16) | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 18 07.51 (T16) | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 07.34 (T16) | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 15 07.49 (T16) | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 07.35 (T16) | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 11 07.46 (T16) | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | 04.30 | 02.47 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.31 (T16) | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | 22.00 | 23.42 | 23.40 | 22.00 | 20.08 | 10 07.41 (T16) | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | | 04.16 | 02.37 | 02.58 | 04.37 | 06.13 | 07.28 (T16) | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 15 07.43 (T16) | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.25 (T16) | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | 22.07 | 23.47 | 23.34 | 21.52 | 20.00 | 18 07.43 (T16) | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.24 (T16) | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 20 07.44 (T16) | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | 04.05 | 02.32 | 03.04 | 04.46 | 06.22 | 07.23 (T16) | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 22 07.45 (T16) | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.23 (T16) | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 22 07.45 (T16) | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.22 (T16) | 07.58 | 08.39 | 10.06 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 23 07.45 (T16) | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 07.22 (T16) | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | 22.24 | 23.57 | 23.20 | 21.35 | 19.42 | 23 07.45 (T16) | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 07.22 (T16) | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 22 07.44 (T16) | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 07.21 (T16) | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 22 07.43 (T16) | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 07.21 (T16) | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 21 07.42 (T16) | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | | 03.41 | 02.25 | 03.26 | 05.09 | 06.43 | 07.22 (T16) | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 19 07.41 (T16) | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 07.23 (T16) | 08.16 | 08.59 | 10.14 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 16 07.39 (T16) | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 07.26 (T16) | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 11 07.37 (T16) | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 06.41 (T16) | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 07.29 (T16) | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 10 06.51 (T16) | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 5 07.34 (T16) | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 06.38 (T16) | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 15 06.53 (T16) | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 06.35 (T16) | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 19 06.54 (T16) | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 06.33 (T16) | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21 06.54 (T16) | 21.17 | 22.59 | 00.02 | 22.48 | 20.58 | 19.06 | | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 06.33 (T16) | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 22 06.55 (T16) | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 06.32 (T16) | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 23 06.55 (T16) | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.58 | | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 06.31 (T16) | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 23 06.54 (T16) | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 07.31 (T16) | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 24 07.55 (T16) | 21.30 | 23.12 | 23.58 | 22.34 | 20.44 | 18.51 | | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 07.31 (T16) | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 23 07.54 (T16) | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | 07.32 (T16) | | 03.03 | | 04.06 | 05.46 | | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | 21 07.53 (T16) | | 23.19 | | 22.28 | 20.37 | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 638 | 618 | 512 | 394 | 303 | 193 | 127 |
| Total, worst case | | | 201 | 64 | | | | | 269 | | | |
| Sun reduction | | | 0,36 | 0,43 | | | | | 0,32 | | | |
| Oper. time red. | | | 0,99 | 0,99 | | | | | 0,99 | | | |
| Wind dir. red. | | | 0,62 | 0,62 | | | | | 0,62 | | | |
| Total reduction | | | 0,22 | 0,26 | | | | | 0,20 | | | |
| Total, real | | | 44 | 17 | | | | | 53 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** D - Lomarakennus D (Mutaniemi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | 04.44 | 03.00 | 02.37 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.03 | 08.37 | 06.59 | 06.07 | 04.19 | 02.39 | 02.55 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.33 | 06.56 | 06.03 | 04.16 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.58 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.34 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.09 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.32 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.35 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.29 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.45 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.26 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.31 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 07.59 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.31 | 02.25 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.50 | 05.31 | 07.03 | 07.35 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.35 | 04.03 | 05.43 | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.14 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** E - Asuinrakennus E (Alanko)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | | | May | | | June | July | | | August | | | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.24 | 06.33 | | | 04.44 | | 05.28 (T9) | 03.00 | 02.37 | | | 04.10 | | 05.41 (T9) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | | | 21.37 | 22 | 05.50 (T9) | 23.22 | 23.55 | | | 22.24 | 16 | 05.57 (T9) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | | | 04.40 | | 05.28 (T9) | 02.54 | 02.39 | | | 04.13 | | 05.39 (T9) | 05.52 | 07.21 | 07.58 | 09.37 |
| | 14.19 | 15.56 | 17.29 | 20.05 | | | 21.40 | 23 | 05.51 (T9) | 23.25 | 23.53 | | | 22.21 | 19 | 05.58 (T9) | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | | | 04.37 | | 05.27 (T9) | 02.52 | 02.41 | | | 04.17 | | 05.38 (T9) | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | | | 21.44 | 24 | 05.51 (T9) | 23.28 | 23.51 | | | 22.17 | 21 | 05.59 (T9) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | | | 04.33 | | 05.27 (T9) | 02.49 | 02.44 | | | 04.20 | | 05.38 (T9) | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | | | 21.47 | 24 | 05.51 (T9) | 23.31 | 23.49 | | | 22.14 | 21 | 05.59 (T9) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | | | 04.30 | | 05.27 (T9) | 02.46 | 02.46 | | | 04.23 | | 05.38 (T9) | 06.01 | 07.30 | 08.08 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | | | 21.50 | 24 | 05.51 (T9) | 23.34 | 23.47 | | | 22.10 | 22 | 06.00 (T9) | 20.18 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | | | 04.26 | | 05.27 (T9) | 02.44 | 02.49 | | | 04.27 | | 05.36 (T9) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | | | 21.54 | 24 | 05.51 (T9) | 23.37 | 23.45 | | | 22.07 | 24 | 06.00 (T9) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | | | 04.23 | | 05.28 (T9) | 02.42 | 02.52 | | | 04.30 | | 05.36 (T9) | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | | | 21.57 | 22 | 05.50 (T9) | 23.40 | 23.42 | | | 22.03 | 24 | 06.00 (T9) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | | | 04.19 | | 05.28 (T9) | 02.39 | 02.54 | | | 04.33 | | 05.36 (T9) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | | | 22.01 | 22 | 05.50 (T9) | 23.42 | 23.40 | | | 22.00 | 24 | 06.00 (T9) | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | | | 04.15 | | 05.28 (T9) | 02.37 | 02.57 | | | 04.37 | | 05.36 (T9) | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | | | 22.04 | 21 | 05.49 (T9) | 23.45 | 23.37 | | | 21.56 | 24 | 06.00 (T9) | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | | | 04.12 | | 05.29 (T9) | 02.35 | 03.00 | | | 04.40 | | 05.36 (T9) | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | | | 22.07 | 19 | 05.48 (T9) | 23.47 | 23.35 | | | 21.53 | 24 | 06.00 (T9) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | | | 04.08 | | 05.29 (T9) | 02.33 | 03.00 | | | 04.43 | | 05.36 (T9) | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | | | 22.11 | 18 | 05.47 (T9) | 23.50 | 23.32 | | | 21.49 | 23 | 05.59 (T9) | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | | | 04.05 | | 05.30 (T9) | 02.31 | 03.03 | | | 04.46 | | 05.36 (T9) | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | | | 22.14 | 16 | 05.46 (T9) | 23.52 | 23.29 | | | 21.45 | 22 | 05.58 (T9) | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | | | 04.02 | | 05.31 (T9) | 02.30 | 03.07 | | | 04.50 | | 05.37 (T9) | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.03 | 20.39 | | | 22.18 | 13 | 05.44 (T9) | 23.54 | 23.26 | | | 21.42 | 21 | 05.58 (T9) | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | | | 03.58 | | 05.33 (T9) | 02.29 | 03.10 | | | 04.53 | | 05.38 (T9) | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | | | 22.21 | 9 | 05.42 (T9) | 23.56 | 23.23 | | | 21.38 | 19 | 05.57 (T9) | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | | | 03.55 | | | 02.27 | 03.13 | | | 04.56 | | 05.41 (T9) | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | | | 22.25 | | | 23.57 | 23.20 | | | 21.35 | 15 | 05.56 (T9) | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | | | 03.51 | | | 02.26 | 03.16 | | | 04.59 | | 05.44 (T9) | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | | | 22.28 | | | 23.59 | 23.17 | | | 21.31 | 11 | 05.55 (T9) | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | | | 03.48 | | | 02.25 | 03.19 | | | 05.03 | | 05.46 (T9) | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | | | 22.31 | | | 00.00 | 23.14 | | | 21.27 | 6 | 05.52 (T9) | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | | | 03.44 | | | 02.25 | 03.23 | | | 05.06 | | | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | | | 22.35 | | | 00.01 | 23.11 | | | 21.24 | | | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | | | 03.41 | | | 02.24 | 03.26 | | | 05.09 | | | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | | | 22.38 | | | 00.02 | 23.08 | | | 21.20 | | | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | | | 03.38 | | | 02.24 | 03.29 | | | 05.12 | | | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | | | 22.42 | | | 00.03 | 23.05 | | | 21.17 | | | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | | | 03.34 | | | 02.24 | 03.33 | | | 05.15 | | | 06.49 | 08.19 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | | | 22.45 | | | 00.03 | 23.01 | | | 21.13 | | | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | | | 03.31 | | | 02.25 | 03.36 | | | 05.18 | | | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | | | 22.49 | | | 00.03 | 22.58 | | | 21.09 | | | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | | | 03.28 | | | 02.25 | 03.39 | | | 05.22 | | | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | | | 22.52 | | | 00.03 | 22.55 | | | 21.06 | | | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | | | 03.25 | | | 02.26 | 03.43 | | | 05.25 | | | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | | | 22.55 | | | 00.03 | 22.51 | | | 21.02 | | | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | | | 03.21 | | | 02.27 | 03.46 | | | 05.28 | | | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | | | 22.59 | | | 00.02 | 22.48 | | | 20.59 | | | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | | 05.39 (T9) | 03.18 | | | 02.28 | 03.49 | | | 05.31 | | | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 7 | 05.46 (T9) | 23.02 | | | 00.02 | 22.45 | | | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | | 05.36 (T9) | 03.15 | | | 02.29 | 03.53 | | | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 12 | 05.48 (T9) | 23.06 | | | 00.01 | 22.41 | | | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | | 05.33 (T9) | 03.12 | | | 02.31 | 03.56 | | | 05.37 | | | 07.09 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 16 | 05.49 (T9) | 23.09 | | | 00.00 | 22.38 | | | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | | 05.29 (T9) | 03.09 | | | 02.33 | 04.00 | | 05.45 (T9) | 05.40 | | | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 20 | 05.49 (T9) | 23.12 | | | 23.58 | 22.35 | 6 | 05.51 (T9) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | | 05.28 (T9) | 03.06 | | | 02.34 | 04.03 | | 05.43 (T9) | 05.43 | | | 07.15 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 22 | 05.50 (T9) | 23.15 | | | 23.57 | 22.31 | 11 | 05.54 (T9) | 20.40 | | | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | | | 03.03 | | | | 04.06 | | 05.42 (T9) | 05.46 | | | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | | | 23.19 | | | | 22.28 | 14 | 05.56 (T9) | 20.37 | | | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | | | 577 | | | 639 | 618 | | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | | | 77 | | | 281 | | | | 31 | | | 336 | | | | | | |
| Sun reduction | | | | 0,43 | | | 0,47 | | | | 0,48 | | | 0,42 | | | | | | |
| Oper. time red. | | | | 0,99 | | | 0,99 | | | | 0,99 | | | 0,99 | | | | | | |
| Wind dir. red. | | | | 0,62 | | | 0,62 | | | | 0,62 | | | 0,62 | | | | | | |
| Total reduction | | | | 0,26 | | | 0,29 | | | | 0,29 | | | 0,26 | | | | | | |
| Total, real | | | | 20 | | | 82 | | | | 9 | | | 86 | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| | | | | |
|---|---|---|---|---|
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** F - Asuinrakennus F (Joensuu)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.24 | 06.33 | 04.44 | 03.00 | 02.36 | 04.10 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.40 | 02.54 | 02.39 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.29 | 18.40 | 15.52 | 14.24 |
| 3 | 10.11 | 08.53 | 07.17 | 06.25 | 04.37 | 02.52 | 02.41 | 04.17 | 05.55 | 07.24 | 08.02 | 09.40 |
| | 14.22 | 15.59 | 17.32 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.49 | 02.44 | 04.20 | 05.58 | 07.27 | 08.05 | 09.43 |
| | 14.24 | 16.03 | 17.35 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.08 | 08.47 | 07.10 | 06.18 | 04.30 | 02.46 | 02.46 | 04.23 | 06.01 | 07.30 | 08.09 | 09.46 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.18 |
| 6 | 10.07 | 08.43 | 07.07 | 06.14 | 04.26 | 02.44 | 02.49 | 04.27 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.29 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.45 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.42 | 02.52 | 04.30 | 06.07 | 07.36 | 08.15 | 09.51 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.57 | 23.40 | 23.42 | 22.03 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.19 | 02.39 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.13 |
| 9 | 10.01 | 08.34 | 06.56 | 06.03 | 04.15 | 02.37 | 02.57 | 04.37 | 06.13 | 07.42 | 08.22 | 09.56 |
| | 14.37 | 16.20 | 17.51 | 20.26 | 22.04 | 23.45 | 23.37 | 21.56 | 20.04 | 18.15 | 15.29 | 14.11 |
| 10 | 09.59 | 08.30 | 06.52 | 06.00 | 04.12 | 02.35 | 03.00 | 04.40 | 06.16 | 07.45 | 08.25 | 09.59 |
| | 14.40 | 16.23 | 17.54 | 20.29 | 22.07 | 23.47 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 09.57 | 08.27 | 06.49 | 05.56 | 04.08 | 02.33 | 03.00 | 04.43 | 06.19 | 07.48 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.11 | 23.50 | 23.32 | 21.49 | 19.57 | 18.08 | 15.22 | 14.09 |
| 12 | 09.55 | 08.23 | 06.45 | 05.53 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.51 | 08.32 | 10.03 |
| | 14.46 | 16.30 | 18.00 | 20.36 | 22.14 | 23.52 | 23.29 | 21.45 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.30 | 03.07 | 04.50 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.54 | 23.26 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.50 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.10 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.52 | 16.37 | 18.07 | 20.42 | 22.21 | 23.56 | 23.23 | 21.38 | 19.46 | 17.57 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.34 | 05.42 | 03.55 | 02.27 | 03.13 | 04.56 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.05 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.26 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.28 | 23.59 | 23.17 | 21.31 | 19.38 | 17.50 | 15.07 | 14.04 |
| 17 | 09.43 | 08.06 | 06.27 | 05.34 | 03.48 | 02.25 | 03.19 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.01 | 16.47 | 18.16 | 20.51 | 22.32 | 00.00 | 23.14 | 21.27 | 19.35 | 17.47 | 15.04 | 14.04 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.44 | 02.25 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.13 |
| | 15.05 | 16.50 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.43 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.24 | 03.26 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.54 | 18.22 | 20.58 | 22.38 | 00.02 | 23.08 | 21.20 | 19.27 | 17.40 | 14.58 | 14.03 |
| 20 | 09.35 | 07.56 | 06.16 | 05.23 | 03.38 | 02.24 | 03.29 | 05.12 | 06.46 | 08.16 | 08.59 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.03 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.34 | 02.24 | 03.33 | 05.15 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.20 | 17.33 | 14.52 | 14.04 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.24 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.18 | 17.03 | 18.31 | 21.07 | 22.49 | 00.03 | 22.58 | 21.09 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.13 | 03.28 | 02.25 | 03.39 | 05.22 | 06.55 | 08.26 | 09.09 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.05 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.26 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.03 | 22.51 | 21.02 | 19.09 | 17.22 | 14.44 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.27 | 03.46 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.28 | 03.49 | 05.31 | 07.03 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.02 | 00.02 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.29 | 03.53 | 05.34 | 07.06 | 07.39 | 09.22 | 10.17 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.01 | 22.41 | 20.51 | 18.58 | 16.12 | 14.36 | 14.09 |
| 28 | 09.12 | 07.28 | 05.47 | 04.55 | 03.12 | 02.31 | 03.56 | 05.37 | 07.09 | 07.42 | 09.25 | 10.17 |
| | 15.39 | 17.23 | 18.49 | 21.27 | 23.09 | 00.00 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.10 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.09 | 02.33 | 04.00 | 05.40 | 07.12 | 07.45 | 09.28 | 10.16 |
| | 15.42 | | 19.52 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.06 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.55 | 21.34 | 23.15 | 23.57 | 22.31 | 20.40 | 18.48 | 16.02 | 14.29 | 14.13 |
| 31 | 09.03 | | 06.36 | | 03.03 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.58 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.15 |
| Potential sun hours | 164 | 235 | 363 | 454 | 577 | 639 | 618 | 513 | 394 | 303 | 193 | 127 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | | April | | May | | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | | 06.33 | 07.49 (T3) | 04.44 | 05.23 (T1) | 03.00 |
| | 14.17 | 15.52 | 17.26 | | 20.02 | 6 07.55 (T3) | 21.37 | 8 05.31 (T1) | 23.22 |
| 2 | 10.13 | 08.57 | 07.21 | | 06.29 | | 04.40 | 05.20 (T1) | 02.54 |
| | 14.19 | 15.56 | 17.29 | | 20.05 | | 21.40 | 13 05.33 (T1) | 23.25 |
| 3 | 10.12 | 08.53 | 07.17 | | 06.25 | | 04.37 | 05.18 (T1) | 02.51 |
| | 14.21 | 15.59 | 17.32 | | 20.08 | | 21.44 | 16 05.34 (T1) | 23.29 |
| 4 | 10.10 | 08.50 | 07.14 | | 06.22 | | 04.33 | 05.17 (T1) | 02.48 |
| | 14.23 | 16.03 | 17.35 | | 20.11 | | 21.47 | 18 05.35 (T1) | 23.32 |
| 5 | 10.09 | 08.47 | 07.10 | | 06.18 | | 04.29 | 05.15 (T1) | 02.46 |
| | 14.26 | 16.06 | 17.39 | | 20.14 | | 21.51 | 20 05.35 (T1) | 23.35 |
| 6 | 10.07 | 08.44 | 07.07 | | 06.14 | | 04.26 | 05.14 (T1) | 02.43 |
| | 14.28 | 16.10 | 17.42 | | 20.17 | | 21.54 | 22 05.36 (T1) | 23.37 |
| 7 | 10.05 | 08.40 | 07.03 | | 06.11 | | 04.22 | 05.14 (T1) | 02.41 |
| | 14.31 | 16.13 | 17.45 | | 20.20 | | 21.57 | 22 05.36 (T1) | 23.40 |
| 8 | 10.04 | 08.37 | 07.00 | | 06.07 | | 04.19 | 05.13 (T1) | 02.39 |
| | 14.34 | 16.16 | 17.48 | | 20.23 | | 22.01 | 23 05.36 (T1) | 23.43 |
| 9 | 10.02 | 08.34 | 06.56 | | 06.03 | | 04.15 | 05.14 (T1) | 02.37 |
| | 14.37 | 16.20 | 17.51 | | 20.26 | | 22.04 | 24 05.38 (T1) | 23.45 |
| 10 | 10.00 | 08.30 | 06.52 | | 06.00 | | 04.12 | 05.14 (T1) | 02.34 |
| | 14.39 | 16.23 | 17.54 | | 20.29 | | 22.08 | 24 05.38 (T1) | 23.48 |
| 11 | 09.58 | 08.27 | 06.49 | | 05.56 | | 04.08 | 05.13 (T1) | 02.33 |
| | 14.42 | 16.27 | 17.57 | | 20.33 | | 22.11 | 24 05.37 (T1) | 23.50 |
| 12 | 09.55 | 08.24 | 06.45 | | 05.52 | | 04.05 | 05.13 (T1) | 02.31 |
| | 14.45 | 16.30 | 18.00 | | 20.36 | | 22.15 | 24 05.37 (T1) | 23.52 |
| 13 | 09.53 | 08.20 | 06.42 | | 05.49 | | 04.01 | 05.13 (T1) | 02.29 |
| | 14.48 | 16.33 | 18.04 | | 20.39 | | 22.18 | 24 05.37 (T1) | 23.54 |
| 14 | 09.51 | 08.17 | 06.38 | | 05.45 | | 03.58 | 05.13 (T1) | 02.28 |
| | 14.52 | 16.37 | 18.07 | | 20.42 | | 22.21 | 23 05.36 (T1) | 23.56 |
| 15 | 09.48 | 08.13 | 06.34 | | 05.42 | | 03.54 | 05.15 (T1) | 02.27 |
| | 14.55 | 16.40 | 18.10 | | 20.45 | | 22.25 | 22 05.37 (T1) | 23.58 |
| 16 | 09.46 | 08.10 | 06.31 | | 05.38 | | 03.51 | 05.15 (T1) | 02.26 |
| | 14.58 | 16.44 | 18.13 | | 20.48 | | 22.28 | 21 05.36 (T1) | 23.59 |
| 17 | 09.43 | 08.07 | 06.27 | | 05.34 | | 03.48 | 05.15 (T1) | 02.25 |
| | 15.01 | 16.47 | 18.16 | | 20.51 | | 22.32 | 20 05.35 (T1) | 00.01 |
| 18 | 09.41 | 08.03 | 06.24 | 06.56 (T3) | 05.31 | | 03.44 | 05.16 (T1) | 02.24 |
| | 15.04 | 16.50 | 18.19 | 3 06.59 (T3) | 20.55 | | 22.35 | 19 05.35 (T1) | 00.02 |
| 19 | 09.38 | 08.00 | 06.20 | 06.52 (T3) | 05.27 | | 03.41 | 05.17 (T1) | 02.24 |
| | 15.08 | 16.54 | 18.22 | 10 07.02 (T3) | 20.58 | | 22.39 | 16 05.33 (T1) | 00.03 |
| 20 | 09.35 | 07.56 | 06.16 | 06.49 (T3) | 05.23 | | 03.37 | 05.18 (T1) | 02.23 |
| | 15.11 | 16.57 | 18.25 | 15 07.04 (T3) | 21.01 | | 22.42 | 15 05.33 (T1) | 00.03 |
| 21 | 09.33 | 07.53 | 06.13 | 06.46 (T3) | 05.20 | | 03.34 | 05.19 (T1) | 02.24 |
| | 15.14 | 17.00 | 18.28 | 19 07.05 (T3) | 21.04 | | 22.46 | 12 05.31 (T1) | 00.04 |
| 22 | 09.30 | 07.49 | 06.09 | 06.44 (T3) | 05.16 | | 03.31 | 05.21 (T1) | 02.24 |
| | 15.18 | 17.03 | 18.31 | 21 07.05 (T3) | 21.08 | | 22.49 | 8 05.29 (T1) | 00.04 |
| 23 | 09.27 | 07.46 | 06.05 | 06.44 (T3) | 05.12 | | 03.27 | | 02.24 |
| | 15.21 | 17.07 | 18.34 | 22 07.06 (T3) | 21.11 | | 22.52 | | 00.04 |
| 24 | 09.24 | 07.42 | 06.02 | 06.43 (T3) | 05.09 | | 03.24 | | 02.25 |
| | 15.25 | 17.10 | 18.37 | 23 07.06 (T3) | 21.14 | | 22.56 | | 00.04 |
| 25 | 09.21 | 07.39 | 05.58 | 06.42 (T3) | 05.05 | | 03.21 | | 02.26 |
| | 15.28 | 17.13 | 18.40 | 23 07.05 (T3) | 21.17 | | 22.59 | | 00.03 |
| 26 | 09.18 | 07.35 | 05.54 | 06.43 (T3) | 05.02 | | 03.18 | | 02.27 |
| | 15.31 | 17.16 | 18.43 | 22 07.05 (T3) | 21.21 | | 23.03 | | 00.02 |
| 27 | 09.15 | 07.32 | 05.51 | 06.42 (T3) | 04.58 | | 03.15 | | 02.29 |
| | 15.35 | 17.20 | 18.46 | 22 07.04 (T3) | 21.24 | | 23.06 | | 00.01 |
| 28 | 09.12 | 07.28 | 05.47 | 06.43 (T3) | 04.54 | | 03.12 | | 02.30 |
| | 15.38 | 17.23 | 18.49 | 21 07.04 (T3) | 21.27 | | 23.09 | | 00.00 |
| 29 | 09.09 | | 06.44 | 07.44 (T3) | 04.51 | | 03.08 | | 02.32 |
| | 15.42 | | 19.52 | 18 08.02 (T3) | 21.30 | | 23.13 | | 23.59 |
| 30 | 09.06 | | 06.40 | 07.44 (T3) | 04.47 | | 03.05 | | 02.34 |
| | 15.45 | | 19.55 | 16 08.00 (T3) | 21.34 | | 23.16 | | 23.57 |
| 31 | 09.03 | | 06.36 | 07.46 (T3) | | | 03.02 | | |
| | 15.49 | | 19.59 | 13 07.59 (T3) | | | 23.19 | | |
| Potential sun hours | 163 | 235 | 363 | | 454 | | 577 | | 639 |
| Total, worst case | | | | 248 | | 6 | | 418 | |
| Sun reduction | | | | 0,36 | | 0,43 | | 0,47 | |
| Oper. time red. | | | | 0,99 | | 0,99 | | 0,99 | |
| Wind dir. red. | | | | 0,62 | | 0,62 | | 0,63 | |
| Total reduction | | | | 0,22 | | 0,26 | | 0,29 | |
| Total, real | | | | 54 | | 2 | | 122 | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** G - Asuinrakennus G (Heiniaho)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | October | November | December |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.36 | | 04.10 | | 05.23 (T1) | 05.49 | 07.18 | 07.55 | 09.35 |
| | 23.56 | | 22.25 | 24 | 05.47 (T1) | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 02.38 | | 04.13 | | 05.23 (T1) | 05.52 | 07.21 | 07.59 | 09.38 |
| | 23.54 | | 22.21 | 24 | 05.47 (T1) | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 02.40 | | 04.16 | | 05.24 (T1) | 05.55 | 07.24 | 08.02 | 09.41 |
| | 23.52 | | 22.18 | 23 | 05.47 (T1) | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 02.43 | | 04.20 | | 05.24 (T1) | 05.58 | 07.27 | 08.05 | 09.44 |
| | 23.50 | | 22.14 | 23 | 05.47 (T1) | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 02.46 | | 04.23 | | 05.23 (T1) | 06.01 | 07.30 | 08.09 | 09.46 |
| | 23.48 | | 22.11 | 23 | 05.46 (T1) | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 02.48 | | 04.26 | | 05.24 (T1) | 06.04 | 07.33 | 08.12 | 09.49 |
| | 23.45 | | 22.07 | 22 | 05.46 (T1) | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 02.51 | | 04.30 | | 05.24 (T1) | 06.07 | 07.36 | 08.15 | 09.52 |
| | 23.43 | | 22.03 | 22 | 05.46 (T1) | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 02.54 | | 04.33 | | 05.25 (T1) | 06.10 | 07.39 | 08.19 | 09.54 |
| | 23.40 | | 22.00 | 20 | 05.45 (T1) | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 02.57 | | 04.36 | | 05.26 (T1) | 06.13 | 07.42 | 08.22 | 09.57 |
| | 23.38 | | 21.56 | 18 | 05.44 (T1) | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 03.00 | | 04.40 | | 05.27 (T1) | 06.16 | 07.45 | 08.26 | 09.59 |
| | 23.35 | | 21.53 | 16 | 05.43 (T1) | 20.00 | 18.12 | 15.25 | 14.10 |
| 11 | 03.00 | | 04.43 | | 05.29 (T1) | 06.19 07.42 (T3) | 07.48 | 08.29 | 10.01 |
| | 23.32 | | 21.49 | 12 | 05.41 (T1) | 19.57 4 07.46 (T3) | 18.08 | 15.22 | 14.08 |
| 12 | 03.03 | | 04.46 | | 05.32 (T1) | 06.22 07.38 (T3) | 07.52 | 08.32 | 10.03 |
| | 23.29 | | 21.46 | 6 | 05.38 (T1) | 19.53 12 07.50 (T3) | 18.04 | 15.19 | 14.07 |
| 13 | 03.06 | | 04.49 | | | 06.25 07.36 (T3) | 07.55 | 08.36 | 10.05 |
| | 23.27 | | 21.42 | | | 19.49 16 07.52 (T3) | 18.01 | 15.16 | 14.06 |
| 14 | 03.09 | | 04.53 | | | 06.28 07.34 (T3) | 07.58 | 08.39 | 10.07 |
| | 23.24 | | 21.38 | | | 19.46 19 07.53 (T3) | 17.57 | 15.13 | 14.05 |
| 15 | 03.12 | | 04.56 | | | 06.31 07.33 (T3) | 08.01 | 08.43 | 10.09 |
| | 23.21 | | 21.35 | | | 19.42 21 07.54 (T3) | 17.54 | 15.09 | 14.04 |
| 16 | 03.16 | | 04.59 | | | 06.34 07.32 (T3) | 08.04 | 08.46 | 10.10 |
| | 23.18 | | 21.31 | | | 19.38 22 07.54 (T3) | 17.50 | 15.06 | 14.04 |
| 17 | 03.19 | | 05.02 | | | 06.37 07.31 (T3) | 08.07 | 08.49 | 10.12 |
| | 23.14 | | 21.28 | | | 19.35 22 07.53 (T3) | 17.47 | 15.03 | 14.03 |
| 18 | 03.22 | | 05.06 | | | 06.40 07.30 (T3) | 08.10 | 08.53 | 10.13 |
| | 23.11 | | 21.24 | | | 19.31 23 07.53 (T3) | 17.43 | 15.00 | 14.03 |
| 19 | 03.26 | | 05.09 | | | 06.43 07.30 (T3) | 08.13 | 08.56 | 10.14 |
| | 23.08 | | 21.20 | | | 19.28 23 07.53 (T3) | 17.40 | 14.58 | 14.03 |
| 20 | 03.29 | | 05.12 | | | 06.46 07.30 (T3) | 08.16 | 08.59 | 10.15 |
| | 23.05 | | 21.17 | | | 19.24 22 07.52 (T3) | 17.36 | 14.55 | 14.03 |
| 21 | 03.32 | 05.32 (T1) | 05.15 | | | 06.49 07.30 (T3) | 08.20 | 09.03 | 10.16 |
| | 23.02 | 5 05.37 (T1) | 21.13 | | | 19.20 21 07.51 (T3) | 17.33 | 14.52 | 14.03 |
| 22 | 03.36 | 05.30 (T1) | 05.18 | | | 06.52 07.31 (T3) | 08.23 | 09.06 | 10.17 |
| | 22.58 | 10 05.40 (T1) | 21.10 | | | 19.17 19 07.50 (T3) | 17.29 | 14.49 | 14.04 |
| 23 | 03.39 | 05.28 (T1) | 05.21 | | | 06.55 07.32 (T3) | 08.26 | 09.09 | 10.17 |
| | 22.55 | 13 05.41 (T1) | 21.06 | | | 19.13 17 07.49 (T3) | 17.26 | 14.46 | 14.04 |
| 24 | 03.42 | 05.28 (T1) | 05.25 | | | 06.58 07.35 (T3) | 08.29 | 09.13 | 10.17 |
| | 22.52 | 15 05.43 (T1) | 21.02 | | | 19.09 12 07.47 (T3) | 17.22 | 14.43 | 14.05 |
| 25 | 03.46 | 05.27 (T1) | 05.28 | | | 07.01 07.38 (T3) | 07.32 | 09.16 | 10.17 |
| | 22.48 | 18 05.45 (T1) | 20.59 | | | 19.06 6 07.44 (T3) | 16.19 | 14.41 | 14.06 |
| 26 | 03.49 | 05.26 (T1) | 05.31 | | | 07.04 | 07.36 | 09.19 | 10.17 |
| | 22.45 | 19 05.45 (T1) | 20.55 | | | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 03.53 | 05.26 (T1) | 05.34 | | | 07.06 | 07.39 | 09.22 | 10.17 |
| | 22.42 | 20 05.46 (T1) | 20.51 | | | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 03.56 | 05.25 (T1) | 05.37 | | | 07.09 | 07.42 | 09.26 | 10.17 |
| | 22.38 | 22 05.47 (T1) | 20.48 | | | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 03.59 | 05.24 (T1) | 05.40 | | | 07.12 | 07.45 | 09.29 | 10.16 |
| | 22.35 | 23 05.47 (T1) | 20.44 | | | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 04.03 | 05.24 (T1) | 05.43 | | | 07.15 | 07.49 | 09.32 | 10.16 |
| | 22.31 | 23 05.47 (T1) | 20.40 | | | 18.48 | 16.02 | 14.28 | 14.13 |
| 31 | 04.06 | 05.24 (T1) | 05.46 | | | | 07.52 | | 10.15 |
| | 22.28 | 24 05.48 (T1) | 20.37 | | | | 15.58 | | 14.14 |
| Potential sun hours | 619 | | 513 | | | 394 | 303 | 193 | 127 |
| Total, worst case | | 192 | | 233 | | 259 | | | |
| Sun reduction | | 0,48 | | 0,42 | | 0,32 | | | |
| Oper. time red. | | 0,99 | | 0,99 | | 0,99 | | | |
| Wind dir. red. | | 0,63 | | 0,63 | | 0,62 | | | |
| Total reduction | | 0,29 | | 0,26 | | 0,20 | | | |
| Total, real | | 56 | | 60 | | 51 | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** H - Asuinrakennus H (Mäkelä)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | 09.00 | 07.25 | 06.33 | 04.44 | 02.56 | 02.36 | 04.09 | 05.49 | 07.18 | 07.55 | 09.35 |
| | 14.17 | 15.52 | 17.26 | 20.02 | 21.37 | 23.23 | 23.56 | 22.25 | 20.33 | 18.44 | 15.55 | 14.26 |
| 2 | 10.13 | 08.57 | 07.21 | 06.29 | 04.40 | 02.54 | 02.38 | 04.13 | 05.52 | 07.21 | 07.59 | 09.38 |
| | 14.19 | 15.56 | 17.29 | 20.05 | 21.41 | 23.26 | 23.54 | 22.21 | 20.30 | 18.40 | 15.51 | 14.24 |
| 3 | 10.12 | 08.53 | 07.18 | 06.25 | 04.36 | 02.51 | 02.40 | 04.16 | 05.55 | 07.24 | 08.02 | 09.41 |
| | 14.21 | 15.59 | 17.32 | 20.08 | 21.44 | 23.29 | 23.52 | 22.18 | 20.26 | 18.37 | 15.48 | 14.22 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.33 | 02.48 | 02.43 | 04.20 | 05.58 | 07.27 | 08.05 | 09.44 |
| | 14.23 | 16.03 | 17.35 | 20.11 | 21.47 | 23.32 | 23.50 | 22.14 | 20.22 | 18.33 | 15.45 | 14.20 |
| 5 | 10.09 | 08.47 | 07.10 | 06.18 | 04.29 | 02.46 | 02.45 | 04.23 | 06.01 | 07.30 | 08.09 | 09.47 |
| | 14.26 | 16.06 | 17.39 | 20.14 | 21.51 | 23.35 | 23.48 | 22.11 | 20.19 | 18.30 | 15.41 | 14.18 |
| 6 | 10.07 | 08.44 | 07.07 | 06.14 | 04.26 | 02.43 | 02.48 | 04.26 | 06.04 | 07.33 | 08.12 | 09.49 |
| | 14.28 | 16.10 | 17.42 | 20.17 | 21.54 | 23.38 | 23.46 | 22.07 | 20.15 | 18.26 | 15.38 | 14.16 |
| 7 | 10.06 | 08.40 | 07.03 | 06.11 | 04.22 | 02.41 | 02.51 | 04.30 | 06.07 | 07.36 | 08.16 | 09.52 |
| | 14.31 | 16.13 | 17.45 | 20.20 | 21.58 | 23.40 | 23.43 | 22.04 | 20.11 | 18.22 | 15.35 | 14.14 |
| 8 | 10.04 | 08.37 | 07.00 | 06.07 | 04.19 | 02.38 | 02.54 | 04.33 | 06.10 | 07.39 | 08.19 | 09.54 |
| | 14.34 | 16.16 | 17.48 | 20.23 | 22.01 | 23.43 | 23.41 | 22.00 | 20.08 | 18.19 | 15.32 | 14.12 |
| 9 | 10.02 | 08.34 | 06.56 | 06.03 | 04.15 | 02.36 | 02.57 | 04.36 | 06.13 | 07.42 | 08.22 | 09.57 |
| | 14.36 | 16.20 | 17.51 | 20.26 | 22.04 | 23.46 | 23.38 | 21.56 | 20.04 | 18.15 | 15.28 | 14.11 |
| 10 | 10.00 | 08.30 | 06.52 | 06.00 | 04.12 | 02.34 | 03.00 | 04.40 | 06.16 | 07.45 | 08.26 | 09.59 |
| | 14.39 | 16.23 | 17.54 | 20.29 | 22.08 | 23.48 | 23.35 | 21.53 | 20.00 | 18.12 | 15.25 | 14.09 |
| 11 | 09.58 | 08.27 | 06.49 | 05.56 | 04.08 | 02.32 | 03.00 | 04.43 | 06.19 | 07.49 | 08.29 | 10.01 |
| | 14.42 | 16.27 | 17.57 | 20.33 | 22.11 | 23.51 | 23.33 | 21.49 | 19.57 | 18.08 | 15.22 | 14.08 |
| 12 | 09.56 | 08.24 | 06.45 | 05.52 | 04.05 | 02.31 | 03.03 | 04.46 | 06.22 | 07.52 | 08.32 | 10.03 |
| | 14.45 | 16.30 | 18.00 | 20.36 | 22.15 | 23.53 | 23.30 | 21.46 | 19.53 | 18.04 | 15.19 | 14.07 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.01 | 02.29 | 03.06 | 04.49 | 06.25 | 07.55 | 08.36 | 10.05 |
| | 14.48 | 16.33 | 18.04 | 20.39 | 22.18 | 23.55 | 23.27 | 21.42 | 19.49 | 18.01 | 15.16 | 14.06 |
| 14 | 09.51 | 08.17 | 06.38 | 05.45 | 03.58 | 02.28 | 03.09 | 04.53 | 06.28 | 07.58 | 08.39 | 10.07 |
| | 14.51 | 16.37 | 18.07 | 20.42 | 22.22 | 23.57 | 23.24 | 21.39 | 19.46 | 17.57 | 15.13 | 14.05 |
| 15 | 09.49 | 08.14 | 06.34 | 05.42 | 03.54 | 02.26 | 03.12 | 04.56 | 06.31 | 08.01 | 08.43 | 10.09 |
| | 14.55 | 16.40 | 18.10 | 20.45 | 22.25 | 23.58 | 23.21 | 21.35 | 19.42 | 17.54 | 15.09 | 14.04 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.51 | 02.25 | 03.16 | 04.59 | 06.34 | 08.04 | 08.46 | 10.11 |
| | 14.58 | 16.44 | 18.13 | 20.48 | 22.29 | 00.00 | 23.18 | 21.31 | 19.38 | 17.50 | 15.06 | 14.04 |
| 17 | 09.43 | 08.07 | 06.27 | 05.34 | 03.47 | 02.24 | 03.19 | 05.02 | 06.37 | 08.07 | 08.49 | 10.12 |
| | 15.01 | 16.47 | 18.16 | 20.52 | 22.32 | 00.01 | 23.15 | 21.28 | 19.35 | 17.47 | 15.03 | 14.03 |
| 18 | 09.41 | 08.03 | 06.24 | 05.31 | 03.44 | 02.24 | 03.22 | 05.06 | 06.40 | 08.10 | 08.53 | 10.13 |
| | 15.04 | 16.50 | 18.19 | 20.55 | 22.35 | 00.02 | 23.11 | 21.24 | 19.31 | 17.43 | 15.00 | 14.03 |
| 19 | 09.38 | 08.00 | 06.20 | 05.27 | 03.41 | 02.23 | 03.25 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.08 | 16.53 | 18.22 | 20.58 | 22.39 | 00.03 | 23.08 | 21.21 | 19.28 | 17.40 | 14.57 | 14.03 |
| 20 | 09.36 | 07.56 | 06.16 | 05.23 | 03.37 | 02.23 | 03.29 | 05.12 | 06.46 | 08.17 | 09.00 | 10.15 |
| | 15.11 | 16.57 | 18.25 | 21.01 | 22.42 | 00.04 | 23.05 | 21.17 | 19.24 | 17.36 | 14.55 | 14.03 |
| 21 | 09.33 | 07.53 | 06.13 | 05.20 | 03.34 | 02.23 | 03.32 | 05.15 | 06.49 | 08.20 | 09.03 | 10.16 |
| | 15.14 | 17.00 | 18.28 | 21.04 | 22.46 | 00.04 | 23.02 | 21.13 | 19.20 | 17.33 | 14.52 | 14.03 |
| 22 | 09.30 | 07.49 | 06.09 | 05.16 | 03.31 | 02.23 | 03.36 | 05.18 | 06.52 | 08.23 | 09.06 | 10.17 |
| | 15.18 | 17.03 | 18.31 | 21.08 | 22.49 | 00.04 | 22.59 | 21.10 | 19.17 | 17.29 | 14.49 | 14.04 |
| 23 | 09.27 | 07.46 | 06.05 | 05.12 | 03.27 | 02.24 | 03.39 | 05.21 | 06.55 | 08.26 | 09.10 | 10.17 |
| | 15.21 | 17.07 | 18.34 | 21.11 | 22.53 | 00.04 | 22.55 | 21.06 | 19.13 | 17.26 | 14.46 | 14.04 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.24 | 02.25 | 03.42 | 05.25 | 06.58 | 08.29 | 09.13 | 10.18 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.56 | 00.04 | 22.52 | 21.02 | 19.09 | 17.22 | 14.43 | 14.05 |
| 25 | 09.21 | 07.39 | 05.58 | 05.05 | 03.21 | 02.26 | 03.46 | 05.28 | 07.01 | 07.33 | 09.16 | 10.18 |
| | 15.28 | 17.13 | 18.40 | 21.17 | 22.59 | 00.03 | 22.49 | 20.59 | 19.06 | 16.19 | 14.41 | 14.06 |
| 26 | 09.18 | 07.35 | 05.54 | 05.02 | 03.18 | 02.27 | 03.49 | 05.31 | 07.04 | 07.36 | 09.19 | 10.18 |
| | 15.31 | 17.16 | 18.43 | 21.21 | 23.03 | 00.03 | 22.45 | 20.55 | 19.02 | 16.15 | 14.38 | 14.07 |
| 27 | 09.15 | 07.32 | 05.51 | 04.58 | 03.15 | 02.28 | 03.52 | 05.34 | 07.06 | 07.39 | 09.23 | 10.18 |
| | 15.35 | 17.20 | 18.46 | 21.24 | 23.06 | 00.02 | 22.42 | 20.51 | 18.58 | 16.12 | 14.36 | 14.08 |
| 28 | 09.12 | 07.28 | 05.47 | 04.54 | 03.11 | 02.30 | 03.56 | 05.37 | 07.09 | 07.42 | 09.26 | 10.17 |
| | 15.38 | 17.23 | 18.49 | 21.27 | 23.10 | 00.01 | 22.38 | 20.48 | 18.55 | 16.08 | 14.33 | 14.09 |
| 29 | 09.09 | | 06.44 | 04.51 | 03.08 | 02.32 | 03.59 | 05.40 | 07.12 | 07.46 | 09.29 | 10.17 |
| | 15.42 | | 19.52 | 21.31 | 23.13 | 23.59 | 22.35 | 20.44 | 18.51 | 16.05 | 14.31 | 14.11 |
| 30 | 09.06 | | 06.40 | 04.47 | 03.05 | 02.34 | 04.03 | 05.43 | 07.15 | 07.49 | 09.32 | 10.16 |
| | 15.45 | | 19.56 | 21.34 | 23.16 | 23.58 | 22.32 | 20.41 | 18.48 | 16.02 | 14.28 | 14.12 |
| 31 | 09.03 | | 06.36 | | 03.02 | | 04.06 | 05.46 | | 07.52 | | 10.15 |
| | 15.49 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.58 | | 14.14 |
| Potential sun hours | 163 | 235 | 363 | 454 | 577 | 640 | 619 | 513 | 394 | 303 | 192 | 126 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas**Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | | February | | March | | April | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.14 | | 08.59 | 12.37 (T7) | 07.24 | | 06.32 | 04.43 | 02.56 |
| | 14.16 | | 15.52 9 | 12.46 (T7) | 17.26 | | 20.01 | 21.37 | 23.22 |
| 2 | 10.13 | | 08.56 | | 07.21 | | 06.29 | 04.40 | 02.53 |
| | 14.18 | | 15.55 | | 17.29 | | 20.04 | 21.40 | 23.25 |
| 3 | 10.11 | | 08.53 | | 07.17 | | 06.25 | 04.36 | 02.50 |
| | 14.21 | | 15.59 | | 17.32 | | 20.07 | 21.44 | 23.28 |
| 4 | 10.10 | | 08.50 | | 07.14 | | 06.21 | 04.33 | 02.48 |
| | 14.23 | | 16.02 | | 17.35 | | 20.10 | 21.47 | 23.31 |
| 5 | 10.09 | | 08.47 | | 07.10 | 16.55 (T2) | 06.18 | 04.29 | 02.45 |
| | 14.25 | | 16.06 | | 17.38 6 | 17.01 (T2) | 20.14 | 21.50 | 23.34 |
| 6 | 10.07 | | 08.43 | | 07.06 | 16.52 (T2) | 06.14 | 04.25 | 02.43 |
| | 14.28 | | 16.09 | | 17.41 12 | 17.04 (T2) | 20.17 | 21.54 | 23.37 |
| 7 | 10.05 | | 08.40 | | 07.03 | 16.51 (T2) | 06.10 | 04.22 | 02.40 |
| | 14.30 | | 16.13 | | 17.44 17 | 17.08 (T2) | 20.20 | 21.57 | 23.40 |
| 8 | 10.03 | 12.27 (T7) | 08.37 | | 06.59 | 16.50 (T2) | 06.07 | 04.18 | 02.38 |
| | 14.33 5 | 12.32 (T7) | 16.16 | | 17.48 20 | 17.10 (T2) | 20.23 | 22.01 | 23.43 |
| 9 | 10.01 | 12.26 (T7) | 08.33 | | 06.56 | 16.49 (T2) | 06.03 | 04.15 | 02.36 |
| | 14.36 16 | 12.42 (T7) | 16.19 | | 17.51 21 | 17.10 (T2) | 20.26 | 22.04 | 23.45 |
| 10 | 09.59 | 12.26 (T7) | 08.30 | | 06.52 | 16.48 (T2) | 05.59 | 04.11 | 02.34 |
| | 14.39 18 | 12.44 (T7) | 16.23 | | 17.54 22 | 17.10 (T2) | 20.29 | 22.07 | 23.48 |
| 11 | 09.57 | 12.26 (T7) | 08.27 | | 06.48 | 16.48 (T2) | 05.56 | 04.08 | 02.32 |
| | 14.42 19 | 12.45 (T7) | 16.26 | | 17.57 22 | 17.10 (T2) | 20.32 | 22.11 | 23.50 |
| 12 | 09.55 | 12.25 (T7) | 08.23 | | 06.45 | 16.47 (T2) | 05.52 | 04.04 | 02.30 |
| | 14.45 20 | 12.45 (T7) | 16.30 | | 18.00 23 | 17.10 (T2) | 20.35 | 22.14 | 23.52 |
| 13 | 09.53 | 12.26 (T7) | 08.20 | | 06.41 | 16.47 (T2) | 05.48 | 04.01 | 02.29 |
| | 14.48 20 | 12.46 (T7) | 16.33 | | 18.03 22 | 17.09 (T2) | 20.38 | 22.18 | 23.54 |
| 14 | 09.51 | 12.25 (T7) | 08.17 | | 06.38 | 16.48 (T2) | 05.45 | 03.57 | 02.27 |
| | 14.51 22 | 12.47 (T7) | 16.36 | | 18.06 21 | 17.09 (T2) | 20.42 | 22.21 | 23.56 |
| 15 | 09.48 | 12.26 (T7) | 08.13 | | 06.34 | 16.48 (T2) | 05.41 | 03.54 | 02.26 |
| | 14.54 22 | 12.48 (T7) | 16.40 | | 18.09 20 | 17.08 (T2) | 20.45 | 22.25 | 23.58 |
| 16 | 09.46 | 12.25 (T7) | 08.10 | | 06.30 | 16.48 (T2) | 05.37 | 03.50 | 02.25 |
| | 14.57 23 | 12.48 (T7) | 16.43 | | 18.12 18 | 17.06 (T2) | 20.48 | 22.28 | 00.00 |
| 17 | 09.43 | 12.25 (T7) | 08.06 | | 06.27 | 16.49 (T2) | 05.34 | 03.47 | 02.24 |
| | 15.01 24 | 12.49 (T7) | 16.46 | | 18.15 15 | 17.04 (T2) | 20.51 | 22.32 | 00.01 |
| 18 | 09.41 | 12.25 (T7) | 08.03 | | 06.23 | 16.52 (T2) | 05.30 | 03.44 | 02.23 |
| | 15.04 25 | 12.50 (T7) | 16.50 | | 18.18 11 | 17.03 (T2) | 20.54 | 22.35 | 00.02 |
| 19 | 09.38 | 12.25 (T7) | 07.59 | | 06.20 | | 05.27 | 03.40 | 02.23 |
| | 15.07 25 | 12.50 (T7) | 16.53 | | 18.22 | | 20.58 | 22.39 | 00.03 |
| 20 | 09.35 | 12.26 (T7) | 07.56 | | 06.16 | | 05.23 | 03.37 | 02.23 |
| | 15.11 25 | 12.51 (T7) | 16.56 | | 18.25 | | 21.01 | 22.42 | 00.03 |
| 21 | 09.32 | 12.26 (T7) | 07.52 | | 06.12 | | 05.19 | 03.34 | 02.23 |
| | 15.14 25 | 12.51 (T7) | 17.00 | | 18.28 | | 21.04 | 22.45 | 00.04 |
| 22 | 09.30 | 12.26 (T7) | 07.49 | | 06.09 | | 05.16 | 03.30 | 02.23 |
| | 15.17 25 | 12.51 (T7) | 17.03 | | 18.31 | | 21.07 | 22.49 | 00.04 |
| 23 | 09.27 | 12.27 (T7) | 07.45 | | 06.05 | | 05.12 | 03.27 | 02.24 |
| | 15.21 25 | 12.52 (T7) | 17.06 | | 18.34 | | 21.10 | 22.52 | 00.04 |
| 24 | 09.24 | 12.27 (T7) | 07.42 | | 06.01 | | 05.08 | 03.24 | 02.24 |
| | 15.24 24 | 12.51 (T7) | 17.09 | | 18.37 | | 21.14 | 22.56 | 00.04 |
| 25 | 09.21 | 12.28 (T7) | 07.38 | | 05.58 | | 05.05 | 03.20 | 02.25 |
| | 15.28 24 | 12.52 (T7) | 17.13 | | 18.40 | | 21.17 | 22.59 | 00.03 |
| 26 | 09.18 | 12.29 (T7) | 07.35 | | 05.54 | | 05.01 | 03.17 | 02.26 |
| | 15.31 23 | 12.52 (T7) | 17.16 | | 18.43 | | 21.20 | 23.03 | 00.02 |
| 27 | 09.15 | 12.29 (T7) | 07.31 | | 05.50 | | 04.58 | 03.14 | 02.28 |
| | 15.34 22 | 12.51 (T7) | 17.19 | | 18.46 | | 21.24 | 23.06 | 00.01 |
| 28 | 09.12 | 12.30 (T7) | 07.28 | | 05.47 | | 04.54 | 03.11 | 02.29 |
| | 15.38 21 | 12.51 (T7) | 17.22 | | 18.49 | | 21.27 | 23.09 | 00.00 |
| 29 | 09.09 | 12.31 (T7) | | | 06.43 | | 04.50 | 03.08 | 02.31 |
| | 15.41 19 | 12.50 (T7) | | | 19.52 | | 21.30 | 23.13 | 23.59 |
| 30 | 09.06 | 12.33 (T7) | | | 06.39 | | 04.47 | 03.05 | 02.33 |
| | 15.45 17 | 12.50 (T7) | | | 19.55 | | 21.34 | 23.16 | 23.57 |
| 31 | 09.03 | 12.34 (T7) | | | 06.36 | | | 03.02 | |
| | 15.48 14 | 12.48 (T7) | | | 19.58 | | | 23.19 | |
| Potential sun hours | 163 | | 235 | | 363 | | 454 | 577 | 640 |
| Total, worst case | 503 | | 9 | | 250 | | | | |
| Sun reduction | 0,11 | | 0,31 | | 0,36 | | | | |
| Oper. time red. | 0,99 | | 0,99 | | 0,99 | | | | |
| Wind dir. red. | 0,66 | | 0,66 | | 0,61 | | | | |
| Total reduction | 0,08 | | 0,21 | | 0,22 | | | | |
| Total, real | 38 | | 2 | | 55 | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas**Shadow receptor:** I - Lomarakennus I

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | July | | August | | September | | | October | | | November | | | December | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 02.35 | | 04.09 | | 05.49 | | | 07.18 | | 17.27 (T2) | 07.55 | | | 09.35 | | 12.08 (T7) |
| | 23.56 | | 22.24 | | 20.33 | | | 18.44 | 22 | 17.49 (T2) | 15.54 | | | 14.25 | 19 | 12.27 (T7) |
| 2 | 02.37 | | 04.12 | | 05.52 | | | 07.21 | | 17.26 (T2) | 07.58 | | | 09.38 | | 12.09 (T7) |
| | 23.54 | | 22.21 | | 20.29 | | | 18.40 | 23 | 17.49 (T2) | 15.51 | | | 14.23 | 18 | 12.27 (T7) |
| 3 | 02.40 | | 04.16 | | 05.55 | | | 07.24 | | 17.26 (T2) | 08.02 | | | 09.41 | | 12.10 (T7) |
| | 23.52 | | 22.17 | | 20.26 | | | 18.36 | 22 | 17.48 (T2) | 15.48 | | | 14.21 | 16 | 12.26 (T7) |
| 4 | 02.42 | | 04.19 | | 05.58 | | | 07.27 | | 17.26 (T2) | 08.05 | | | 09.43 | | 12.11 (T7) |
| | 23.50 | | 22.14 | | 20.22 | | | 18.33 | 22 | 17.48 (T2) | 15.44 | | | 14.19 | 6 | 12.17 (T7) |
| 5 | 02.45 | | 04.23 | | 06.01 | | | 07.30 | | 17.26 (T2) | 08.08 | | | 09.46 | | |
| | 23.48 | | 22.10 | | 20.18 | | | 18.29 | 21 | 17.47 (T2) | 15.41 | | | 14.17 | | |
| 6 | 02.48 | | 04.26 | | 06.04 | | | 07.33 | | 17.27 (T2) | 08.12 | | | 09.49 | | |
| | 23.45 | | 22.07 | | 20.15 | | | 18.26 | 18 | 17.45 (T2) | 15.38 | | | 14.15 | | |
| 7 | 02.50 | | 04.29 | | 06.07 | | | 07.36 | | 17.27 (T2) | 08.15 | | | 09.52 | | |
| | 23.43 | | 22.03 | | 20.11 | | | 18.22 | 14 | 17.41 (T2) | 15.34 | | | 14.14 | | |
| 8 | 02.53 | | 04.33 | | 06.10 | | | 07.39 | | 17.30 (T2) | 08.19 | | | 09.54 | | |
| | 23.40 | | 22.00 | | 20.07 | | | 18.18 | 8 | 17.38 (T2) | 15.31 | | | 14.12 | | |
| 9 | 02.56 | | 04.36 | | 06.13 | | | 07.42 | | 17.33 (T2) | 08.22 | | | 09.56 | | |
| | 23.38 | | 21.56 | | 20.04 | | | 18.15 | 1 | 17.34 (T2) | 15.28 | | | 14.10 | | |
| 10 | 02.59 | | 04.39 | | 06.16 | | | 07.45 | | | 08.25 | | 12.07 (T7) | 09.59 | | |
| | 23.35 | | 21.53 | | 20.00 | | | 18.11 | | | 15.25 | 10 | 12.17 (T7) | 14.09 | | |
| 11 | 03.02 | | 04.42 | | 06.19 | | | 07.48 | | | 08.29 | | 12.05 (T7) | 10.01 | | |
| | 23.32 | | 21.49 | | 19.56 | | | 18.08 | | | 15.22 | 14 | 12.19 (T7) | 14.08 | | |
| 12 | 03.02 | | 04.46 | | 06.22 | | | 07.51 | | | 08.32 | | 12.04 (T7) | 10.03 | | |
| | 23.29 | | 21.45 | | 19.53 | | | 18.04 | | | 15.18 | 17 | 12.21 (T7) | 14.07 | | |
| 13 | 03.05 | | 04.49 | | 06.25 | | | 07.54 | | | 08.35 | | 12.03 (T7) | 10.05 | | |
| | 23.26 | | 21.42 | | 19.49 | | | 18.00 | | | 15.15 | 19 | 12.22 (T7) | 14.06 | | |
| 14 | 03.09 | | 04.52 | | 06.28 | | | 07.57 | | | 08.39 | | 12.03 (T7) | 10.07 | | |
| | 23.23 | | 21.38 | | 19.45 | | | 17.57 | | | 15.12 | 21 | 12.24 (T7) | 14.05 | | |
| 15 | 03.12 | | 04.56 | | 06.31 | | | 08.00 | | | 08.42 | | 12.02 (T7) | 10.09 | | |
| | 23.20 | | 21.35 | | 19.42 | | | 17.53 | | | 15.09 | 22 | 12.24 (T7) | 14.04 | | |
| 16 | 03.15 | | 04.59 | | 06.34 | | | 08.04 | | | 08.46 | | 12.02 (T7) | 10.10 | | |
| | 23.17 | | 21.31 | | 19.38 | | | 17.50 | | | 15.06 | 23 | 12.25 (T7) | 14.03 | | |
| 17 | 03.18 | | 05.02 | | 06.37 | | | 08.07 | | | 08.49 | | 12.02 (T7) | 10.12 | | |
| | 23.14 | | 21.27 | | 19.34 | | | 17.46 | | | 15.03 | 24 | 12.26 (T7) | 14.03 | | |
| 18 | 03.22 | | 05.05 | | 06.40 | | | 08.10 | | | 08.52 | | 12.01 (T7) | 10.13 | | |
| | 23.11 | | 21.24 | | 19.31 | | | 17.43 | | | 15.00 | 24 | 12.25 (T7) | 14.03 | | |
| 19 | 03.25 | | 05.08 | | 06.42 | | | 08.13 | | | 08.56 | | 12.01 (T7) | 10.14 | | |
| | 23.08 | | 21.20 | | 19.27 | | | 17.39 | | | 14.57 | 25 | 12.26 (T7) | 14.02 | | |
| 20 | 03.28 | | 05.12 | | 06.45 | | | 08.16 | | | 08.59 | | 12.01 (T7) | 10.15 | | |
| | 23.05 | | 21.17 | | 19.24 | | | 17.36 | | | 14.54 | 25 | 12.26 (T7) | 14.03 | | |
| 21 | 03.32 | | 05.15 | | 06.48 | | | 08.19 | | | 09.03 | | 12.01 (T7) | 10.16 | | |
| | 23.01 | | 21.13 | | 19.20 | | | 17.32 | | | 14.51 | 25 | 12.26 (T7) | 14.03 | | |
| 22 | 03.35 | | 05.18 | | 06.51 | | | 08.22 | | | 09.06 | | 12.02 (T7) | 10.16 | | |
| | 22.58 | | 21.09 | | 19.16 | | | 17.29 | | | 14.48 | 25 | 12.27 (T7) | 14.03 | | |
| 23 | 03.38 | | 05.21 | | 06.54 | | | 08.26 | | | 09.09 | | 12.03 (T7) | 10.17 | | |
| | 22.55 | | 21.06 | | 19.13 | | | 17.25 | | | 14.46 | 24 | 12.27 (T7) | 14.04 | | |
| 24 | 03.42 | | 05.24 | | 06.57 | | | 08.29 | | | 09.13 | | 12.03 (T7) | 10.17 | | |
| | 22.52 | | 21.02 | | 19.09 | | | 17.22 | | | 14.43 | 24 | 12.27 (T7) | 14.04 | | |
| 25 | 03.45 | | 05.27 | | 07.00 | | 17.36 (T2) | 07.32 | | | 09.16 | | 12.04 (T7) | 10.17 | | |
| | 22.48 | | 20.58 | | 19.05 | 9 | 17.45 (T2) | 16.18 | | | 14.40 | 23 | 12.27 (T7) | 14.05 | | |
| 26 | 03.49 | | 05.30 | | 07.03 | | 17.33 (T2) | 07.35 | | | 09.19 | | 12.04 (T7) | 10.17 | | |
| | 22.45 | | 20.55 | | 19.02 | 14 | 17.47 (T2) | 16.15 | | | 14.38 | 24 | 12.28 (T7) | 14.06 | | |
| 27 | 03.52 | | 05.33 | | 07.06 | | 17.31 (T2) | 07.39 | | | 09.22 | | 12.04 (T7) | 10.17 | | |
| | 22.41 | | 20.51 | | 18.58 | 17 | 17.48 (T2) | 16.11 | | | 14.35 | 23 | 12.27 (T7) | 14.08 | | |
| 28 | 03.55 | | 05.37 | | 07.09 | | 17.29 (T2) | 07.42 | | | 09.25 | | 12.06 (T7) | 10.17 | | |
| | 22.38 | | 20.47 | | 18.54 | 20 | 17.49 (T2) | 16.08 | | | 14.33 | 22 | 12.28 (T7) | 14.09 | | |
| 29 | 03.59 | | 05.40 | | 07.12 | | 17.28 (T2) | 07.45 | | | 09.29 | | 12.06 (T7) | 10.16 | | |
| | 22.35 | | 20.44 | | 18.51 | 21 | 17.49 (T2) | 16.05 | | | 14.30 | 21 | 12.27 (T7) | 14.10 | | |
| 30 | 04.02 | | 05.43 | | 07.15 | | 17.27 (T2) | 07.48 | | | 09.32 | | 12.07 (T7) | 10.16 | | |
| | 22.31 | | 20.40 | | 18.47 | 22 | 17.49 (T2) | 16.01 | | | 14.28 | 20 | 12.27 (T7) | 14.12 | | |
| 31 | 04.06 | | 05.46 | | | | | 07.52 | | | | | | 10.15 | | |
| | 22.28 | | 20.37 | | | | | 15.58 | | | | | | 14.14 | | |
| Potential sun hours | 619 | | 513 | | 394 | | | 303 | | | 192 | | | 126 | | |
| Total, worst case | | | | | | 103 | | | 151 | | | 455 | | | 59 | |
| Sun reduction | | | | | | 0,32 | | | 0,28 | | | 0,19 | | | 0,04 | |
| Oper. time red. | | | | | | 0,99 | | | 0,99 | | | 0,99 | | | 0,99 | |
| Wind dir. red. | | | | | | 0,61 | | | 0,61 | | | 0,66 | | | 0,66 | |
| Total reduction | | | | | | 0,20 | | | 0,17 | | | 0,13 | | | 0,03 | |
| Total, real | | | | | | 20 | | | 26 | | | 57 | | | 2 | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** J - Lomarakennus J (Hautakaarto)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.40 | 23.24 | 23.52 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.17 | 06.25 | 04.37 | 02.53 | 02.42 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.27 | 23.50 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.09 | 08.49 | 07.14 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.05 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.30 | 23.48 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.47 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.10 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.48 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.53 | 23.35 | 23.43 | 22.06 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.15 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.03 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.53 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.01 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.49 | 05.56 | 04.09 | 02.35 | 03.01 | 04.43 | 06.19 | 07.48 | 08.28 | 10.00 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.48 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.04 | 04.47 | 06.22 | 07.51 | 08.31 | 10.02 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.28 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.20 | 06.41 | 05.49 | 04.02 | 02.31 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.04 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.54 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.42 | 10.07 |
| | 14.56 | 16.40 | 18.10 | 20.45 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.45 | 08.09 | 06.31 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.57 | 23.16 | 21.31 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.23 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.07 | 21.20 | 19.27 | 17.40 | 14.58 | 14.04 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.01 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.32 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.13 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.57 | 08.29 | 09.12 | 10.16 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.01 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.00 | 08.32 | 09.15 | 10.16 |
| | 15.29 | 17.13 | 18.40 | 21.17 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.16 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 00.00 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.16 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.59 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.32 | 03.57 | 05.37 | 07.09 | 07.42 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.08 | 23.58 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.44 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.31 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** K - Asuinrakennus K (Takalo)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.12 | 08.59 | 07.24 | 06.32 | 04.44 | 03.01 | 02.38 | 04.10 | 05.49 | 07.18 | 07.55 | 09.33 |
| | 14.18 | 15.53 | 17.26 | 20.01 | 21.36 | 23.20 | 23.53 | 22.23 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.11 | 08.56 | 07.20 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.52 | 07.21 | 07.58 | 09.36 |
| | 14.20 | 15.56 | 17.29 | 20.04 | 21.39 | 23.23 | 23.51 | 22.20 | 20.29 | 18.40 | 15.52 | 14.25 |
| 3 | 10.10 | 08.52 | 07.17 | 06.25 | 04.37 | 02.53 | 02.43 | 04.17 | 05.55 | 07.24 | 08.01 | 09.39 |
| | 14.22 | 16.00 | 17.32 | 20.07 | 21.43 | 23.26 | 23.49 | 22.16 | 20.25 | 18.37 | 15.48 | 14.23 |
| 4 | 10.08 | 08.49 | 07.13 | 06.22 | 04.33 | 02.50 | 02.45 | 04.20 | 05.58 | 07.27 | 08.04 | 09.42 |
| | 14.25 | 16.03 | 17.35 | 20.10 | 21.46 | 23.29 | 23.47 | 22.13 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.07 | 08.46 | 07.10 | 06.18 | 04.30 | 02.48 | 02.48 | 04.24 | 06.01 | 07.30 | 08.08 | 09.45 |
| | 14.27 | 16.07 | 17.39 | 20.13 | 21.50 | 23.32 | 23.45 | 22.09 | 20.18 | 18.29 | 15.42 | 14.19 |
| 6 | 10.05 | 08.43 | 07.06 | 06.14 | 04.26 | 02.45 | 02.50 | 04.27 | 06.04 | 07.33 | 08.11 | 09.47 |
| | 14.30 | 16.10 | 17.42 | 20.16 | 21.53 | 23.35 | 23.43 | 22.06 | 20.14 | 18.26 | 15.39 | 14.17 |
| 7 | 10.04 | 08.39 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.07 | 07.36 | 08.14 | 09.50 |
| | 14.32 | 16.13 | 17.45 | 20.20 | 21.56 | 23.38 | 23.41 | 22.02 | 20.11 | 18.22 | 15.35 | 14.15 |
| 8 | 10.02 | 08.36 | 06.59 | 06.07 | 04.19 | 02.41 | 02.56 | 04.34 | 06.10 | 07.39 | 08.18 | 09.52 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.00 | 23.40 | 23.38 | 21.59 | 20.07 | 18.19 | 15.32 | 14.14 |
| 9 | 10.00 | 08.33 | 06.56 | 06.03 | 04.16 | 02.39 | 02.59 | 04.37 | 06.13 | 07.42 | 08.21 | 09.55 |
| | 14.38 | 16.20 | 17.51 | 20.26 | 22.03 | 23.43 | 23.36 | 21.55 | 20.04 | 18.15 | 15.29 | 14.12 |
| 10 | 09.58 | 08.30 | 06.52 | 06.00 | 04.12 | 02.37 | 03.02 | 04.40 | 06.16 | 07.45 | 08.25 | 09.57 |
| | 14.40 | 16.24 | 17.54 | 20.29 | 22.06 | 23.45 | 23.33 | 21.52 | 20.00 | 18.11 | 15.26 | 14.11 |
| 11 | 09.56 | 08.26 | 06.48 | 05.56 | 04.09 | 02.35 | 03.02 | 04.43 | 06.19 | 07.48 | 08.28 | 09.59 |
| | 14.43 | 16.27 | 17.57 | 20.32 | 22.10 | 23.47 | 23.30 | 21.48 | 19.56 | 18.08 | 15.22 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.05 | 02.33 | 03.05 | 04.47 | 06.22 | 07.51 | 08.31 | 10.01 |
| | 14.46 | 16.30 | 18.00 | 20.35 | 22.13 | 23.50 | 23.27 | 21.45 | 19.53 | 18.04 | 15.19 | 14.08 |
| 13 | 09.52 | 08.19 | 06.41 | 05.49 | 04.02 | 02.32 | 03.08 | 04.50 | 06.25 | 07.54 | 08.35 | 10.03 |
| | 14.49 | 16.34 | 18.03 | 20.38 | 22.17 | 23.52 | 23.25 | 21.41 | 19.49 | 18.01 | 15.16 | 14.07 |
| 14 | 09.49 | 08.16 | 06.38 | 05.45 | 03.59 | 02.30 | 03.11 | 04.53 | 06.28 | 07.57 | 08.38 | 10.05 |
| | 14.52 | 16.37 | 18.06 | 20.41 | 22.20 | 23.53 | 23.22 | 21.38 | 19.45 | 17.57 | 15.13 | 14.07 |
| 15 | 09.47 | 08.13 | 06.34 | 05.42 | 03.55 | 02.29 | 03.14 | 04.56 | 06.31 | 08.00 | 08.41 | 10.07 |
| | 14.56 | 16.40 | 18.09 | 20.44 | 22.24 | 23.55 | 23.19 | 21.34 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.44 | 08.09 | 06.30 | 05.38 | 03.52 | 02.28 | 03.17 | 05.00 | 06.34 | 08.03 | 08.45 | 10.08 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.27 | 23.56 | 23.16 | 21.30 | 19.38 | 17.50 | 15.07 | 14.05 |
| 17 | 09.42 | 08.06 | 06.27 | 05.34 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.06 | 08.48 | 10.10 |
| | 15.02 | 16.47 | 18.16 | 20.51 | 22.30 | 23.58 | 23.13 | 21.27 | 19.34 | 17.47 | 15.04 | 14.05 |
| 18 | 09.39 | 08.02 | 06.23 | 05.31 | 03.45 | 02.27 | 03.24 | 05.06 | 06.40 | 08.10 | 08.52 | 10.11 |
| | 15.05 | 16.50 | 18.19 | 20.54 | 22.34 | 23.59 | 23.10 | 21.23 | 19.31 | 17.43 | 15.01 | 14.05 |
| 19 | 09.37 | 07.59 | 06.20 | 05.27 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.55 | 10.12 |
| | 15.09 | 16.54 | 18.22 | 20.57 | 22.37 | 00.00 | 23.06 | 21.20 | 19.27 | 17.40 | 14.58 | 14.05 |
| 20 | 09.34 | 07.56 | 06.16 | 05.24 | 03.38 | 02.26 | 03.30 | 05.12 | 06.46 | 08.16 | 08.58 | 10.13 |
| | 15.12 | 16.57 | 18.25 | 21.00 | 22.41 | 00.00 | 23.03 | 21.16 | 19.24 | 17.36 | 14.55 | 14.05 |
| 21 | 09.31 | 07.52 | 06.12 | 05.20 | 03.35 | 02.26 | 03.33 | 05.15 | 06.49 | 08.19 | 09.02 | 10.14 |
| | 15.15 | 17.00 | 18.28 | 21.04 | 22.44 | 00.01 | 23.00 | 21.12 | 19.20 | 17.33 | 14.52 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.16 | 03.32 | 02.26 | 03.37 | 05.19 | 06.51 | 08.22 | 09.05 | 10.15 |
| | 15.19 | 17.03 | 18.31 | 21.07 | 22.47 | 00.01 | 22.57 | 21.09 | 19.16 | 17.29 | 14.50 | 14.05 |
| 23 | 09.26 | 07.45 | 06.05 | 05.13 | 03.29 | 02.27 | 03.40 | 05.22 | 06.54 | 08.25 | 09.08 | 10.15 |
| | 15.22 | 17.07 | 18.34 | 21.10 | 22.51 | 00.01 | 22.54 | 21.05 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.09 | 03.25 | 02.28 | 03.43 | 05.25 | 06.57 | 08.29 | 09.11 | 10.15 |
| | 15.25 | 17.10 | 18.37 | 21.13 | 22.54 | 00.00 | 22.50 | 21.02 | 19.09 | 17.22 | 14.44 | 14.06 |
| 25 | 09.20 | 07.38 | 05.58 | 05.06 | 03.22 | 02.29 | 03.47 | 05.28 | 07.00 | 07.32 | 09.15 | 10.15 |
| | 15.29 | 17.13 | 18.40 | 21.16 | 22.58 | 00.00 | 22.47 | 20.58 | 19.05 | 16.19 | 14.42 | 14.07 |
| 26 | 09.17 | 07.35 | 05.54 | 05.02 | 03.19 | 02.30 | 03.50 | 05.31 | 07.03 | 07.35 | 09.18 | 10.15 |
| | 15.32 | 17.16 | 18.43 | 21.20 | 23.01 | 23.59 | 22.44 | 20.54 | 19.02 | 16.15 | 14.39 | 14.08 |
| 27 | 09.14 | 07.31 | 05.51 | 04.58 | 03.16 | 02.31 | 03.53 | 05.34 | 07.06 | 07.38 | 09.21 | 10.15 |
| | 15.36 | 17.20 | 18.46 | 21.23 | 23.04 | 23.58 | 22.40 | 20.51 | 18.58 | 16.12 | 14.36 | 14.10 |
| 28 | 09.11 | 07.28 | 05.47 | 04.55 | 03.13 | 02.33 | 03.57 | 05.37 | 07.09 | 07.41 | 09.24 | 10.15 |
| | 15.39 | 17.23 | 18.49 | 21.26 | 23.07 | 23.57 | 22.37 | 20.47 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.08 | | 06.43 | 04.51 | 03.10 | 02.34 | 04.00 | 05.40 | 07.12 | 07.45 | 09.27 | 10.15 |
| | 15.42 | | 19.52 | 21.30 | 23.11 | 23.56 | 22.34 | 20.43 | 18.51 | 16.05 | 14.32 | 14.12 |
| 30 | 09.05 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.43 | 07.15 | 07.48 | 09.30 | 10.14 |
| | 15.46 | | 19.55 | 21.33 | 23.14 | 23.55 | 22.30 | 20.40 | 18.47 | 16.02 | 14.29 | 14.14 |
| 31 | 09.02 | | 06.36 | | 03.04 | | 04.07 | 05.46 | | 07.51 | | 10.13 |
| | 15.49 | | 19.58 | | 23.17 | | 22.27 | 20.36 | | 15.58 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** L - Lomarakennus L (Haukijärvi)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 08.59 | 07.25 | 06.33 | 04.45 | 03.02 | 02.39 | 04.11 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.19 | 15.53 | 17.27 | 20.02 | 21.37 | 23.21 | 23.54 | 22.24 | 20.33 | 18.44 | 15.56 | 14.28 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.56 | 02.41 | 04.14 | 05.53 | 07.22 | 07.58 | 09.37 |
| | 14.21 | 15.57 | 17.30 | 20.05 | 21.40 | 23.24 | 23.52 | 22.20 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.10 | 08.53 | 07.18 | 06.26 | 04.38 | 02.53 | 02.43 | 04.18 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.23 | 16.00 | 17.33 | 20.08 | 21.43 | 23.27 | 23.50 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.09 | 08.50 | 07.14 | 06.22 | 04.34 | 02.51 | 02.46 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.04 | 17.36 | 20.11 | 21.47 | 23.30 | 23.48 | 22.13 | 20.22 | 18.34 | 15.46 | 14.21 |
| 5 | 10.08 | 08.47 | 07.10 | 06.19 | 04.31 | 02.48 | 02.48 | 04.24 | 06.02 | 07.31 | 08.08 | 09.45 |
| | 14.28 | 16.07 | 17.39 | 20.14 | 21.50 | 23.33 | 23.46 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.06 | 08.43 | 07.07 | 06.15 | 04.27 | 02.46 | 02.51 | 04.28 | 06.05 | 07.34 | 08.12 | 09.48 |
| | 14.30 | 16.11 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.06 | 20.15 | 18.26 | 15.39 | 14.18 |
| 7 | 10.04 | 08.40 | 07.03 | 06.11 | 04.23 | 02.44 | 02.54 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.33 | 16.14 | 17.45 | 20.20 | 21.57 | 23.38 | 23.41 | 22.03 | 20.11 | 18.23 | 15.36 | 14.16 |
| 8 | 10.02 | 08.37 | 07.00 | 06.08 | 04.20 | 02.41 | 02.56 | 04.34 | 06.11 | 07.40 | 08.18 | 09.53 |
| | 14.36 | 16.17 | 17.48 | 20.23 | 22.00 | 23.41 | 23.39 | 21.59 | 20.08 | 18.19 | 15.33 | 14.14 |
| 9 | 10.01 | 08.33 | 06.56 | 06.04 | 04.16 | 02.39 | 02.59 | 04.37 | 06.14 | 07.43 | 08.22 | 09.55 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.43 | 23.36 | 21.56 | 20.04 | 18.16 | 15.29 | 14.13 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.37 | 03.02 | 04.41 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.29 | 22.07 | 23.46 | 23.33 | 21.52 | 20.00 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.10 | 02.35 | 03.02 | 04.44 | 06.20 | 07.49 | 08.29 | 10.00 |
| | 14.44 | 16.28 | 17.58 | 20.33 | 22.10 | 23.48 | 23.31 | 21.49 | 19.57 | 18.09 | 15.23 | 14.10 |
| 12 | 09.54 | 08.23 | 06.45 | 05.53 | 04.06 | 02.34 | 03.05 | 04.47 | 06.23 | 07.52 | 08.32 | 10.02 |
| | 14.47 | 16.31 | 18.01 | 20.36 | 22.14 | 23.50 | 23.28 | 21.45 | 19.53 | 18.05 | 15.20 | 14.09 |
| 13 | 09.52 | 08.20 | 06.42 | 05.50 | 04.03 | 02.32 | 03.08 | 04.51 | 06.26 | 07.55 | 08.35 | 10.04 |
| | 14.50 | 16.34 | 18.04 | 20.39 | 22.17 | 23.52 | 23.25 | 21.42 | 19.50 | 18.01 | 15.17 | 14.08 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.31 | 03.11 | 04.54 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.38 | 18.07 | 20.42 | 22.21 | 23.54 | 23.22 | 21.38 | 19.46 | 17.58 | 15.14 | 14.07 |
| 15 | 09.47 | 08.13 | 06.35 | 05.42 | 03.56 | 02.30 | 03.14 | 04.57 | 06.32 | 08.01 | 08.42 | 10.07 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.24 | 23.56 | 23.19 | 21.35 | 19.42 | 17.54 | 15.11 | 14.06 |
| 16 | 09.45 | 08.10 | 06.31 | 05.39 | 03.52 | 02.29 | 03.18 | 05.00 | 06.34 | 08.04 | 08.45 | 10.09 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.57 | 23.16 | 21.31 | 19.39 | 17.51 | 15.08 | 14.06 |
| 17 | 09.43 | 08.06 | 06.27 | 05.35 | 03.49 | 02.28 | 03.21 | 05.03 | 06.37 | 08.07 | 08.49 | 10.10 |
| | 15.03 | 16.48 | 18.16 | 20.51 | 22.31 | 23.58 | 23.13 | 21.27 | 19.35 | 17.47 | 15.05 | 14.06 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.46 | 02.27 | 03.24 | 05.07 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.06 | 16.51 | 18.19 | 20.55 | 22.34 | 23.59 | 23.10 | 21.24 | 19.31 | 17.44 | 15.02 | 14.05 |
| 19 | 09.37 | 08.00 | 06.20 | 05.28 | 03.42 | 02.27 | 03.27 | 05.10 | 06.43 | 08.13 | 08.55 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.00 | 23.07 | 21.20 | 19.28 | 17.40 | 14.59 | 14.05 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.39 | 02.27 | 03.31 | 05.13 | 06.46 | 08.16 | 08.59 | 10.14 |
| | 15.12 | 16.58 | 18.25 | 21.01 | 22.41 | 00.01 | 23.04 | 21.17 | 19.24 | 17.37 | 14.56 | 14.05 |
| 21 | 09.32 | 07.53 | 06.13 | 05.21 | 03.36 | 02.27 | 03.34 | 05.16 | 06.49 | 08.20 | 09.02 | 10.15 |
| | 15.16 | 17.01 | 18.28 | 21.04 | 22.45 | 00.01 | 23.01 | 21.13 | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.29 | 07.49 | 06.09 | 05.17 | 03.32 | 02.27 | 03.37 | 05.19 | 06.52 | 08.23 | 09.05 | 10.15 |
| | 15.19 | 17.04 | 18.31 | 21.07 | 22.48 | 00.01 | 22.57 | 21.09 | 19.17 | 17.30 | 14.50 | 14.06 |
| 23 | 09.26 | 07.46 | 06.06 | 05.13 | 03.29 | 02.28 | 03.41 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.23 | 17.07 | 18.34 | 21.11 | 22.51 | 00.01 | 22.54 | 21.06 | 19.13 | 17.26 | 14.48 | 14.06 |
| 24 | 09.23 | 07.42 | 06.02 | 05.10 | 03.26 | 02.28 | 03.44 | 05.25 | 06.58 | 08.29 | 09.12 | 10.16 |
| | 15.26 | 17.11 | 18.37 | 21.14 | 22.55 | 00.01 | 22.51 | 21.02 | 19.10 | 17.23 | 14.45 | 14.07 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.23 | 02.29 | 03.47 | 05.28 | 07.01 | 07.32 | 09.15 | 10.16 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.58 | 00.01 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.08 |
| 26 | 09.18 | 07.35 | 05.55 | 05.03 | 03.20 | 02.30 | 03.51 | 05.32 | 07.04 | 07.36 | 09.18 | 10.16 |
| | 15.33 | 17.17 | 18.44 | 21.20 | 23.01 | 00.00 | 22.44 | 20.55 | 19.02 | 16.16 | 14.40 | 14.09 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.17 | 02.32 | 03.54 | 05.35 | 07.07 | 07.39 | 09.22 | 10.16 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 23.59 | 22.41 | 20.51 | 18.59 | 16.13 | 14.37 | 14.10 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.33 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.40 | 17.23 | 18.50 | 21.27 | 23.08 | 23.58 | 22.38 | 20.48 | 18.55 | 16.09 | 14.35 | 14.12 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.35 | 04.01 | 05.41 | 07.13 | 07.45 | 09.28 | 10.15 |
| | 15.43 | | 19.53 | 21.30 | 23.11 | 23.57 | 22.34 | 20.44 | 18.52 | 16.06 | 14.32 | 14.13 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.37 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.14 |
| | 15.46 | | 19.56 | 21.33 | 23.15 | 23.55 | 22.31 | 20.40 | 18.48 | 16.02 | 14.30 | 14.15 |
| 31 | 09.02 | | 06.37 | | 03.05 | | 04.08 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.27 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 165 | 235 | 363 | 453 | 576 | 637 | 617 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** M - Lomarakennus M (Haukilahti)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.35 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.57 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.34 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.51 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.37 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.12 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.26 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.08 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.07 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.14 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.49 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.32 | 00.00 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.53 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.14 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.15 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.56 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.03 | 23.01 | 21.13 | 19.21 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.10 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.13 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.33 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.41 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.06 | 00.00 | 22.41 | 20.52 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.46 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.32 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.19 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** N - Lomarakennus N (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.31 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.08 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.52 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.41 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.05 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.26 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.52 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 19.45/3.5.584

# SHADOW - Calendar

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas **Shadow receptor:** O - Lomarakennus O (Kuusela)

## Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [LULEA]

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0,60 | 2,61 | 4,18 | 6,47 | 8,80 | 10,60 | 9,50 | 6,88 | 4,22 | 2,77 | 1,22 | 0,17 |

Operational time

| N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 531 | 419 | 483 | 544 | 577 | 835 | 1 110 | 1 067 | 895 | 816 | 712 | 643 | 8 632 |

Idle start wind speed: Cut in wind speed from power curve

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.13 | 09.00 | 07.25 | 06.33 | 04.44 | 03.01 | 02.38 | 04.10 | 05.50 | 07.19 | 07.55 | 09.34 |
| | 14.18 | 15.53 | 17.26 | 20.02 | 21.37 | 23.22 | 23.55 | 22.24 | 20.33 | 18.44 | 15.55 | 14.27 |
| 2 | 10.12 | 08.56 | 07.21 | 06.29 | 04.41 | 02.55 | 02.40 | 04.14 | 05.53 | 07.22 | 07.59 | 09.37 |
| | 14.20 | 15.56 | 17.30 | 20.05 | 21.40 | 23.25 | 23.53 | 22.21 | 20.30 | 18.41 | 15.52 | 14.25 |
| 3 | 10.11 | 08.53 | 07.18 | 06.26 | 04.37 | 02.53 | 02.42 | 04.17 | 05.56 | 07.25 | 08.02 | 09.40 |
| | 14.22 | 16.00 | 17.33 | 20.08 | 21.44 | 23.28 | 23.51 | 22.17 | 20.26 | 18.37 | 15.49 | 14.23 |
| 4 | 10.10 | 08.50 | 07.14 | 06.22 | 04.34 | 02.50 | 02.45 | 04.21 | 05.59 | 07.28 | 08.05 | 09.43 |
| | 14.25 | 16.03 | 17.36 | 20.11 | 21.47 | 23.31 | 23.49 | 22.14 | 20.22 | 18.33 | 15.45 | 14.21 |
| 5 | 10.08 | 08.47 | 07.11 | 06.18 | 04.30 | 02.47 | 02.47 | 04.24 | 06.02 | 07.31 | 08.09 | 09.46 |
| | 14.27 | 16.07 | 17.39 | 20.14 | 21.50 | 23.34 | 23.47 | 22.10 | 20.19 | 18.30 | 15.42 | 14.19 |
| 6 | 10.07 | 08.44 | 07.07 | 06.15 | 04.27 | 02.45 | 02.50 | 04.27 | 06.05 | 07.34 | 08.12 | 09.49 |
| | 14.30 | 16.10 | 17.42 | 20.17 | 21.54 | 23.36 | 23.44 | 22.07 | 20.15 | 18.26 | 15.39 | 14.17 |
| 7 | 10.05 | 08.40 | 07.03 | 06.11 | 04.23 | 02.43 | 02.53 | 04.30 | 06.08 | 07.37 | 08.15 | 09.51 |
| | 14.32 | 16.14 | 17.45 | 20.20 | 21.57 | 23.39 | 23.42 | 22.03 | 20.11 | 18.23 | 15.36 | 14.15 |
| 8 | 10.03 | 08.37 | 07.00 | 06.07 | 04.20 | 02.40 | 02.55 | 04.34 | 06.11 | 07.40 | 08.19 | 09.54 |
| | 14.35 | 16.17 | 17.48 | 20.23 | 22.01 | 23.42 | 23.40 | 22.00 | 20.08 | 18.19 | 15.32 | 14.14 |
| 9 | 10.01 | 08.34 | 06.56 | 06.04 | 04.16 | 02.38 | 02.58 | 04.37 | 06.14 | 07.43 | 08.22 | 09.56 |
| | 14.38 | 16.21 | 17.51 | 20.26 | 22.04 | 23.44 | 23.37 | 21.56 | 20.04 | 18.16 | 15.29 | 14.12 |
| 10 | 09.59 | 08.30 | 06.53 | 06.00 | 04.13 | 02.36 | 03.01 | 04.40 | 06.17 | 07.46 | 08.25 | 09.58 |
| | 14.40 | 16.24 | 17.55 | 20.30 | 22.07 | 23.47 | 23.34 | 21.53 | 20.01 | 18.12 | 15.26 | 14.11 |
| 11 | 09.57 | 08.27 | 06.49 | 05.57 | 04.09 | 02.34 | 03.01 | 04.44 | 06.20 | 07.49 | 08.29 | 10.01 |
| | 14.43 | 16.27 | 17.58 | 20.33 | 22.11 | 23.49 | 23.32 | 21.49 | 19.57 | 18.08 | 15.23 | 14.09 |
| 12 | 09.55 | 08.24 | 06.45 | 05.53 | 04.06 | 02.33 | 03.04 | 04.47 | 06.23 | 07.52 | 08.32 | 10.03 |
| | 14.46 | 16.31 | 18.01 | 20.36 | 22.14 | 23.51 | 23.29 | 21.46 | 19.53 | 18.05 | 15.20 | 14.08 |
| 13 | 09.53 | 08.20 | 06.42 | 05.49 | 04.02 | 02.31 | 03.07 | 04.50 | 06.26 | 07.55 | 08.36 | 10.05 |
| | 14.49 | 16.34 | 18.04 | 20.39 | 22.18 | 23.53 | 23.26 | 21.42 | 19.50 | 18.01 | 15.16 | 14.07 |
| 14 | 09.50 | 08.17 | 06.38 | 05.46 | 03.59 | 02.30 | 03.11 | 04.53 | 06.29 | 07.58 | 08.39 | 10.06 |
| | 14.53 | 16.37 | 18.07 | 20.42 | 22.21 | 23.55 | 23.23 | 21.38 | 19.46 | 17.58 | 15.13 | 14.06 |
| 15 | 09.48 | 08.13 | 06.35 | 05.42 | 03.55 | 02.28 | 03.14 | 04.57 | 06.31 | 08.01 | 08.42 | 10.08 |
| | 14.56 | 16.41 | 18.10 | 20.45 | 22.25 | 23.57 | 23.20 | 21.35 | 19.42 | 17.54 | 15.10 | 14.06 |
| 16 | 09.46 | 08.10 | 06.31 | 05.38 | 03.52 | 02.27 | 03.17 | 05.00 | 06.34 | 08.04 | 08.46 | 10.10 |
| | 14.59 | 16.44 | 18.13 | 20.48 | 22.28 | 23.58 | 23.17 | 21.31 | 19.39 | 17.51 | 15.07 | 14.05 |
| 17 | 09.43 | 08.07 | 06.27 | 05.35 | 03.48 | 02.27 | 03.20 | 05.03 | 06.37 | 08.07 | 08.49 | 10.11 |
| | 15.02 | 16.47 | 18.16 | 20.52 | 22.31 | 23.59 | 23.14 | 21.28 | 19.35 | 17.47 | 15.04 | 14.05 |
| 18 | 09.40 | 08.03 | 06.24 | 05.31 | 03.45 | 02.26 | 03.23 | 05.06 | 06.40 | 08.10 | 08.52 | 10.12 |
| | 15.05 | 16.51 | 18.19 | 20.55 | 22.35 | 00.01 | 23.11 | 21.24 | 19.31 | 17.44 | 15.01 | 14.04 |
| 19 | 09.38 | 08.00 | 06.20 | 05.28 | 03.42 | 02.26 | 03.27 | 05.09 | 06.43 | 08.13 | 08.56 | 10.13 |
| | 15.09 | 16.54 | 18.22 | 20.58 | 22.38 | 00.01 | 23.08 | 21.20 | 19.28 | 17.40 | 14.58 | 14.04 |
| 20 | 09.35 | 07.56 | 06.17 | 05.24 | 03.38 | 02.25 | 03.30 | 05.13 | 06.46 | 08.17 | 08.59 | 10.14 |
| | 15.12 | 16.57 | 18.25 | 21.01 | 22.42 | 00.02 | 23.04 | 21.17 | 19.24 | 17.37 | 14.55 | 14.04 |
| 21 | 09.32 | 07.53 | 06.13 | 05.20 | 03.35 | 02.25 | 03.33 | 05.16 | 06.49 | 08.20 | 09.03 | 10.15 |
| | 15.15 | 17.01 | 18.28 | 21.04 | 22.45 | 00.02 | 23.01 | 21.13 | 19.20 | 17.33 | 14.53 | 14.05 |
| 22 | 09.30 | 07.49 | 06.09 | 05.17 | 03.32 | 02.26 | 03.37 | 05.19 | 06.52 | 08.23 | 09.06 | 10.16 |
| | 15.19 | 17.04 | 18.31 | 21.08 | 22.49 | 00.03 | 22.58 | 21.10 | 19.17 | 17.30 | 14.50 | 14.05 |
| 23 | 09.27 | 07.46 | 06.06 | 05.13 | 03.29 | 02.26 | 03.40 | 05.22 | 06.55 | 08.26 | 09.09 | 10.16 |
| | 15.22 | 17.07 | 18.34 | 21.11 | 22.52 | 00.03 | 22.55 | 21.06 | 19.13 | 17.26 | 14.47 | 14.06 |
| 24 | 09.24 | 07.42 | 06.02 | 05.09 | 03.25 | 02.27 | 03.43 | 05.25 | 06.58 | 08.29 | 09.12 | 10.17 |
| | 15.25 | 17.10 | 18.37 | 21.14 | 22.55 | 00.02 | 22.51 | 21.02 | 19.10 | 17.23 | 14.44 | 14.06 |
| 25 | 09.21 | 07.39 | 05.58 | 05.06 | 03.22 | 02.28 | 03.47 | 05.28 | 07.01 | 07.32 | 09.16 | 10.17 |
| | 15.29 | 17.14 | 18.40 | 21.17 | 22.59 | 00.02 | 22.48 | 20.59 | 19.06 | 16.19 | 14.42 | 14.07 |
| 26 | 09.18 | 07.35 | 05.55 | 05.02 | 03.19 | 02.29 | 03.50 | 05.31 | 07.04 | 07.36 | 09.19 | 10.17 |
| | 15.32 | 17.17 | 18.44 | 21.21 | 23.02 | 00.01 | 22.45 | 20.55 | 19.02 | 16.16 | 14.39 | 14.08 |
| 27 | 09.15 | 07.32 | 05.51 | 04.59 | 03.16 | 02.30 | 03.54 | 05.34 | 07.07 | 07.39 | 09.22 | 10.17 |
| | 15.36 | 17.20 | 18.47 | 21.24 | 23.05 | 00.00 | 22.41 | 20.51 | 18.59 | 16.12 | 14.37 | 14.09 |
| 28 | 09.12 | 07.28 | 05.48 | 04.55 | 03.13 | 02.32 | 03.57 | 05.38 | 07.10 | 07.42 | 09.25 | 10.16 |
| | 15.39 | 17.23 | 18.50 | 21.27 | 23.09 | 23.59 | 22.38 | 20.48 | 18.55 | 16.09 | 14.34 | 14.11 |
| 29 | 09.09 | | 06.44 | 04.52 | 03.10 | 02.34 | 04.00 | 05.41 | 07.13 | 07.45 | 09.28 | 10.16 |
| | 15.43 | | 19.53 | 21.30 | 23.12 | 23.58 | 22.35 | 20.44 | 18.51 | 16.06 | 14.32 | 14.12 |
| 30 | 09.06 | | 06.40 | 04.48 | 03.07 | 02.36 | 04.04 | 05.44 | 07.16 | 07.49 | 09.31 | 10.15 |
| | 15.46 | | 19.56 | 21.34 | 23.15 | 23.56 | 22.31 | 20.41 | 18.48 | 16.02 | 14.29 | 14.14 |
| 31 | 09.03 | | 06.37 | | 03.04 | | 04.07 | 05.47 | | 07.52 | | 10.14 |
| | 15.50 | | 19.59 | | 23.18 | | 22.28 | 20.37 | | 15.59 | | 14.16 |
| Potential sun hours | 164 | 235 | 363 | 453 | 576 | 638 | 618 | 512 | 394 | 303 | 193 | 128 |
| Total, worst case | | | | | | | | | | | | |
| Sun reduction | | | | | | | | | | | | |
| Oper. time red. | | | | | | | | | | | | |
| Wind dir. red. | | | | | | | | | | | | |
| Total reduction | | | | | | | | | | | | |
| Total, real | | | | | | | | | | | | |

**Table layout: For each day in each month the following matrix apply**

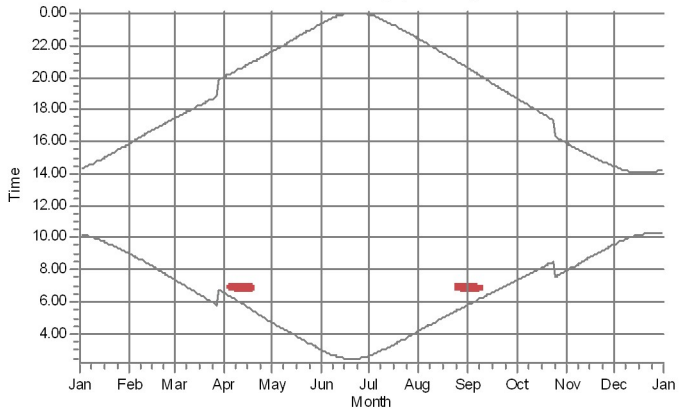
| Day in month | Sun rise (hh:mm)<br>Sun set (hh:mm) | Minutes with flicker | First time (hh:mm) with flicker<br>Last time (hh:mm) with flicker | (WTG causing flicker first time)<br>(WTG causing flicker last time) |
|---|---|---|---|---|

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9.5.2023 19.45/3.5.584

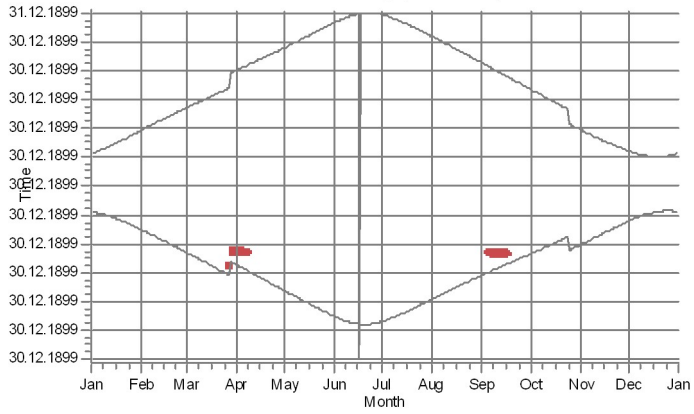
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

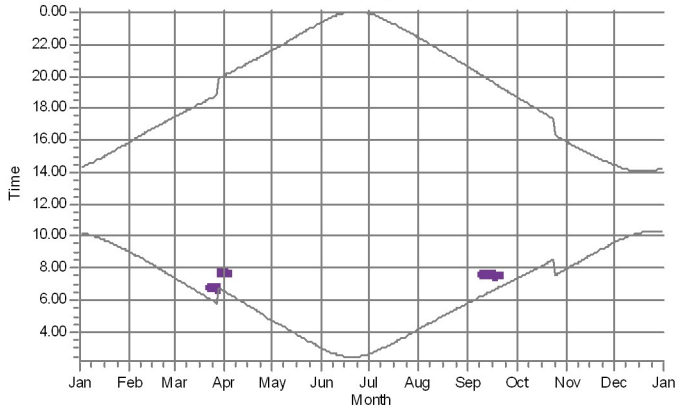
A: Lomarakennus A (Syvälahti)



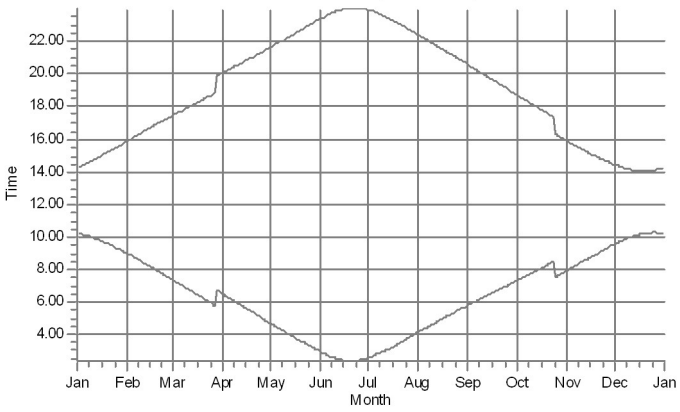

B: Asuinrakennus B (Syväänlahti)



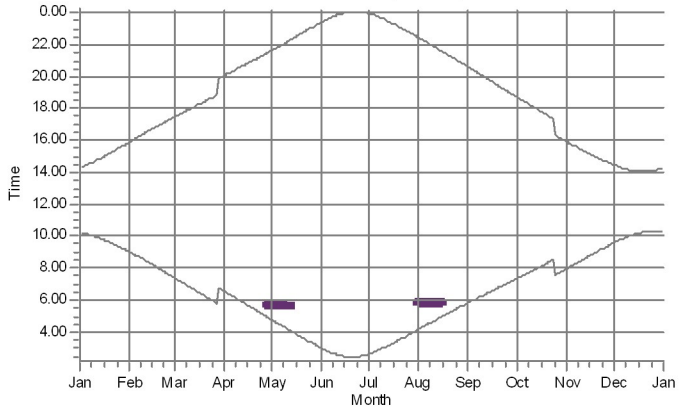

C: Lomarakennus C (Mutalahti)



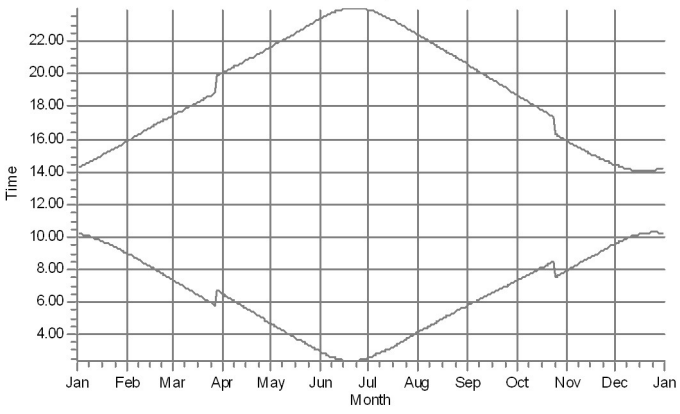

D: Lomarakennus D (Mutaniemi)




E: Asuinrakennus E (Alanko)




F: Asuinrakennus F (Joensuu)



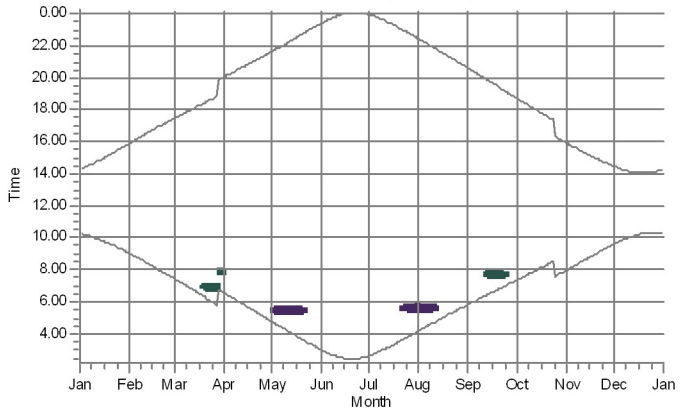



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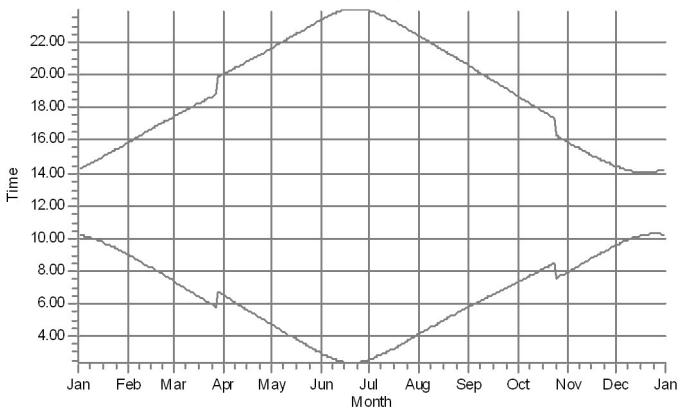
# SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

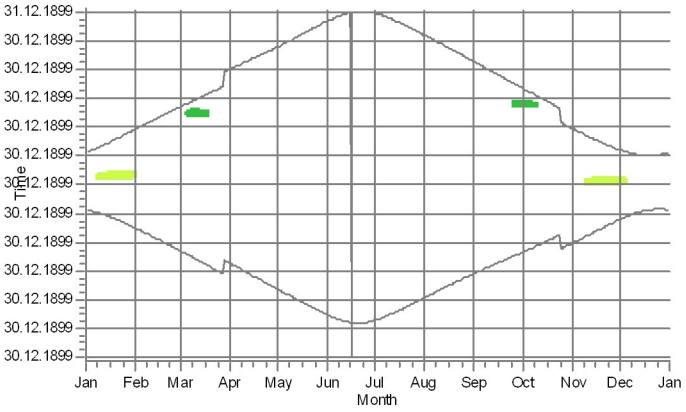
G: Asuinrakennus G (Heiniaho)



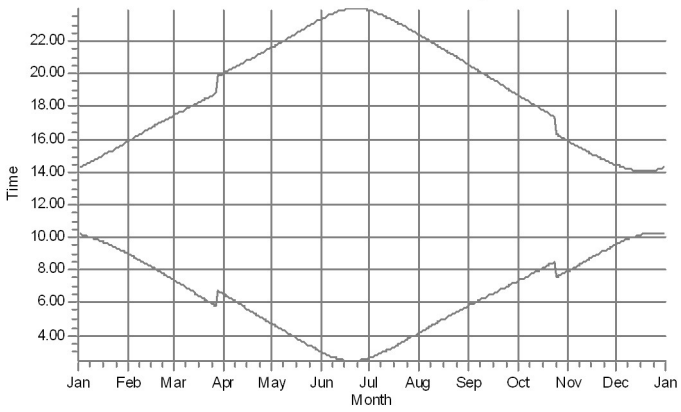

H: Asuinrakennus H (Mäkelä)



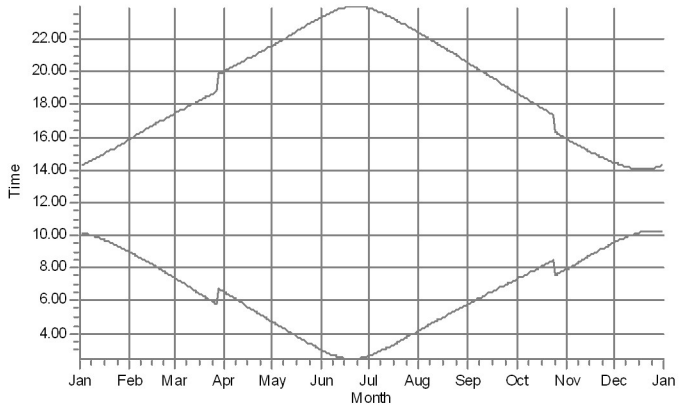

I: Lomarakennus I



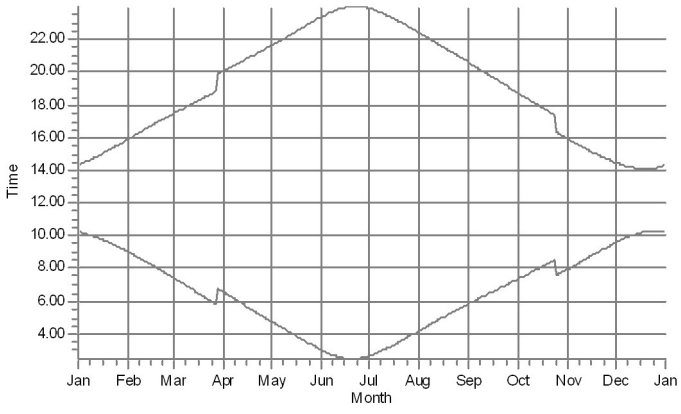

J: Lomarakennus J (Hautakaarto)




K: Asuinrakennus K (Takalo)




L: Lomarakennus L (Haukijärvi)



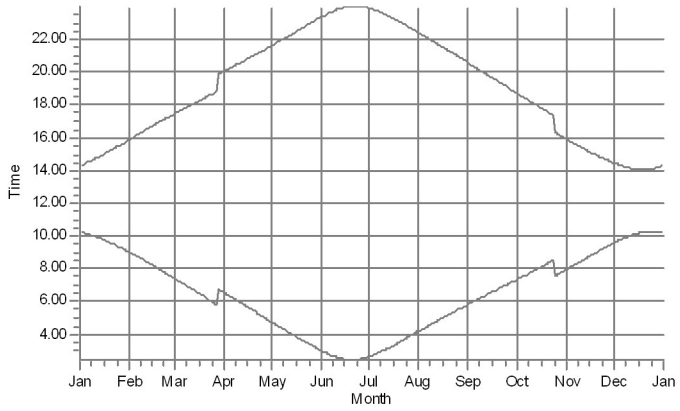



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Calculated:
9.5.2023 19.45/3.5.584

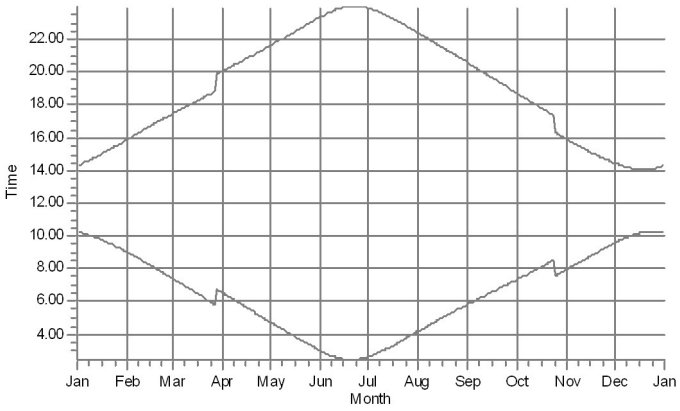
## SHADOW - Calendar, graphical

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas

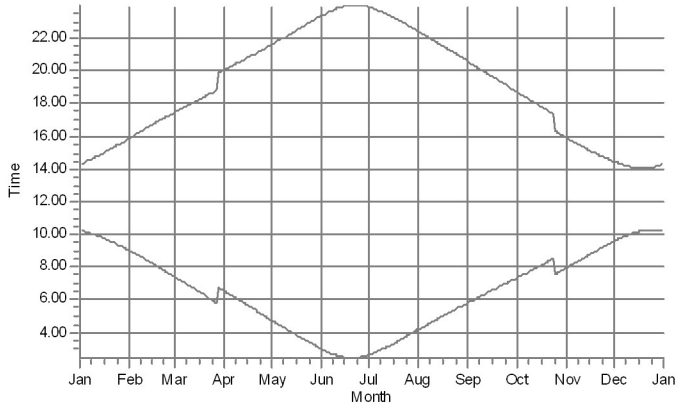
M: Lomarakennus M (Haukilahti)




N: Lomarakennus N (Kuusela)




O: Lomarakennus O (Kuusela)

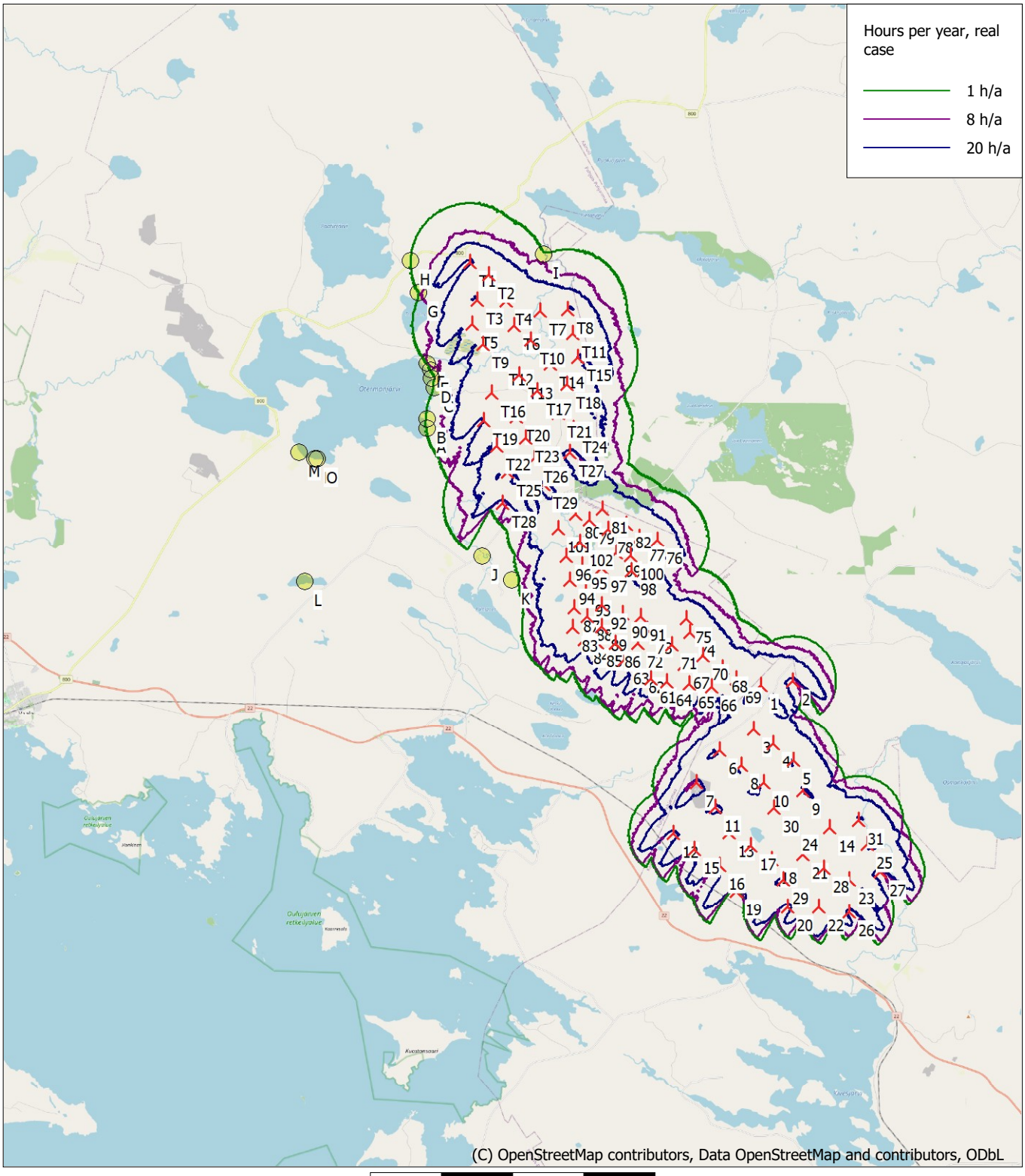



WTGs

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Calculated:
9.5.2023 19.45/3.5.584

# SHADOW - Map

**Calculation:** Haarasuonkangas_VE2_RD200x29xHH200_2023058 + Turkkiselkä + Takiankangas




Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 509 790 North: 7 163 490

New WTG  Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (2)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m